CSMP Mathematics for the First Grade

Teacher's Guide

McREL

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For additional information, contact:
McREL Institute
2550 So. Parker Rd., Suite 500
Aurora, CO 80014
(303) 337-0990

PREFACE

CSMP Mathematics for the First Grade owes its existence to the vision and leadership of *CSMP*'s first director, Burt Kaufman, and a special group of people concerned not only about the kind of mathematics being taught to children but also the manner in which it is taught. This distinction is crucial to a child's early exposure to and future relationship with mathematics.

The *CSMP* first grade curriculum is in large part the outgrowth of a great deal of active involvement with students in ordinary classroom settings. Its current form has been strongly influenced by information gathered from field test classes in Fort Collins and Eaton, Colorado, as well as from earlier extended pilot test sites nationwide. But its underlying manner of presentation and many of the pedagogical ideas and tools, which make *CSMP* unique among curricula, are based on the pioneering works of Georges and Frédérique Papy. We acknowledge them here with deep gratitude. We also acknowledge the work of mathematician and psychologist Caleb Gattegno for the fundamental idea of presenting mathematics to students via pedagogical situations.

Earlier versions of *CSMP Mathematics for the First Grade* dating back to 1973 were due to the efforts of former *CSMP* staff members Martin Caplan, Lowell Carmony, Edward Esty, Jerry Exum, Robert and Henrianne Hammond, Ann Karmos, Sol Pelavin, Kevin Saunders, Janis Schweitzer, and Christiane Vandeputte.

This revised edition of the program—*CSMP/21*—is a result of new information gleaned thanks to the interest and concern of *CSMP* teachers nationwide. During the 1991–92 school year, the lessons in this edition were tested by first grade teachers MaryAnn Armstrong, Patty Bell, Cathy Bishop, Judy Comedi, Stephanie Damour, Joyce Hubka, Pat Long, Mandy Magill, Terry Malholland, Bunny Roeser, Nancy Rowe, and Mary Beth Solano in schools of the Poudre R-1 School District, Fort Collins, Colorado.

In addition, we acknowledge the following individuals for their work in producing the *CSMP/21* edition of the first grade program.

Writer
Clare Heidema

Consultants
Lois Ball
Patty Bell

Editors
Clare Heidema
Shae Isaacs

Production Specialists
Judy Schlecte
Kevin Tatroe

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Notes to the Teacher

WELCOME

Welcome! You are about to teach *CSMP Mathematics for the First Grade,* perhaps for the first time. We wish you success and hope both you and your students enjoy the activities suggested in this teacher's guide. The purpose of this section is to help you use this book effectively, to describe the *CSMP* materials, and to give suggestions for organizing the program. In Section Two, you'll find answers to some frequently asked questions; in Section Three, a suggested schedule of lessons; and in Section Four, a suggested teaching guide.

As you and your students take part in these activities during the year, you will discover a definite *CSMP* viewpoint about elementary school mathematics, one we hope you will come to understand and share. Part of that viewpoint is that learning takes place when students react to interesting real-life or fantasy situations (sometimes called a *pedagogy of situations),* such as those in stories or games. You'll find that *CSMP* presents situations that involve students personally and allow arithmetic to take the form of adventures in the world of numbers.

We believe that every child can and does learn something from each situation encountered in the program, sometimes suddenly and dramatically, sometimes latently. For this reason, *CSMP* teachers do not stick to one topic until it is mastered. Indeed, our experience indicates that learning often stops when the purpose of a lesson is merely the mastery of a skill. Instead, we view learning as more of a spiral rather than a linear process in which intuitive leaps play as big a role as the acquisition of small successive pieces of information, and that a variety of situations can provide the interrelated experiences through which we learn.

Further explanation of what we mean by a pedagogy of situations and spiral development can be found in the question and answer section, but you will learn their meanings primarily by experiencing them for yourself as you teach the curriculum. Meanwhile, we assure you that a large number of *CSMP* teachers across the country have come to understand and embrace the *CSMP* style of teaching and learning and are very pleased with the results.

PROGRAM DESCRIPTION

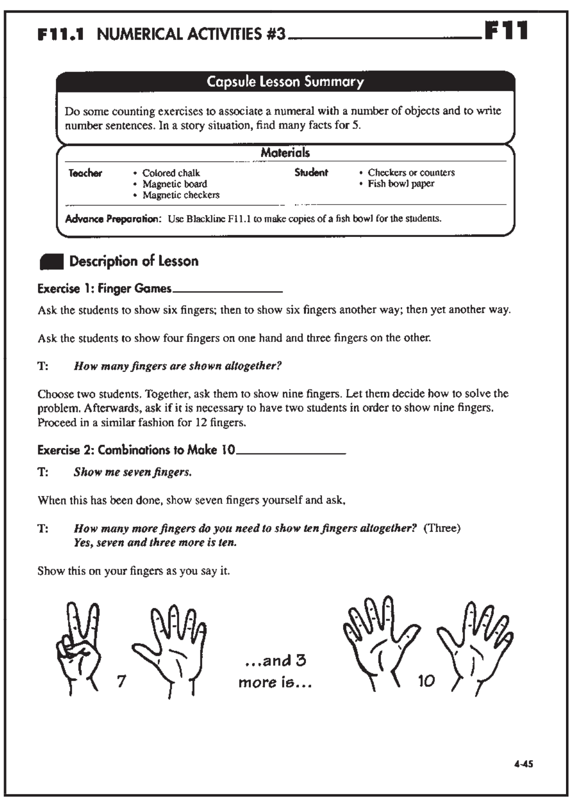
Since the learning process occurs through many interrelated experiences, the *CSMP* curriculum is structured so that no single lesson is an end in itself. It is neither intended nor expected that every student will meet the full challenge of a particular situation in any given lesson. Furthermore, we have found it is most effective to vary the situations from day-to-day rather than to continue one type of situation or topic until so-called mastery has occurred. This spiral development (see page 2-1) is reflected in the materials and curriculum scheduling. This approach allows a student to experience each of several ideas a little at a time and then proceed through increasing levels of sophistication as the situations become more challenging. We hope you will keep in mind the spiral approach as you teach *CSMP Mathematics for the First Grade*.

Description of Materials

Teacher's Guide

Following some important introductory sections, the bulk of the teacher's guide contains day-by-day lessons numbered F0-F160. You will start with Lesson F1 and progress as far as possible during the school year. Many of the lessons are in two parts.

Each lesson is presented in a format that includes its number, title, a capsule summary, the materials needed, and a step-by-step lesson description. For example, the illustration below shows the first pages from the two lesson parts which together comprise the 11th mathematics lesson of the year.



F11.1 NUMERICAL ACTIVITIES #3 — F11

Capsule Lesson Summary

Do some counting exercises to associate a numeral with a number of objects and to write number sentences. In a story situation, find many facts for 5.

Materials

Teacher
- Colored chalk
- Magnetic board
- Magnetic checkers

Student
- Checkers or counters
- Fish bowl paper

Advance Preparation: Use Blackline F11.1 to make copies of a fish bowl for the students.

Description of Lesson

Exercise 1: Finger Games

Ask the students to show six fingers; then to show six fingers another way; then yet another way.

Ask the students to show four fingers on one hand and three fingers on the other.

T: ***How many fingers are shown altogether?***

Choose two students. Together, ask them to show nine fingers. Let them decide how to solve the problem. Afterwards, ask if it is necessary to have two students in order to show nine fingers. Proceed in a similar fashion for 12 fingers.

Exercise 2: Combinations to Make 10

T: ***Show me seven fingers.***

When this has been done, show seven fingers yourself and ask,

T: ***How many more fingers do you need to show ten fingers altogether?*** (Three)
Yes, seven and three more is ten.

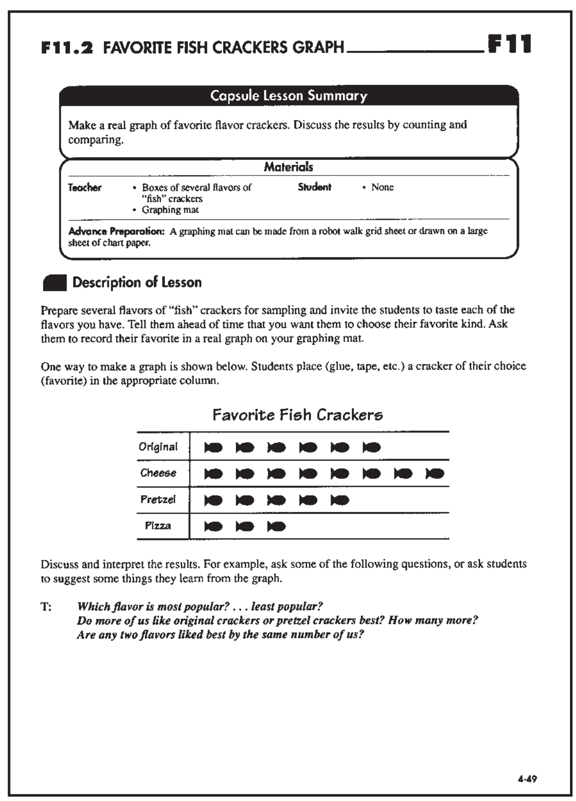
Show this on your fingers as you say it.

7

...and 3 more is...

10

4-45



F11.2 FAVORITE FISH CRACKERS GRAPH — F11

Capsule Lesson Summary

Make a real graph of favorite flavor crackers. Discuss the results by counting and comparing.

Materials

Teacher
- Boxes of several flavors of "fish" crackers
- Graphing mat

Student
- None

Advance Preparation: A graphing mat can be made from a robot walk grid sheet or drawn on a large sheet of chart paper.

Description of Lesson

Prepare several flavors of "fish" crackers for sampling and invite the students to taste each of the flavors you have. Tell them ahead of time that you want them to choose their favorite kind. Ask them to record their favorite in a real graph on your graphing mat.

One way to make a graph is shown below. Students place (glue, tape, etc.) a cracker of their choice (favorite) in the appropriate column.

Favorite Fish Crackers

Original

Cheese

Pretzel

Pizza

Discuss and interpret the results. For example, ask some of the following questions, or ask students to suggest some things they learn from the graph.

T: ***Which flavor is most popular? . . . least popular?***
Do more of us like original crackers or pretzel crackers best? How many more?
Are any two flavors liked best by the same number of us?

4-49

The lesson description includes important teaching notes, illustrations of diagrams to put on the chalkboard or otherwise display for the class, examples of possible dialogue, and suggestions for group activities. Answer keys for worksheets and workbooks are provided in reduced form at the end of a lesson description.

At the beginning of the day-by-day lesson guide (F0), there are some recommendations to prepare you for the first day of class: materials *CSMP* assumes are available in your classroom, how to arrange materials so that they are accessible, and visual aids that can improve the learning atmosphere of your classroom.

Every tenth day (F10, F20, ...) is called an adjustment/assessment day, and provides a time when you can stop and deal with the special needs of your class. Suggestions are provided for dealing with a variety of student problems and needs. Also, early warnings advise you of any special materials needed in the next nine lessons. See page 1-9 for more information on adjustment/assessment days.

Teacher Materials

In addition to the teacher's guide, you will need certain demonstration or manipulative materials. Those listed here are contained in the *CSMP* Classroom Set.

- **Demonstration Minicomputer Kit:** Four magnetic Minicomputer boards; one set of magnetic checkers
- **A-Blocks String Game Kit:** Two sets of A-blocks; two attribute posters; two sets of string game cards; magnetic material
- **Demonstration C-Rods**†
- **Demonstration Numeral Cards**
- **0–109 Numeral Chart**
- **Number Line**
- **First Grade Poster Set**
- **Robot Walk Grid Sheets**
- **Blacklines**

These and/or other materials needed are listed at the beginning of each lesson. Materials not included in the classroom set are generally readily available or can be prepared from usual classroom supplies. Many lessons call for an overhead or class calculator.

Student Materials

Some individual materials will be needed for each student (or each pair of students). The materials listed here are contained in the *CSMP* Classroom Set.

- **FG Worksheet Booklet**
- **Parade of Problems #1, #2, and #3 Workbooks**
- **One Out of Seven, I Am a Very Happy Boy, The Little Dreamer, The Weird Story of 24 Storybooks**
- **A-Blocks Set**
- **Individual Minicomputer Set:** Two sheets of Minicomputer boards; one sheet of checkers
- **Tangram Sheet and Tangram Puzzles Booklet**
- **Individual Number Line**
- **Coin Cubes**

†C-Rods can be found commercially under the name Cuisenaire Rods.

These and/or other materials needed are listed at the beginning of each lesson. Often, commercially available manipulatives are suggested (such as Unifix® cubes, geoboards, counters, base-10 blocks, and so on) along with several alternatives. Many lessons call for the students to have calculators (see page 1-8 on the role and use of calculators).

Some teachers find it convenient to provide each student with a sturdy cardboard box for storing manipulative materials. Others find it easier to store all the materials of one kind together in a container of appropriate size and to distribute these materials to the students as they are needed. In any case, you should probably keep the worksheet booklets, workbooks, and storybooks in your storage area and distribute them as called for in the lessons.

Role and Use of Worksheets, Workbooks, and Storybooks

Worksheets

Some lessons include worksheets for class, group, or independent work. Worksheets are designated with numbers corresponding to the lessons with which they are used, and with stars indicating the order in which they are to be completed. The stars also suggest an increasing level of difficulty which provides for various abilities of students. It is important that you do not insist that every student finish every worksheet before going on to the next lesson. Though some students will finish more worksheets than others during the allotted time, don't worry. The same ideas will emerge in new settings in later lessons so that students will have other opportunities to work independently on the same topics.

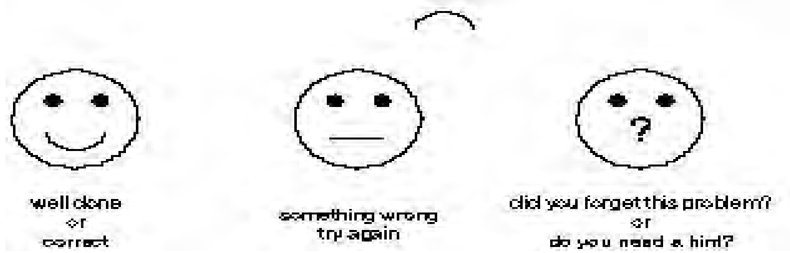
Workbooks

CSMP Mathematics for the First Grade includes three workbooks titled *Parade of Problems #1*, *#2*, and *#3*. Each is a 32-page booklet that reviews problems that have been encountered up to that point in the curriculum. Two lessons are scheduled for each workbook. We suggest that all students be directed to start at the beginning of a workbook and work independently through as many pages as they can during the two periods.

Ordinarily the first ten pages of a workbook are easy enough to guarantee some success for all your students; the next ten pages are average level difficulty; and the remaining pages are more difficult, often challenging even your best students. We estimate that about two-thirds of your students should correctly finish the first ten pages during the two scheduled lessons; one-third should finish the first twenty pages; and a few might finish all or most of the pages. Of course, these proportions will vary from class to class.

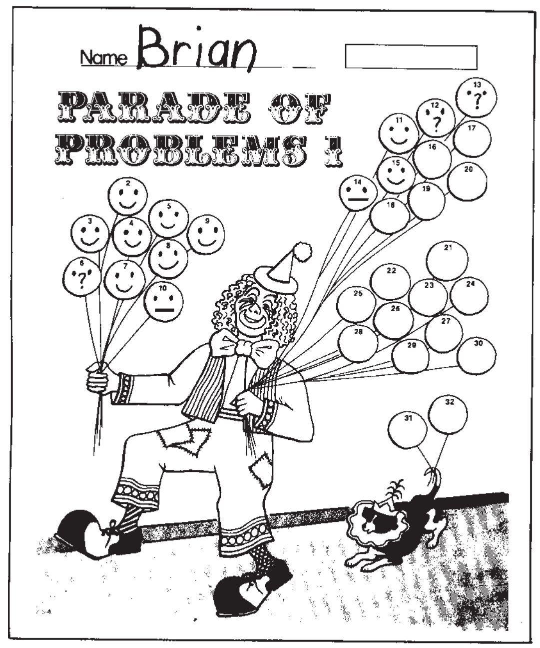
Two full class periods are devoted to each workbook. At the end of the first period, collect the workbooks and check some or all of the completed pages. When you return the workbooks at the beginning of the next workbook period, the students can correct their mistakes before going on to new problems.

Notice that the cover page of each workbook includes spaces for marking your evaluation of the work on each page. One way to do this is to use symbols such as the following:



The illustration below shows the front cover of a *Parade of Problems #1* Workbook after checking. Again, we recommend that you do not require or even encourage every student to finish every problem in a workbook. If, at the end of the two lessons, some students have not completed as much of the workbook as you expect they are capable of, you might suggest they spend some extra time on it during the next adjustment/assessment day. It is not useful to demand completion or mastery before permitting work to begin on the next series.

Note: This is the way Brian's workbook was returned to him at the beginning of the second *Parade of Problems #1* lesson. The blank circles 16–32 indicate that he had not yet worked on these pages. Before Brian goes ahead to page 16 during the second lesson, he should correct mistakes on pages 10 and 14 and finish the work on pages 6, 12, and 13.



After the second workbook period, and after you have checked the results, you might want to send workbooks home with students. This can be one way to keep parents informed of their child's progress. A letter to parents/guardians concerning the workbooks might accompany the first workbook sent home. See Lesson F80.

Storybooks

There are twenty-four storybooks for young readers in the collection *Stories by Frédérique*. Each story is presented in a colorful newsprint booklet and can be used for individual or collective reading at school or at home. The stories are independent of each other and for the most part need no teacher explanation. The storybook titles and their intended age range are as follows:

Ages 5 to 8

The Playful Numbers
The Baby is Born
81 Roses
One Out of Seven
The Old Shoemaker
I Am a Very Happy Boy
The Little Dreamer
Two by Two
The Weird Story of 24
Where's My Nose?
The Happy Puppet
The Magic Box
Summer School in the Old Days

Ages 8 to 12

The Little Donkey
Singing Friends
Dancing Friends
I Am Not My Name
The Living Lines
The Square Trap
Nabu Wins an Award

Ages 10 to 14

The Hidden Treasure
A Valentine Mystery
Election in the Number World
A Very Strange Neighborhood

Four of the thirteen storybooks intended for children ages 5 to 8 are used in *CSMP Mathematics for the First Grade*. Students can become easily engaged in these stories: there are questions to answer, pictures to relate to the story, and new adventures to invent for story characters. Students find expression of emotions and aesthetic senses in the world of numbers, just as in the world of people.

At the first grade level, an important part of the storybook lesson is relating a picture to a story. The non-verbal languages of arrows and strings communicate exciting information to the reader. Your students may want to reread (or just look at) the storybooks several times after they have used them for lessons.

Many lessons suggest reading activities using other books as extensions or enhancements. See the appendix for a list of all the books suggested in lessons and many others you might consider.

Role and Use of Calculators

The calculator, if used creatively, can have a remarkably beneficial effect on students' interest in and understanding of arithmetic, and can contribute to their developing capabilities. The reasons for this are many and varied, but the following are certainly among them:

- Students enjoy using calculators and respond with enthusiasm to most calculator activities.
- As a pedagogical tool, the calculator contributes to the development of mental arithmetic skills, number sense, and mathematical concepts.
- By removing the burden of mechanical computation, the calculator frees students to concentrate on the thinking that is a necessary part of the solution to any meaningful problem.
- The instant feedback provided by the calculator enables students to explore patterns, and make and test conjectures, both important areas that might otherwise be overwhelming.

Calculators are recommended for many lessons in *CSMP Mathematics for the First Grade*. Ideally your class should have access to at least one calculator for every two students and an overhead calculator that matches the students' calculators. If this is not possible, you may want to encourage students to bring calculators from home. Check that your classroom calculators or any calculators brought by students have the following features:

- **Chain operations:** This means that the calculator responds to instructions given in the order in which they are entered. To check that this is the case, press ′4 + 1 x 5 =. If you have 10 on the display, then all is well
- **Constant mode:** Some calculators have a switch so that the calculator can be set in constant mode. If your calculator lacks a switch, it is quite likely that the calculator has an *automatic constant*. For calculators with an automatic constant, the first number entered during multiplication is the constant, while for addition, subtraction, or division the second number entered is the constant.

  To check your calculator for the constant mode operation of ×, press × 2 = = = and so on. If the number on the display increases by two at each depression of =, then × is operating in a constant mode. Check the constant mode operation of − in a similar fashion.

  To check the constant mode operation of × (in which the first number entered will be the constant), press 2 × 3 === and so on. If the number on the display doubles at each depression of ×,, then × is operating in a constant mode.

While it is possible to use calculators without these characteristics in the lessons, the adjustments required in the instructions make the calculators unsuitable. Even if your calculators have chain operations, check that they operate in the way described above.

SUGGESTIONS FOR ORGANIZING THE PROGRAM

Schedule of Lessons

The design and schedule of the lessons in this guide should be regarded as a suggestion. We cannot be sure which topics will be easy for your particular class or which lessons will require more or less time. Only you will be able to judge that as you teach the lessons. The program is not meant to be rigid or followed exactly; the schedule is a suggested guide.

The master schedule can be found in Section Three. It is constructed for a hypothetical first grade class with the usual range of abilities, having one class period a day of 40 to 45 minutes. Although a school year may have approximately 180 teaching days, we expect that several days will be taken up by activities such as parent-teacher conferences, assemblies, field trips, snow days, and so on. Twenty unscheduled days during the year should provide for such days and allow you some freedom in planning mathematics lessons. Feel free to adjust this schedule to the abilities, maturity, and interests of your own students, as well as to the length of your school year and the length of time each day that you devote to mathematics.

Each block in the schedule represents one class period. It may be, however, that you will spend more than one period on a few lessons. A lesson that is much too long might be finished the next day, but do not prolong a lesson which is just a bit too long. Remember, it is better to stop a lesson when student interest is high; the topic will reappear in another context later. If you find that you and your class are more comfortable with a slower pace, still follow the suggested order of the lessons.

Adjustment/Assessment Days

Adjustment/assessment days appear every tenth day of the schedule. On these days no regular lesson is scheduled so that you will have an opportunity to meet the special needs of your class.

For example, students entering first grade vary widely in their number readiness. You will be aware of these individual needs and can use the adjustment days to help students who lack certain readiness skills assumed by the *CSMP* curriculum; for example, students who cannot recite the numbers in order from 1 to 20, who cannot count a small number of objects, or who cannot recognize the numerals from 0 to 10. Suggestions for activities to use with these students are included in these sections.

These days can also be used for assessment purposes. We expect that you are already using students' class participation, writing activities, center activities, worksheets, and so on to assess student progress. On these days, we provide another form—a short, written assessment that looks like a two-page worksheet, with several different problems covering concepts from earlier lessons. These can serve as written assessments in addition to the *Parade of Problems* Workbooks.

You may wish to use some portion of adjustment/assessment days to repeat certain lessons either with a small group or the entire class. Many lessons can easily be made to appear completely different by changing the story lines and/or the numbers in the lessons. Such repetition is encouraged. Further, you may like to use an adjustment/assessment day to let students work in centers or on a project of your choice.

Of course, you might not need an adjustment day when one is scheduled. If you feel there is no need for one, simply go on to the next lesson.

At the end of these sections you will be given early warnings about upcoming lessons requiring special materials you may need to prepare or obtain.

Home Activities/Parent Communication

Parent involvement is built into *CSMP Mathematics for the First Grade* in several ways. Included in the *CSMP* Blacklines you will find a number of parent/guardian letters designed to make parents more aware of the *CSMP* languages, tools, and methods. These letters can advise parents about some types of mathematical activities their children are involved in. These can be photocopied and sent home at various points throughout the year.

In addition, suggestions for home activities frequently follow lessons. Home activities are opportunities for parents to work with their children in doing mathematics. Some are follow-up or practice for a lesson; others are for enrichment or extension. Reproducible blackline descriptions of the home activities, specifically written to parents, are also included in the Blacklines.

Cooperative Groups

Students can be placed in pairs, or groups of three or four depending on the situation. A cooperative group gives students a chance to talk through what they are learning with other students. They get immediate help and support and learn to care about the progress of every other member of the class. Cooperative groups give an opportunity for peer teaching. Students enjoy having a peer to discuss their ideas with and to give them assistance when something is difficult.

Many lessons will give suggestions for using cooperative or other group activities. Feel free to use these suggestions in your classroom. You may also want to use cooperative or other group activities in lessons where no such suggestions are given.

Centers

Many classrooms are organized with centers or stations where students work on activities without the direct assistance of the teacher. We offer these suggestions as possible ways that you might incorporate math centers into the regular classroom set-up, or might enhance and extend the math curriculum into center activities.

Manipulative/Free Play Center: Place items introduced in previous lessons here and allow students to explore them without direction. Counters, C-rods, the Minicomputer, A-blocks, Tangrams, and so on might each take a turn in the center. You might also add other types of manipulatives, purchased or handmade, to support a lesson or concept.

Reading and Writing Numbers Center: Activities here might include practice in writing numerals with different media (yarn, glitter, paint), activities on numeral recognition, reading the *CSMP* Storybooks after they have been introduced, reading other books and stories about number concepts, and creative writing activities built around *CSMP* lessons.

Relating to Lessons Center: This center could include changing task cards and worksheet suggestions that follow a particular lesson and reinforce the ideas presented there. We have suggested ideas for this type of center at the end of some lessons and you may wish to add others as the need arises in your particular class.

Setting up centers may be done so that students work alone or in groups. Many of the activities lend themselves to small groups of students working on their own but in close proximity to each other, sharing results or giving help to others as needed.

Mental Arithmetic and Supplementary Activities

Throughout the lessons there are many activities that students enjoy doing over and over in a variety of forms. For example, the String Game and the Number Line Game (to mention only two) can be played whenever an extra time period is available. Activities dealing with mental arithmetic are particularly important and fun; fully one-third of the lessons involve such activities. Teachers can invent clever variations of these mental arithmetic activities and use them often during a school day as adjuncts to the natural school routines. Some of the most obvious are checking class attendance (How many students are present? How many should be here? How many are absent?); determining the date (What day of the month is it? How many days are there in this month? How many days are left?); distributing materials (How many students are there? Two pencils for each, so how many pencils are needed?).

You may want to do some supplementary drill work on writing numbers or on basic number facts. We suggest that drills be kept to a minimum so as not to suggest to students that arithmetic is a chore.

Integration with Other Curriculum Areas

There are many opportunities in the daily classroom schedule to introduce and reinforce mathematics concepts with students. Some of these may be specifically planned by the teacher and some may arise incidentally in conversations and activities. Number recognition and counting will occur regularly, as will activities requiring looking at patterns, sorting, and using the vocabulary and concepts of mathematics. Literature that is read and shared in the class will suggest mathematical ideas that can be explored further. Books and stories can be found to support and reinforce mathematics topics. Looking for ways to integrate mathematics topics with other subject areas, and using concepts introduced through math to explore other topics will help students to see the relevance and applications of mathematics to their lives.

Reading

To find a particular page in a book is a frequent instruction for students in the first grade classroom. Taking some time to reinforce number concepts during this process will strengthen the mathematics learning of the students. Sequencing numbers and number recognition will happen each time the student opens the book. Ask students to predict what number comes before and what comes next, or to determine if the number they are looking for is more than or less than a certain number. You can begin to ask students if the number will be near the beginning, middle, or end of the book; or ask if the number is closer to one number than another. Reading numbers with two and three digits and reinforcing place value can be incorporated into these activities.

Songs, fingerplays, and stories form the foundation of much of the first grade curriculum. These contain many counting activities and introductions to number concepts. Students can connect to these in a physical sense and act out the idea, as well as remember them because of the distinctive rhyme or rhythm. Some students may make some of their first attempts to read through these patterned and predictable texts, thus connecting early mathematics concepts with reading.

Calendar

Work with a calendar is usually a regular part of the first grade day. You can reinforce number recognition and counting skills with this daily activity. Students can also begin to understand the concepts of week, month, and year, and can predict how long until certain events. Students may note even or odd numbers, may count by twos and threes, and may learn what the terms *yesterday*, *tomorrow*, *before*, and *next* mean in relation to the calendar. To record the days, the class can make a pattern of shapes or colors and students can predict what will come next in the pattern. For one month, a class might record some item each day (for example, "the temperature at 9:00 a.m." or "attendance" or "how many in the class rode a bike today"). Then, at the end of the month, they can consult the calendar to make a graph or to make statements regarding the information they gathered.

Time

Students come to school curious about the passage of time during the day and wanting to know how to tell time on a clock face. You can help them recognize the numbers on the clock, differentiate the two hands, and notice what numbers the hands are pointing toward. Students can begin to count around the clock by fives and learn to read the time written in standard form or from a digital clock. You may want to establish regular times in the daily schedule for certain activities and teach the students to recognize those positions on the clock. Students can begin to explore ideas such as how long until an event happens or how many minutes have passed since something occurred. Getting a feel for relative time may be of interest to students. Closing their eyes and waiting for a minute to go by can be a real surprise to many. Talk about which is longer: a second, minute, hour, or day. How many minutes does it take to make an hour? Hours to make a day? Some *CSMP* lessons lend themselves to telling time activities. These are noted in the text.

Measurement

Activities to practice measurement with standard and nonstandard units of measure occur in many other curriculum areas in addition to math. Students will want to explore the relative concepts of measurement—which is shorter/longer, heavier/lighter, thicker/thinner, hotter/colder, and so on. These ideas may be worked on intuitively or explored using measurement devices which students can operate and read for themselves. They can be taught how to use a ruler, a scale, and a thermometer, and introduced to the words used to describe the units of measurement in English and in metric. Recording the temperature on a graph or calendar (as noted earlier) can be an ongoing class activity. Or try recording the height and weight of each student at the start of the school year and taking the same measurements at spaced intervals to note their growth.

Patterns

Activities to recognize, reproduce, and invent patterns occur frequently. Once students are tuned in to looking for patterns they will see them everywhere—in words, in the environment, using color, shape, and sound—and they will be able to create new ones of their own. Art and music are rich areas for using and integrating patterns. Rhyming patterns are usually a part of the language arts curriculum. You may want to create seasonal patterns for decoration or to use on the calendar. There are several *CSMP* lessons that deal with sound patterns, with placing dots in number patterns, and with creating patterns using shapes, colors, sizes, and designs. These activities can be modified and repeated whenever the students are interested. Patterning plays such an important role in all of mathematics that it is important students be given a solid foundation in patterning in the early years.

Graphs

Sorting items and identifying their physical attributes is taught directly in *CSMP* lessons. This skill can be a useful tool in other curriculum areas and can be reinforced outside the realm of mathematics. When children begin to explain why they put certain things together in a group, objects may be related in ways not previously thought of. These activities may lend themselves to written explanations or journal entries by the student.

You may like to introduce students to many types of graphs and have them gather data or construct and infer information from the graph. These activities can engage students in active learning and draw upon experiences from mathematics lessons. Many curriculum areas can be integrated here as well as related to seasonal activities and current classroom topics. The class might graph information about how they travel to school, what they have for lunch, or what their favorite cartoon is. They can construct bar graphs, pictographs, or use strings to display the information. They might discuss how someone could use their information to start a business or help a new student at the school. Learning to collect and organize data can be a cooperative experience with different students taking different roles.

Integration

Mathematics activities do not just occur during the time designated for math in the daily schedule. They are a part of the total school day and occur at every turn in the curriculum. You may plan them, but they will also arise spontaneously as students work with each other. Taking attendance and lunch count, collecting money and book orders, going over the daily schedule and ordering the tasks of the day, playing games at recess, and getting to the next class on time are just a few of the math-related activities in which students participate every day. It is not necessary to always stop and point out the mathematics in a situation, but its presence provides the groundwork for concept understanding and problem solving in formal mathematics lessons.

Throughout the *CSMP* lessons we have tried to integrate other curriculum areas and to suggest ways you might do more within your own classroom. The content of mathematics is not something that students should see and use during an isolated period, but rather throughout the day. In the same way, mathematics classes should not deal only with numbers, but should incorporate elements of reading, writing, social studies, science, and so on. *CSMP* strives not only to involve all students in the learning of mathematical concepts, but to be part of an integrated school day in which students see the application of each subject to other subjects and to their own lives. Integration allows all students to participate and contribute to the total work of the class.

Suggested Schedule of Lessons

Master Schedule for CSMP Mathematics for the First Grade

First Month	F1 Cats and Mice 4-7	F2 Numerical Activities # 1 4-11	F3 Bedtime for Birds 4-15	F4 One-to-One Correspondence 4-19	F5.1 Numerical Activities #2 4-23 F5.2 Numeral Writing 4-25
	F6.1 Walks on One-Way Roads #1 4-27 F6.2 Dot-to-Dot Puzzles	F7.1 Staircase Review 4-31 F7.2 The Little School 4-33	F8 Addition Story #1 4-35	F9 Left Shoe-Right Shoe 4-37	F10 Adjustment/ Assessment Day #1 4-41
	F11.1 Numerical Activities #3 4-45 F11.2 Favorite Fish	F12 Introduction to A-Blocks #1 4-51	F13 The Pet Shop 4-53	F14 Taller Than and Shorter Than 4-55	F15 Distributing Birthday Cards 4-59
	F16.1 Rhythms and Patterns 4-63 F16.2 A Counting Snake	F17.1 Numerical Activities #4 4-69 F17.2 Goldy #1 4-71	F18 Brother-Sister Graphs 4-73	F19.1 Hidden Checkers #1 4-77 F19.2 Addition Story #2 4-79	F20 Adjustment/ Assessment Day #2 4-81
Second Month	F21 Introduction to A-Blocks #2 4-83	F22 Counting Calculator #1 4-87	F23.1 Fingers 4-91 F23.2 Estimation #1 4-93	F24.1 Guess My Rule with A-Blocks #1 4-95 F24.2 The Mailcarrier 4-97	F25.1 Counting Activity #1 4-99 F25.2 Counting Calculator #2 4-101
	F26 A Game With Strings 4-103	F27.1 C-Rod Trains 4-107 F27.2 Goldy #2 4-109	F28 The Ring Man 4-111	F29 The Numbers Speak #1 4-115	F30 Adjustment/ Assessment Day #3 4-119
	F31.1 0–109 Numeral Chart 4-121 F31.2 Walks on One-Way Roads #2 4-123	F32.1 Guess My Rule with A-Blocks #2 4-127 F32.2 One Out of Seven	F33 Place Value (Base 10) 4-131	F34 Minicomputer Introduction #1 4-133	F35 Coin Values 4-139
	F36.1 Geometric Solids 4-141 F36.2 +2 Snake 4-143	F37 Minicomputer Introduction #2 4-147	F38 Sending Cards 4-151	F39.1 Two Sets #1 4-153 F39.2 Graphing Geometric Solids 4-157	F40 Adjustment/ Assessment Day #4 4-159

Third Month	F41.1 Minicomputer Introduction #3 4-161 F41.2 +1 Arrow Road 4-163	F42 The Numbers Speak #2 4-165	F43 Tangram Puzzles 4-169	F44 Calculator Addition & Subtraction 4-179	F45.1 Minicomputer Introduction #4 4-183 F45.2 Addition Story #3 4-185
	F46 Measurement #1 4-187	F47.1 Minicomputer Introduction #5 4-189 F47.2 Telling Stories for an Arrow Picture #1 4-191	F48.1 Counting Activity #2 4-193 F48.2 Candies to Share 4-195	F49.1 Minicomputer Introduction #6 4-199 F49.2 +2 Arrow Road	F50 Adjustment/ Assessment Day #5 4-203
	F51 The Numbers Speak #3 4-205	F52 Counting Calculator #3 4-209	F53.1 Trades on the Minicomputer #1 4-211 F53.2 Goldy #3 4-215	F54 +1 and +2 Arrow Picture #1 4-219	F55 Two Sets #2 4-221
	F56 Trades on the Minicomputer #2 4-225	F57.1 Telling Stories for an Arrow Picture #2 4-231 F57.2 A-Block Table 4-233	F58.1 Trades on the Minicomputer #3 4-235 F58.2 Headband Patterns 4-237	F59 Detective Story #1 4-239	F60 Adjustment/ Assessment Day #6 4-243
Fourth Month	F61.1 Trades on the Minicomputer #4 4-245 F61.2 Composition of Functions #1 4-247	F62 Coin Cubes 4-249	F63.1 Addition on the Minicomputer #1 4-251 F63.2 Class Plan 4-253	F64 +2 and +3 Arrow Roads 4-255	F65.1 Individual Minicomputer Activity #1 4-257 F65.2 Minicomputer Introduction #7 4-259
	F66.1 Subtraction Story #1 4-261 F66.2 +1 and +2 Arrow Picture #2 4-263	F67.1 Trades on the Minicomputer #5 4-265 F67.2 Addition on the Minicomputer #2 4-269	F68.1 Coin Problem #1 4-271 F68.2 Multiplication Story #1 4-275	F69.1 Trades on the Minicomputer #6 4-277 F69.2 Addition on the Minicomputer #3 4-279	F70 Adjustment/ Assessment Day #7 4-281
	F71.1 Subtraction Story #2 4-283 F71.2 +1 and +2 Arrow Picture #3 4-285	F72.1 Trades on the Minicomputer #7 4-287 F72.2 Addition on the Minicomputer #4 4-289	F73.1 String Picture with A-Blocks 4-291 F73.2 The Function +5 4-293	F74.1 The Functions +2 and −2 4-297 F74.2 Parade of Problems #1 (Lesson One)	F75 Individual Minicomputer Activity #2 4-309
	F76 Tina Visits the Library 4-313	F77 Addition on the Minicomputer #5 4-317	F78 The Functions +3 and −3 #1 4-321	F79.1 Addition on the Minicomputer #6 4-325 F79.2 Individual Minicomputer Activity #3 4-327	F80 Parade of Problems #1 (Lesson Two) 4-329

Fifth Month	F81.1 Multiplication Story #2 4-331 F81.2 Length #1 4-333	F82.1 "Who Are You?" Number Game 4-335 F82.2 Addition Problems #1	F83.1 The 2x Function #1 4-341 F83.2 String Game with A-Blocks #1 4-345	F84 Addition Problems #2 4-347	F85.1 Maps of Geometric Solids 4-351 F85.2 Story Problem #1 4-353
	F86 The 2x Function #2 4-355	F87.1 Addition Problems #3 4-359 F87.2 Number Friends #1 4-361	F88.1 Multiplication on the Minicomputer #1 4-363 F88.2 Fair Distribution #1 4-365	F89.1 Subtraction on the Minicomputer #1 4-367 F89.2 −2 Arrow Road 4-369	F90 Adjustment/ Assessment Day #8 4-371
	F91 Estimation #2 4-373	F92.1 Subtraction Story #3 4-375 F92.2 Locating Numbers on the Number Line 4-377	F93.1 Transforming a Number #1 4-381 F93.2 Addition Problems #4 4-383	F94.1 Guess My Rule With Numbers 4-387 F94.2 The Functions +3 and −3 #2 4-389	F95.1 Multiplication on the Minicomputer #2 4-391 F95.2 Counting by Tens #1 4-393
	F96 4-395 Geoboard Exploration	F97.1 Hidden Checkers #2 4-399 F97.2 Coin Problem #2 4-401	F98.1 The Numbers Speak #4 4-403 F98.2 String Game with A-Blocks #2 4-407	F99 A Snake with 2x and +3 4-409	F100 Adjustment/ Assessment Day #9 4-411
Sixth Month	F101 Trades on the Minicomputer #8 4-413	F102.1 Composition of Functions #2 4-417 F102.2 Taxi-Geometry 4-419	F103.1 Subtraction on the Minicomputer #2 4-421 F103.2 The Number Line Game 4-425	F104.1 Counting by Tens #2 4-427 F104.2 Composition of Functions #3? 4-429	F105.1 Fair Distribution #2 4-431 F105.2 Parade of Problems #2 (Lesson One) 4-433
	F106.1 Multiplication Story #3 4-443 F106.2 The Function −3 4-445	F107 I Am a Very Happy Boy 4-447	F108.1 Fair Distribution #3 4-449 F108.2 Magic Squares #1 4-451	F109 Introduction to Even and Odd Numbers #1 4-453	F110 Adjustment/ Assessment Day #10 4-457
	F111.1 Addition Problems #5 4-459 F111.2 Composition of Functions #4 4-461	F112 Measurement #2 4-465	F113.1 Multiplication Story #4 4-467 F113.2 Story Problem #2 4-471	F114.1 Eli's Magic Peanuts #1 4-473 F114.2 Number Friends #2 4-475	F115.1 The Functions 2x and $^1/_2$x #1 4-477 F115.2 Parade of Problems #2 (Lesson Two) 4-479
	F116 Estimation #3 4-481	F117.1 Booker's Bakery 4-483 F117.2 Magic Squares #2 4-485	F118 Three Strings #1 4-489	F119.1 Subtraction on the Minicomputer #3 4-493 F119.2 "Is Less Than" Relation #1 4-495	F120 Adjustment/ Assessment Day #11 4-497

Seventh Month	F121.1 Addition Story #4 4-499 F121.2 Eli's Magic Peanuts #2 4-501	F122.1 Multiplication Story #5 4-503 F122.2 Frogs in a Pond #1 4-505	F123.1 Counting Calculator #4 4-507 F123.2 –3 Arrow Road 4-509	F124.1 The Functions 2x and $\frac{1}{2}x$ #2 4-511 F124.2 Length #2 4-513	F125 Introduction to Even and Odd Numbers #2 4-515
	F126.1 Coin Problem #3 4-519 F126.2 Composition of Functions #5 4-523	F127.1 Mental Arithmetic with +1 Arrow Pictures 4-525 F127.2 String Game with A-Blocks #3 4-527	F128 Consecutive Jumps on the Number Line 4-529	F129 Combinatorics with Three Digits #1 4-533	F130 Adjustment/ Assessment Day #12 4-535
	F131 Subtraction on the Minicomputer #4 4-537	F132.1 Fractions from Paper Folding 4-541 F132.2 Fractional Parts 4-543	F133.1 Counting Activity #3 4-545 F133.2 Addition Problems #6 4-547	F134.1 Eli Visits Grandmother 4-551 F134.2 Addition Story #5 4-553	F135 May Baskets 4-555
	F136.1 Subtraction on the Minicomputer #5 4-559 F136.2 Number Line Activity 4-561	F137 Reflective Symmetry 4-563	F138.1 Eli's Magic Peanuts #3 4-565 F138.2 String Game with A-Blocks #4 4-567	F139.1 The Little Dreamer 4-569 F139.2 Story Problem #3 4-571	F140 Adjustment/ Assessment Day #13 4-573
Eighth Month	F141.1 Detective Story #2 4-575 F141.2 Odd and Even Numbers 4-579	F142.1 $\frac{1}{2}x$ on the Mini-computer #1 4-581 F142.2 Subtraction on the Minicomputer #6 4-583	F143 Arrow Road for Money 4-587	F144.1 Addition Story #6 4-591 F144.2 Area #1 4-593	F145.1 Place Value Review 4-595 F145.2 Addition on the Minicomputer #7 4-597
	F146.1 Length #3 4-599 F146.2 Eli's Magic Peanuts #4 4-601	F147.1 Addition Patterns 4-603 F147.2 Individual Minicomputer Activity #4 4-605	F148.1 "Is Less Than" Relation #2 4-607 F148.2 Calculator Targets 4-609	F149.1 Three Strings #2 4-611 F149.2 Frogs in a Pond #2 4-613	F150 Adjustment/ Assessment Day #14 4-615
	F151.1 $\frac{1}{2}x$ on the Minicomputer #2 4-617 F151.2 The Functions 2x and $\frac{1}{2}$ x #3 4-619	F152.1 Eli is Tricked 4-623 F152.2 Parade of Problems #3 (Lesson One) 4-625	F153 Introduction to Frames 4-635	F154.1 The Function +10 4-639 F154.2 Multiplication on the Minicomputer #3 4-641	F155 The Weird Story of 24 4-645
	F156.1 Mystery Arrows 4-647 F156.2 Area #2 4-649	F157.1 Combinatorics with Three Digits #2 4-653 F157.2 String Game with A-Blocks #5 4-655	F158.1 Eli's Magic Peanuts #5 4-657 F158.2 Parade of Problems #3 (Lesson Two) 4-659	F159 Number Cubes Coloring Game 4-661	F160.1 $\frac{1}{2}x$ on the Minicomputer #3 4-663 F160.2 Transforming a Number #2 4-665

Questions and Answers about CSMP

QUESTIONS AND ANSWERS ABOUT CSMP

As you teach the *CSMP* curriculum or even as you prepare to teach it, some basic questions will come to mind. They are, very likely, the same kinds of questions that parents and supervisors will ask about a curriculum that appears to be different from the traditional program. Perhaps some of the questions that concern you are answered here.

Q: What is the spiral approach? How does it work?

A: We learn through many interrelated experiences. But no experience, particularly a first grade math lesson, is an end in itself. With this in mind, *CSMP* introduces an idea in one lesson, then another in the next lesson, then another. Later, the first idea reappears in a slightly new setting or in a slightly expanded version, perhaps with connections to other concepts; then a second topic reappears; and so on. Each of the many times a particular idea or area of study reappears, it is treated in a different manner and at a slightly higher level than the last time. This is called *spiral development*.

Students learn at different times and at different rates. Only part of the learning of a given topic actually takes place during the classroom lesson. In between the times the topic occurs on the learning spiral, the student is mentally digesting the idea, sometimes consciously, usually unconsciously. In this way the spiral development gives each student a new chance to catch on at each stage.

We find it highly effective to follow this kind of development rather than continuing on and on with a topic until so-called mastery has occurred.

Sticking with the spiral approach requires an act of faith on your part, particularly if you are used to teaching a given topic until you are satisfied that all (or at least most) of the class knows it cold. The spiral approach implies that some lessons may be stopped before some (or even a majority of) students appear to have caught on, or before everyone has successfully completed all the worksheet or workbook pages. It involves knowing that the topic will reappear again and again, and that varying degrees of understanding will come at varying rates and times. It includes the belief that an idea planted now may not sprout until much later, and that it is best not to force its development.

Q: I understand how spiral development works, but how can I assess my students' progress using such an approach?

A: We don't believe it is desirable or reasonable to try to evaluate student mastery of skills from day to day or even from week to week. On the other hand, teachers, parents, and the students themselves benefit by some monitoring of the students' progress and involvement with the activities. Most teachers have their own methods for monitoring with which they are comfortable, and we suggest that you continue to use these methods. You will find that group interactions during the lessons, individual responses on worksheets and workbooks, and center and writing activities provide much valuable information. The adjustment/assessment days include suggestions for additional practice and short, written assessments. A spiral approach, in fact, may help rather than hinder your long-term assessment of students' progress.

Q: Are there goals for each lesson?

A: At the beginning of each lesson plan there is a *capsule lesson summary* that briefly describes the activities and experiences included in the lesson. Because the goals of the curriculum spread over a whole series of lessons, specific goals for individual lessons are stated only indirectly. We expect you will easily see the direction and intent of the lessons, however, we decline to predict what will happen in terms of student learning for any one lesson.

Q: Should I supplement the program with more practice in number facts?

A: There is a surprising amount of such practice throughout the program. Most is implicit in the activities and is not in the form of practice for its own sake. If you still feel it necessary to give supplementary practice, we suggest you keep repetitive drill to a minimum so as not to endanger the students' interest in numerical situations.

Q: Is the CSMP kindergarten program a prerequisite for the first grade program?

A: No. Although students with prior experience in the *CSMP* kindergarten program will have a short-term advantage, we have found that such experience is not essential. The lessons in *CSMP Mathematics for the First Grade* are designed for children with no previous *CSMP* experience; if they have prior experience, they may initially move faster and more easily through lessons, but usually the advantage fades as the rest of the class gains experience.

Q: What provision does the program make for students who enter first grade with poor number readiness?

A: Every tenth day of the schedule is set aside to address problems of this kind. The suggestions for these adjustment days include ideas for dealing with particular needs of certain students, such as the need to be able to count a small number of objects or to recognize the numerals from 0 to 10, and so on.

Q: How do I handle students who have an extended absence or students, new to CSMP, who transfer into my class during the year?

A: The spiral approach allows a student to miss one or two weeks of school without needing much catch-up work. When the student returns, either you or classmates can help with any important material that was missed.

It is probably best not to send worksheets and/or workbooks home to absent students. Without participating in the collective lessons that introduce the worksheets and workbooks, it may be difficult for the student to proceed.

If several months of classes have been missed, you might need to treat the student as you would a transfer student new to *CSMP*. Give the student a little extra attention during a lesson, especially when the questions are review for most of the class.

In most cases, the differences between new and veteran students tend to fade quickly. However, if the absence or transfer occurs later in the year, lessons involving the Minicomputer might be an exception. Veteran students who are adept with the Minicomputer are often good tutors for these students.

Q: What provisions are made for the variety of abilities in a typical class?

A: Every lesson includes something that allows every student to participate in a meaningful way, regardless of differing abilities. Even your brightest students will have challenges. This means that you should not exclude any students from a full group lesson, but at the same time, you should not expect every student to fully understand everything in a lesson either. You will find that the spiral development leaves many situations open-ended, allowing students to experience them at different levels.

Evaluation has shown that students traditionally labeled "slow" do better in *CSMP* classes than in non-*CSMP* classes. We believe this is due to several things: the spiral development, group work on mathematical activities, and the presence of a wide variety of both numerical and non-numerical activities in the *CSMP* curriculum.

Additionally, *CSMP* provides for a range of ability levels in the student materials. Worksheets and workbooks offer problems from very easy to quite challenging. Indeed, some of the multi-starred worksheets and pages toward the end of a workbook may be accessible only to your most advanced students.

In an extreme case, you might consider the possibility of arranging for exceptionally bright students to take their math course with a *CSMP* second grade class.

Q: Why are there no lessons on telling time or on measuring weight, volume, and capacity?

A: Since there are many excellent materials already available to help you teach students to tell time, there is no need for us to duplicate them in this guide. Present your usual lessons on this topic. Furthermore, we feel that instruction in telling time belongs more naturally as a part of a language program than a mathematics program.

Measurement of length and area is begun in *CSMP Mathematics for the First Grade*, but we do not believe that measures of volume, weight, capacity, or temperature are appropriate topics for first grade. Introduction of these measures are taken up in *CSMP* at later grade levels. There are, however, some measurement lessons that involve size comparisons and include volume, weight, and capacity.

Q: I prefer teaching small groups, but many of the lessons seem to be aimed at the whole group. What do you suggest?

A: If your school routine allows, you might try teaching a lesson twice, once to each half of your class. But if you do this, it might be wise to vary the composition of the groups each day so that you are not tempted to group students according to your perception of their ability. Always grouping by ability may guarantee that half your students have less experience than the other half, through no fault of their own. The purpose of the full group experiences is to allow interaction among all students in every situation posed in the lessons. Students learn quite a bit from each other's reactions. You will be surprised to find that in some situations the key responses come from students you least expect.

Our answer might give the impression the *CSMP* teaching takes place only in full group settings. This not the case. There are many opportunities to group students in a variety of ways—partners, small cooperative groups, teams, and so on. In addition, there is time allotted for individual work on worksheets and workbooks. We also encourage you to arrange small group sessions whenever you have time, particularly for students who need extra practice. Such small group activities may supplement the full group lessons, but should not replace them.

Q: What provision is made for individualization in the CSMP program?

A: Many of the first grade lessons contain worksheets to be completed individually by students. Sometimes the worksheets are done during the course of a lesson with a full group discussion of them. At other times a topic is first developed in a group setting, followed by individual student work on related worksheets. This allows students to work at their individual rates and levels. A series of worksheets for a given lesson offers a spectrum of problems from very simple to quite challenging. All students start with the one-star worksheet and proceed at their own pace as far as they are capable. The spiral approach accommodates individual work in the same way as full group work; that is, no single worksheet is a prerequisite for the content of any succeeding lesson.

During the school year, six lessons are based on the three first grade workbooks. Like the worksheets, each workbook moves through a range of levels of difficulty. We believe that the worksheets and workbooks realize the best sense of individualization.

Q: Why are the lesson plans presented as a dialogue?

A: Most of the lessons are written in considerable detail; step-by-step descriptions are frequently given, together with a possible dialogue between teacher and students. These details are given only as suggestions of how a lesson might develop. You should never feel obligated to follow a lesson word for word as it is written in the guide. By the same token, you should never insist that your students give the same responses as those given in the imaginary dialogue. Use your own creativity to draw out student responses as the situations suggest. Read the lesson plans carefully beforehand to get an idea how the lessons are expected to proceed.

Q: How often and for how long should I teach mathematics in first grade?

A: The *CSMP* schedule suggests that you teach mathematics five days a week for 40 to 45 minutes each day. Often the schedule calls for two short lessons in one day. These can be taught during a single math period or at two different times in one day.

Q: Is it necessary to follow the suggested schedule exactly?

A: This program is not meant to be a static sequence. The schedule of lessons is only a suggestion based on the teaching experiences of many teachers and *CSMP* staff. If this is your first time teaching the program, you may like specific suggestions for organizing the lessons, so we offer you the suggested schedule as a guideline. You may wish to follow it at the beginning of the school year and then deviate from it as the needs of your students dictate.

Exercise your own professional judgment in deciding when to stop a particular lesson. It is better to stop a lesson when student interest is high than to teach so methodically that everyone in the class understands everything, but is completely bored. In order to be successful with this curriculum, you should adjust the schedule to the ability, maturity, and interests of your class.

Q: What is the role of storybooks in the curriculum?

A: The storybooks are part of a 24-story collection called *Stories by Frédérique*. Each is presented in a colorful newsprint booklet designed for young students. Four storybooks are used with lessons in *CSMP Mathematics for the First Grade* (15 copies of each storybook are provided in a classroom set of materials). Each story is illustrated using the mathematical languages of dots, arrows, and strings to reinforce the story idea. Young readers can become personally involved in the stories; there are questions to answer, pictures to relate to the story, and new adventures to invent for the characters. They find that emotions and aesthetics are part of the world of mathematics just as in the world of people.

Many other lessons include suggestions for reading activities using children's literature as an extension or enhancement.

Q: For what sort of student is the CSMP elementary curriculum designed?

A: It is designed for *all* students. Students engage with each learning situation at their own level so that they succeed in dealing with some aspects of the situation that challenge them. The pedagogy of situations (see the next question) is particularly effective with all types of learners.

Q: How does CSMP differ from a traditional mathematics curriculum?

A: The core content of *CSMP* is not revolutionary. The program aims to integrate ideas and facts that have always been considered important in mathematics. The major differences are in method. Traditional teaching generally focuses on the mastery of paper-and-pencil algorithms. *CSMP* students, on the other hand, become involved with real mathematical activities from which they develop mathematical understanding.

With a pedagogy of situations, they participate in the learning process which leads to the development of skills—not by rote memorization but by constructing their own understanding. Faced with challenging situations, the students are led by their reactions to important ideas in mathematics—they begin to mathematize situations. This process is fundamental whenever mathematics is applied.

CSMP also makes use of a spiral approach rather than the mastery approach found in most traditional mathematics curricula (see page 3-1).

Q: Are all the topics in the CSMP curriculum really mathematics?

A: Yes. Mathematics is much more than calculation with numbers, and its methods include more than paper-and-pencil algorithms. The *CSMP* curriculum is filled with experiences that directly and indirectly relate to a wide world of numbers, their interrelationships, and the kinds of logical reasoning about these relationships that make mathematics an activity of interest and concern.

Q: Why use the languages of strings and arrows?

A: It is surprising that the language of strings was not used earlier and more extensively to teach mathematics. Mathematicians have used strings for a very long time; they support classification notions so fundamental and natural that they go back to Aristotle. The scope of the string diagrams is broader than mathematics; it is a marvelous instrument for logical thinking. String diagrams permit the understanding of a situation at a glance; they generate math concepts and ideas through related discussion.

Arrow diagrams are probably the most important teaching aid in the *CSMP* curriculum. They are used everywhere in our daily lives: signals, advertisements, directions, and so on. Why not use them to teach mathematics? Arrows are a pictorial way to represent relations. Relations have always been important in mathematics, but in the past seemed to be something rather abstract, elusive, and mysterious. With arrows they become vivid, concrete, and easy to understand.

Q: Why use the Papy Minicomputer and calculators?

A: The Minicomputer allows very young students to become familiar with numbers and numerical operations (especially large numbers and more difficult calculations) before they are able to work with them on paper. Later, the Minicomputer is used as a vehicle for posing situations involving mental arithmetic and for examining the workings of arithmetic operations. It provides the necessary experience so that, rather than memorizing an algorithm and applying it to situations, the situations give rise to the algorithm.

The calculator can have a remarkably beneficial effect on students' interest in and understanding of arithmetic. In *CSMP*, the calculator is used as an instructional tool not as a crutch. That is, with the calculator students develop mental arithmetic skills and number sense as well as the ability to construct their understandings of a variety of mathematical concepts. By removing the need to do messy calculations, the calculator frees students to think about problem solving and possibly tackle even more difficult problems.

Q: If the students use the Minicomputer and a calculator, will they be able to calculate without it?

A: This question suggests that the only purpose of the Minicomputer and the calculator in the *CSMP* curriculum is to perform calculations. To be sure, the Minicomputer and the calculator do enable very young students to deal with large numbers and perform relatively difficult calculations long before they know the paper-and-pencil algorithms. But very soon these experiences suggest how the paper-and-pencil algorithms come about, and from that moment the Minicomputer is no longer regarded as a calculating device. Later, usually by the second grade and for the remainder of the K-6 curriculum, the Minicomputer assumes its primary roles: a source of very interesting problems and games, an effective vehicle for stimulating mental arithmetic, a teaching device for introducing more advanced topics such as the negative numbers and the decimal numbers, and, in general, an alternative to the usual representation of numbers.

Q: Why is there a lack of drill and little emphasis on skills training?

A: The purpose of drill in arithmetic is to acquire the skills of calculation. And while certain numerical skills *are* essential, the usual drill techniques are, unfortunately, dull, stultifying and sometimes even counterproductive. The *CSMP* curriculum *appears* to place little emphasis on skills because it does not resort to drill. But in fact, the essential skills of both mental and written calculation are learned in the many situations where the ability to calculate is needed in order to respond to the situation: to win a number game, to identify the secret number of the detective story, or to build a number road. In *CSMP*, calculation is always considered a tool for doing interesting things, rather than a chore done for its own sake.

Q: How do students learn to use mathematics in practical situations?

A: For elementary school students, a situation that intrigues them, catches their imagination, or piques their curiosity will motivate them to learn whatever is necessary in order to deal with the situation. But situations that adults consider "practical" very often are outside the realm of interest of young students and do not provide motivation for learning. *CSMP* has found that students will indeed learn to use mathematics in situations they consider worthy of their attention. As they approach adulthood, they will begin to consider practical situations worthy of their attention, but in the meanwhile they are more interested in games, fantasy, puzzles, stories, and so on.

Q: How do CSMP students do on standardized tests?

A: While the *CSMP* philosophy disagrees with the philosophy underlying standardized testing, test results are available to us from several sources. The results indicate that *CSMP* classes generally do as well or better on standardized tests than non-*CSMP* classes. It should be pointed out that standardized testing and traditional programs are correlated, and that *CSMP* students are exposed to a great deal of mathematics that is not taught in more traditional programs or that is not considered in the construction of the tests. There are also many immeasurable or unmeasured areas such as enjoyment of mathematics, strategic thinking, organizational ability, and depth of understanding of the methods and uses of mathematics in which we feel *CSMP* students have a definite advantage. Evaluation Report 1-A-3 in the *CSMP Evaluation Report Series* gives a more detailed answer to this question. Copies are available upon request.

Q: What problems will CSMP students have if they return to a more traditional program?

A: There should be no problems for *CSMP* students who return to a traditional program. Test results indicate that *CSMP* students are at or above the level of non-*CSMP* students in terms of material covered in traditional courses. In addition, *CSMP* students will have encountered many situations that are not introduced in traditional programs nor tested for on standardized tests. In particular, their reasoning ability should be much sharper than their non-*CSMP* counterparts.

Q: What are some ways to organize materials and manage my class?

A: It is very important to organize your *CSMP* materials before school begins and to decide where you will store them. File drawers, shelves, boxes, or closets are all satisfactory as long as you can easily get to the materials. Take them all out of their shipping boxes and spread them on several tables and/or desktops in your classroom so they can be organized into the order you will be using them.

Worksheets: You should have a worksheet booklet for each student. Decide whether you will store these booklets and pass them out when a particular lesson calls for worksheets or let the students be responsible for their own worksheet booklets.

Worksheets can be removed from the booklet or left in depending on how you wish to manage them. Once a worksheet is removed, however, it cannot be replaced easily, so make sure students are careful about tearing out the correct sheet.

Manipulatives: Storing all the manipulatives of a certain type in separate marked containers is one way to make them accessible. Another way is to provide each student with a sturdy box (for example, a shoe box) in which they keep their individual manipulative materials. Properly label each box with the student's name.

Additional Materials: Be sure that you have plenty of high quality colored chalk and large sheets of unlined white paper. Your students should have colored pencils, pens, or crayons. Plan well ahead to be sure you have any needed materials that are not supplied by *CSMP*. Early warnings about such materials appear on adjustment days. Keep all teacher materials where they are easily accessible. The demonstration Minicomputer boards, the number line, and the 0–109 numeral chart should always be on display in the room.

Q: Some of the CSMP materials are new to me. How do I learn enough to teach a class?

A: *CSMP* training is recommended for every teacher new to the program. This training may be conducted by a local *CSMP* coordinator or a certified *CSMP* trainer. Kindergarten and first grade program teachers should receive a minimum of 12 hours training; teachers of the upper primary grades program, a minimum of 24 hours training; and teachers of the intermediate grades program, a minimum of 30 hours training. During the training, the *CSMP* content is taught to new teachers and suggestions are given for organization of the materials.

The *CSMP* trainer will present a variety of lessons taken from the *CSMP* curriculum and use an integrated spiral approach during the training itself. In this way teachers not only learn how to teach *CSMP* mathematics, but they become familiar with the spirit and pedagogy of the program.

Q: What should be done when there is a substitute teacher?

A: Some school systems have included individuals who frequently substitute in their *CSMP* training. When this has not been done, it may be difficult for the untrained substitute to teach from *CSMP* materials. One solution is to arrange for another *CSMP* teacher to teach your math class while the substitute teaches another subject to the *CSMP* teacher's class. If you will only miss one or two days, you may find the substitute can manage certain *CSMP* material quite well, for example, workbooks. Otherwise, let the substitute use your math period to cover material not included in the *CSMP* curriculum, such as telling time. If your absence will be an extended one, arrangements should be made with your coordinator to train a substitute, rearrange schedules to put a *CSMP* teacher in your class, or otherwise provide for your students.

Q: The program makes use of the students' creative freedom. How much room is there for the teacher's ingenuity?

A: *CSMP* not only allows for your ingenuity but depends on it. While the lessons may appear to be rigid by presenting a dialogue for teachers and students, remember that these are only suggested questions, answers, and comments based on our experience with development classes. Even if you follow your part of the script, your students are likely to offer responses which differ from those we have listed. It is the students' responses that will determine the content and direction of a lesson.

In a traditional program your creativity is called upon the first time you develop a particular lesson, and to a lesser extent as you revise lessons in succeeding years. There is little room for spur-of-the-moment creativity once a lesson begins. The *CSMP* curriculum, by creating a free and open situation emphasizing the students' creative freedom, continually presents you with unanticipated student responses and calls on your ingenuity at all times.

Q: How can I explain CSMP to parents?

A: The best way is for your *CSMP* coordinator to organize a workshop for interested parents. Parents can then see the languages of the program in use and have some of the same experiences their children are having. Workshops can be of almost any length, but anything short of two hours does not allow participants to gain much familiarity with the material.

In such a workshop, we suggest you explain the language of the Minicomputer with particular emphasis on its use in presenting situations in which mental arithmetic is called upon and in developing algorithms. (For example, physically carry a checker from the ones to the tens board in the 8 + 2 = 10 trade to parallel “carrying” in the paper-and-pencil operation).

A non-numerical example, such as the A-Block String Game, provides a good example of the power of the language of strings. A numerical example, such as building a road from 2 to 23 using +5 and –2 arrows, provides a nice introduction to the language of arrows. Favorite lessons of your students’ are excellent choices to present to parents as well.

Throughout the year there are opportunities to communicate with and involve parents in the math program. The curriculum materials include numerous letters to parents that can provide more introduction to the *CSMP* languages, tools, and methods. Home activities accompany many lessons and are opportunities for parents to become involved with their children in learning mathematics. Sometimes they suggest follow-up or practice and other times enrichment or extension of a class lesson.

You might also extend an invitation to parents to visit your class during the math period. Many times such an invitation leads to a closer parent-teacher relationship or to the parent volunteering as an aide.

If you believe some parents would appreciate a more detailed and sophisticated discussion of *CSMP,* the following letter may serve that purpose. It can be reproduced and sent home with the students.

Dear Parent/Guardian:

Your child is participating in the *Comprehensive School Mathematics Program (CSMP)*. While the program cannot be fully explained in a brief note, we hope this letter will give you some feeling for the substance of your child’s mathematics education.

The goals of the *CSMP* K-6 program include the development of the standard number systems and their operations (including an early introduction to integers, rational numbers, and decimal numbers) interwoven with the development of geometry and measurement. The *CSMP* program also includes a strong component of probability, statistics, and combinatorics. Powerful pedagogical devices are used, such as several nonverbal languages and instructional tools. These make the unifying ideas of the program accessible to very young children.

The Language of Strings: This language mimics the basic methods of collecting and classifying data. It deals with the fundamentally useful and important mathematical notion of sets.

The Language of Arrows: This language models the process of comparing and analyzing sets and performing operations on them. That is, it deals with the mathematical notions of relations and functions including, but not restricted to, ordering relations and the numerical processes of adding to, subtracting from, multiplying by, and sharing equally among.

The Papy Minicomputer: The Papy Minicomputer, an extremely effective abacus invented by Georges Papy, models the positional structure of our number system and lends itself to a multitude of numerical algorithms, including the standard algorithms for the basic numerical operations.

The Calculator: The calculator serves as an instructional tool to help students develop mental arithmetic skills and number sense as well as to focus their attention on understanding and problem solving.

Among other things, these languages and tools allow students to develop an understanding of the basic operations on numbers in a natural way based on previous experiences. They also provide a context in which situations arise that call for the repeated use of arithmetic operations without resorting to drill exercises, which most students find boring.

The content is learned in an atmosphere of constant application using a variety of situations. These vary from simple stories in the early primary grades to challenging applications and nontrivial simulations of real world problems in the upper grades.

One of the tenets of the *CSMP* philosophy is that mathematics is a unified whole and should be learned as such. The *CSMP* content is completely sequenced in spiral form so that students come into contact with each area of mathematics continuously throughout the program. This avoids atomizing the content and requiring mastery of each bit before continuing to the next. Rather, students have repeated exposures to the content, building interlocking experiences of increasing sophistication.

Another tenet of the *CSMP* philosophy, based on years of experimentation in the classroom, is that no single method of classroom management meets the needs of every student. Hence, the program is constructed to allow numerous opportunities for whole class participation, small group cooperative interactions, and independent experiences. Individualization is achieved through independent work on workbooks and worksheets of varying levels of difficulty. Due to the spiral nature of the curriculum, students can work in their workbooks without losing touch with the progress of the class.

CSMP does not prescribe a rigid system of student assessment and progress reporting. It allows the teacher to use classroom interactions, observations of individual and group work, writing activities, and workbooks and worksheets to best advantage for evaluating and reporting student progress. While standardized tests indicate that *CSMP* students develop the basic skills as early or earlier than non-*CSMP* students, we hope you will not be obsessed with your child's development of these skills. Each child is an individual and should not be judged against norms but rather on what he or she can and does accomplish. Many extremely important areas—developing self-confidence, learning to think and reason, being able to pose and solve non-routine problems—are difficult to measure and grade. If you have any questions concerning your child's progress, the classroom teacher is in the best position to answer those questions.

THE *CSMP* STAFF

Day-by-Day
Lesson Guide

DAY-BY-DAY LESSON GUIDE

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F0 THINGS TO DO BEFORE SCHOOL BEGINS

1. Hang the number line except for the negative portion. Above the chalkboard is a good place, but anywhere the students can see it, where you have easy access to it, and where it does not need to be hung in separate parts will do.

2. Hang the 0–109 numeral chart. It should be in a place where students can touch the numerals.

3. Attach a number line to each student's desk.

4. Be sure you have colored chalk.

5. Be sure you have plenty of unlined paper and a box of crayons or colored pencils for each student.

6. Decide how you want to organize student manipulatives: an envelope for A-blocks, one for Tangram pieces, a film canister or pill bottle for Minicomputer checkers, a bin or shoebox for each student, and so on.

7. Prepare demonstration C-rods with magnetic material or masking tape loops.

8. Locate student C-rods, base-10 blocks or other place value manipulatives, two color counters, calculators, and so on.

9. Put manipulatives such as C-rods, A-blocks, counters, and so on in centers for students to explore freely. Such a center can serve to introduce students to manipulatives that will soon be used in lessons, and provide free exploration time before the lessons.

10. Create a "Home Activities" file. The file can help you keep track of the activity ideas *CSMP* suggests be sent home following various lessons. Also, you will want to add activities of your own to the file. The following sample letter might accompany the first activity sent home in an envelope.

> Dear Parent or Guardian:
>
> Activities to accompany various lessons in our mathematics program (*CSMP*) will be sent home with your child periodically. They will be called "Home Activities" rather than "Homework," because we hope you will use them as an opportunity to become involved with your child in learning more about the *CSMP* tools, methods, and skills.
>
> Some home activities will be follow-up or practice for a lesson; others will be for enrichment or extension. It will be helpful if you keep all the activities and materials in the envelope provided. Some materials may be used more than once, and you may want to refer back to previous activities.
>
> Sincerely,
>
> Teacher's Signature

Early Warning

Among the first nine classroom lessons are some that require extra preparation time or use materials not included with the *CSMP* Classroom Set. The lessons are listed here for your convenience in preparing for them. A more detailed description of the needed materials can be found on the first page of each lesson. These special materials are listed here only once even if they are needed more than once during the nine-day period.

F2 *Numerical Activities #1*: C-rods in a container; magnetic board (optional)
F3 *Bedtime for Birds*: Pointer
F4 *One-to-One Correspondence*: Red and blue counters (optional)
F5.2 *Numeral Writing*: Counting book (rhyme or song); numeral writing worksheets
F6.1 *Walks on One-Way Roads #1*: Toy car (optional)
F6.2 *Dot-to-Dot Puzzles*: Dot-to-dot worksheets
F9 *Left Shoe–Right Shoe*: Several pairs of shoes

F1 CATS AND MICE

Capsule Lesson Summary

Progressively draw a number of dots that can be for cats or mice. Use a string to separate (classify) the cats from the mice. Use arrows to picture a relation between cats and mice. Include comparison and counting exercises in a group discussion of the situation.

Materials

Teacher	• Colored chalk • Storybook about cats and mice (optional)	**Student**	• Paper • Colored pencils

Description of Lesson

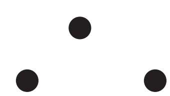
Start the lesson with a short talk about cats and mice. For example,

T: ***Do any of you have a cat? What does your cat like to do? People who live on a farm often have lots of cats. Do you know why? Well, farmers' cats chase and catch mice. Today our story will be about cats and mice. All the dots I draw are for cats and mice.***

For this story, draw large dots spread out across the entire chalkboard. Be sure the dots, strings, and arrows are clearly visible. If necessary, draw them using the side of a small piece of chalk. The arrows should be long, with the arrowheads drawn in about the middle of the arrows and preferably outside the string.

Draw one dot on the board.

T: ***One cat... or one mouse.***



Draw two more dots.

T: ***How many altogether?*** (Three) ***What could they be?*** (Three cats; or three mice; or two cats and one mouse; or two mice and one cat)

At the board, complete a drawing with about 25 dots. Let the children count the dots while you draw them. (This picture could have fewer dots if necessary.) Tell the students the dots are for cats and mice.

T: ***How many dots?*** (25)

Ask someone to point to 25 on the number line.† This may be difficult, so do not be upset if many students are unable to do it.

T: ***25 animals. But which are the cats and which are the mice?***

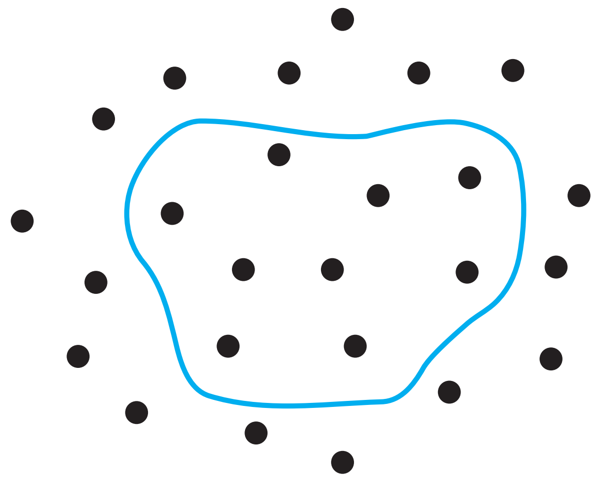
S: ***We can't tell.***

---

†In many lessons, it is suggested that a student be asked to point to a numeral. Throughout the year, you will need to have the number line on display. It should be hung where it can be seen clearly and, preferably, as one continuous strip. In addition, you should put an individual number line (provided with your *CSMP* materials) at each student's place.

T: ***That's correct. They may all be cats or they may all be mice or there may be some of each. I'll give you a clue to help you discover which are the cats and which are the mice.***

Your students may try to guess which dot is for a cat and which is for a mouse. Ask how they can be sure. When they realize they cannot, give this clue. Draw a blue string enclosing nine dots.



T: ***All the cats are inside the blue string, but no mice are inside the blue string. Show me one cat; now five mice; now two cats and three mice.***

How may cats are there? (Nine) ***Show nine fingers.***
Point to 9 on the number line. Trace a 9 with your finger on your desk.
How many mice? (16) ***Point to 16 on the number line.***

What do you think is going to happen?

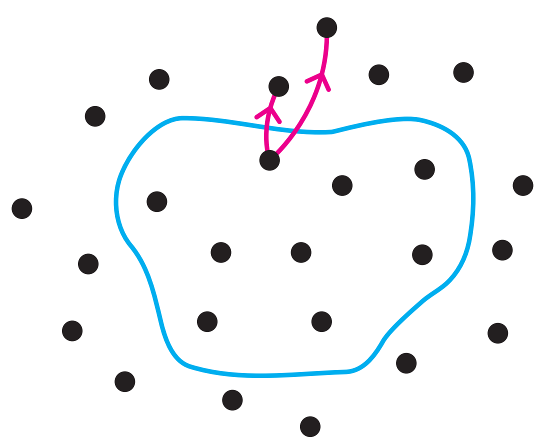
S: ***The cats are going to chase the mice.***

T: ***Let's tell this story with red arrows.***

Ask a volunteer to point to a cat.

T: ***This cat caught two mice. You choose which ones.***

Ask the student to trace two arrows with a pointer or with a finger; then draw them yourself. For example,

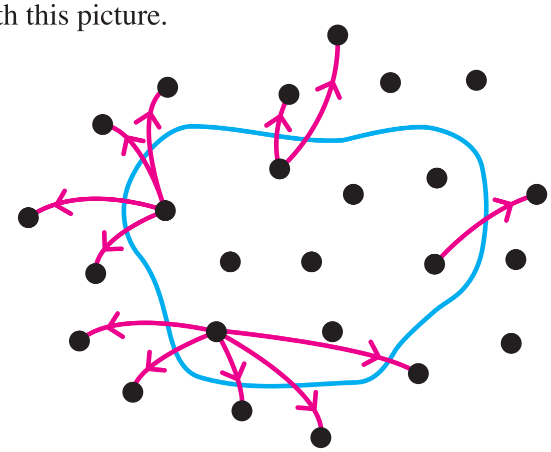


Ask another student to point to another cat.

T: ***This cat caught six mice.***

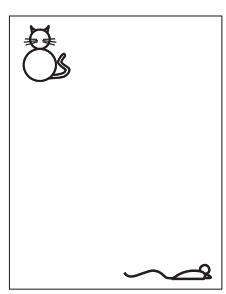
Ask the student to trace the arrows. Draw them. Continue drawing red arrows with the help of your class. Accept students' suggestions such as "I can show a cat who catches four mice."

Your story might end with this picture.



T: ***How many cats did not catch mice?*** (Five)
How many cats did catch mice? (Four)
How many cats are there altogether? (Nine)
Which cat caught the most mice?
How many mice were caught? (Twelve)
How many mice escaped? (Four)
How many mice are there altogether? (Sixteen)

Ask the students to draw their own "cats and mice" story. Encourage students to draw big dots that are well-spaced on the page. You may find it necessary to help some students with their dots. Suggest that they draw all the arrows in the same color. Some students can write something about their stories, particularly about the number of cats and mice. Pictures can be sent home and students instructed to tell their "cat and mouse" stories to their parents. Reading a book dealing with cats and mice (e.g., *The King, the Mice, and the Cheese* by Nancy and Eric Gurney) and/or putting a representation of the animals (e.g., stickers) on the papers may help students to recall the day's lesson.



F2 NUMERICAL ACTIVITIES #1

Capsule Lesson Summary

Do some counting exercises to associate a numeral with a number of objects, to practice writing and recognizing numerals, to use words such as *more* and *less*, and to write number sentences. Use these activities to determine certain mathematical abilities of your students in order to adjust future lessons.

Materials

Teacher	• Numeral cards • Demonstration C-rods in a container • Magnetic board (optional)	**Student**	• C-rod sets for small groups

Advance Preparation: The demonstration C-rods can be magnetized by sticking magnetic material† to the back of each rod. The magnetized C-rods can be displayed on any metallic surface such as a file cabinet or a magnetic chalkboard. As an alternative, C-rods can be prepared for display on a flannel board, or, by putting loops of tape on the back of the C-rods, they can be taped to the chalkboard. If C-rods are not available, an alternative set of colored "rods" can be constructed with Unifix® cubes or other interlocking cubes. Also, C-rods can be made from graph paper, construction paper, or Blackline F2.

Description of Lesson

Observe your students carefully during the lesson to determine their numerical abilities. This information will guide you in choosing exercises that meet the needs of your class.

Exercise 1: Numeral Recognition

Put the numeral cards from 0 to 10 in random order in a stack. Tell the students that you are going to show them a number and they should hold up that many fingers. Go through the numeral cards quickly, helping students who have difficulty.

Exercise 2: Counting and Comparing

Line up the numeral cards, in order, on the tray of the chalkboard. Do not overlap them. If your chalk tray is too short, use only some of the numeral cards and refer to the number line for larger numbers. Spread out the C-rods on a table so they can be handled easily.

T: ***I am going to display some C-rods. Please watch carefully and show me, with your fingers, how many C-rods there are.***

Put three red rods and one blue rod on the magnetic board. Help any students who are not showing four fingers.

T: ***How many C-rods did I put up?*** (Four)
Who can point to 4 among the numeral cards?
We write 4 this way.

†Extra magnetic material is supplied with the A-Block String Game kit and is also available separately from *CSMP*.

Turn your back to the class and trace a large 4 in the air. Ask the students to write a 4 in the air. Ask a volunteer to write a 4 on the board.

T: ***Can you tell me something about these C-rods?***

Accept all correct responses. Encourage, in a casual way, the use of the following words:

same - different
above - below
left - right
long - short
more - less

If a student observes that there are three red rods and one blue rod, you can reply that 3 + 1 = 4. Ask the students to show 3 + 1 with their fingers, and write 3 + 1 = 4 on the chalkboard.

Repeat this sequence of activities for other numbers. Students may work in small groups with their own C-rod sets. You may vary the activity in many ways to add interest. For example,

- point to a numeral and ask a student to put that many C-rods on the magnetic board;
- ask a student to put more than five rods on the magnetic board;
- ask for less (fewer) than ten rods;
- ask for two orange rods and five white rods.

For numbers larger than 10, students can pair up to show that many fingers.

End this activity by counting in unison from 1 to 10 and then backward from 10 to 1. Point to the appropriate numeral card as each number is counted.

Exercise 3: Staircase with C-Rods

Put the demonstration C-rods in a container and show the container to the class.

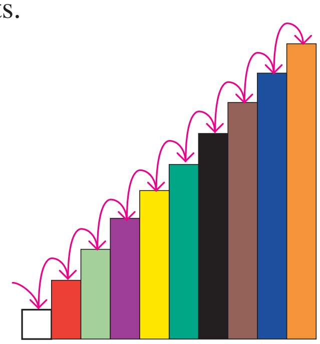
T: ***The C-rods are in this container. Tell me which colors they have. Cover your own rods and use your memory.***

If a student says “red,” put a red C-rod on the magnetic board. If a student says “pink,” reply that you don’t have any pink rods. If a students says “green,” ask if they are thinking of light green or dark green. Continue until one C-rod of each color is on the magnetic board or until the students have no more suggestions. If you still don’t have a least one rod of each color, put rods of the missing colors on the magnetic board, one at a time, and ask the class what color each rod is. You should finish with one rod of each color on the magnetic board. Put the C-rods to one side on the magnetic board.

T: ***Which is the shortest rod?*** (White)
Which rod is just a little bit longer? (Red)
Which rod is a little bit longer than the red one? (Light green)

As the students name the rods in order, construct a staircase at the board using the C-rods.

When the staircase is finished, ask the students to imagine a mouse climbing the stairs, counting as it goes. Demonstrate as the class counts.



T: ***Let's count with the mouse: one, two, …, ten. And down again: ten, nine, …, one.***

Repeat this as often as you think necessary, letting the students count in unison. Instruct students, working in groups, to build their own staircase and to count up (1 to 10) and back (10 to 1). For practice, ask students to work independently, to write the numbers from 0 to 10 in order. Students who wish can write beyond 10.

Center Activity

Put rods and other objects to be counted into centers for additional exploration.

Reading Activity

Introduce students to stories and songs which associate numbers and counting objects. For example,

Books

Anno's Counting Book by Mitsumasa Anno
Anno's Counting House by Mitsumasa Anno
Over in the Meadow by Ezra Jack Keats
Ten, Nine, Eight by Molly Bang
Ten Black Dots by Donald Crews

Songs

This Old Man
Allison's Camel Has Ten Humps
Ten in the Bed (Roll Over)
Ten Little Kittens

F3 BEDTIME FOR BIRDS

Capsule Lesson Summary

Associate a number with tapping sounds. Draw a number of dots that represent birds. Use strings to group the birds living in the same nest. With this situation do a variety of counting, numeral writing, and numeral recognition exercises. Use the diagram to discuss such terms as *most*, *same*, and *exactly*.

Materials

Teacher	• Colored chalk • Pointer	**Student**	Worksheets F3*, **, ***, ****

Description of Lesson

Exercise 1: Rhythm

Tap a sequence of sounds on a desk. Instruct students to listen and tell you how many times you tapped. Be sure to indicate when you start and when you stop a sequence of taps. For instance,

T: ***Ready? Tap, tap, tap, tap. How many ?*** (Four)

Be sure to include some sequences that vary in rhythm such as the following:

T: ***Ready? Tap, tap,*** (pause) ***tap, tap, tap. How many?*** (Five)

Your class may enjoy a more challenging version of this activity. Tap a sequence of sounds on a student's desk. Ask the student to reproduce the sequence exactly (by tapping on the desk), while the class listens to check the response.

Exercise 2

T: ***I am going to draw some dots for birds. Count them to yourself while I draw.***

Draw 15 dots spread out across the board. Be sure the dots, and later strings, are clearly visible.

T: ***How many birds?*** (15)

Ask some students to come to the board and to count the dots, using a pointer to indicate each dot as it is counted. Encourage different students to start counting from different dots. Allow the class to give verbal assistance to the student who is doing the counting.

T: ***How many fingers do you have?***
How many students do we need to show 15 fingers?

You are looking for the answer "two," but any number from 2 to 15 should be accepted as correct even though only two students are needed.

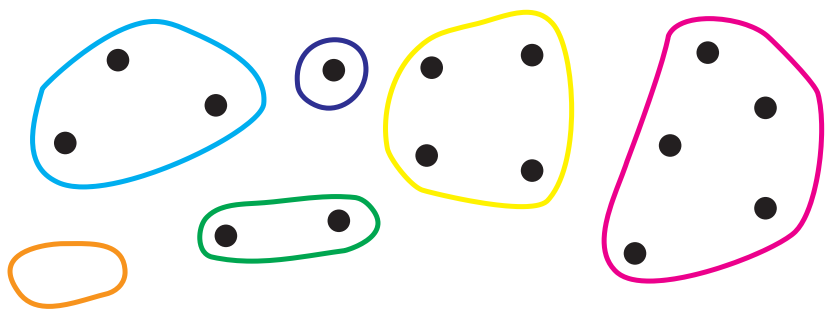
F3

Ask two students to come up to the front of the class and to show 15 fingers.

Invite one student to point to 15 on the classroom number line, and ask everyone else to point to 15 on their desk number line.

T: ***Close your eyes.***

While the students' eyes are shut, complete your picture on the board by drawing six strings in six different colors.



T: ***Open your eyes again. What happened?***

Let the students react. After a while, tell your story.

T: ***It was getting late, and the birds flew home to their nests. I have put all the birds living in the same nest into the same string. The only things inside a string are birds.***

Ask various questions about your completed drawing. For example,

T: ***How many birds are there in the yellow string?*** (Four)

Encourage students, if they can, to answer without counting.

T: ***Who would like to point to 4 on the number line? Trace a 4 with your finger on your desk.***

In one nest there are exactly two birds. Point to them in the picture. Who would like to write 2 on the chalkboard?

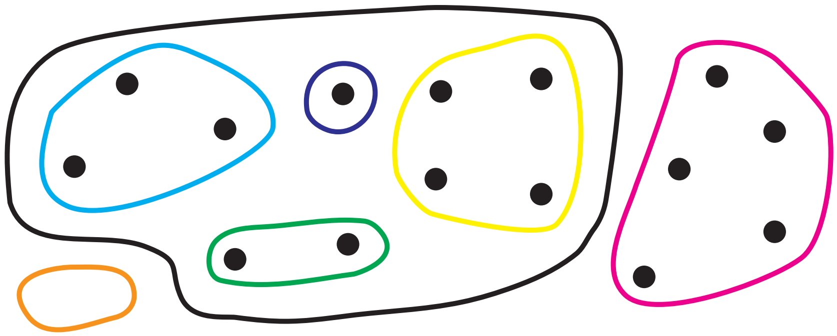
Is there a string with five birds in it? With six? With three?

Are there two nests that house the same number of birds?

Show me the string with the most birds in it. (The red one)
How many birds are there in this string? (Five) ***Clap five times.***

Show me the string with exactly one bird in it. (The purple one)
What can you say about the orange string? (It's empty; there are zero [no] birds in it)

T: ***Some of these birds have planned a picnic together for the next morning; I'll draw a white string around them.***



T: ***How many birds are going on the picnic?*** (Ten)

This question might be more easily solved if you erase the strings inside the white string.

T: ***How many birds are not going to the picnic?*** (Five)
How many birds are there altogether? (Fifteen)

Arrange the students in pairs. First, ask each pair to show ten fingers. Then ask them to show five fingers; and, finally, fifteen fingers.

Distribute Worksheets F3* and **. Instruct everyone to look at F3*.

T: ***What is the green number?*** (Five)
This tells you that exactly five birds live together in one nest. Draw five dots in the green string.

Students who complete Worksheet F3* should do F3** on the back. Upon completing Worksheet F3**, students can be given F3*** and F3****. Worksheet F3**** can be done with the whole group or in cooperative groups, looking for patterns of counting by tens or fives.

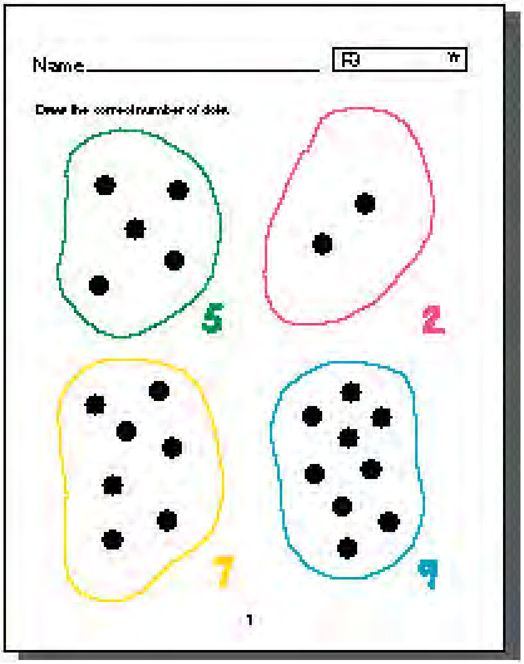
Writing Activity

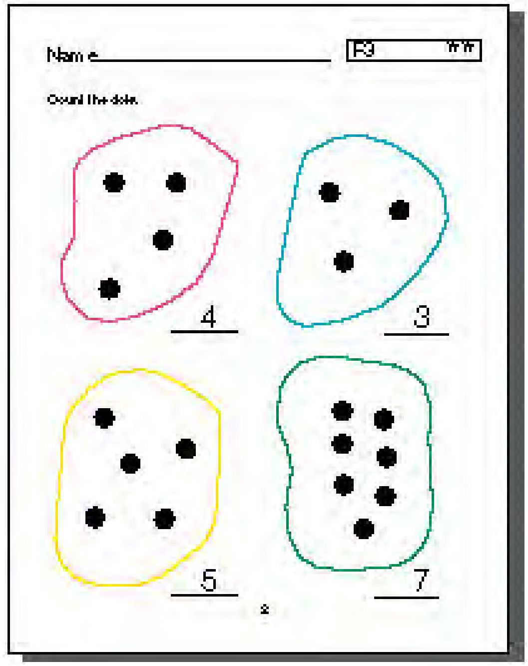
Invite students to write and illustrate a story about birds in their nests.

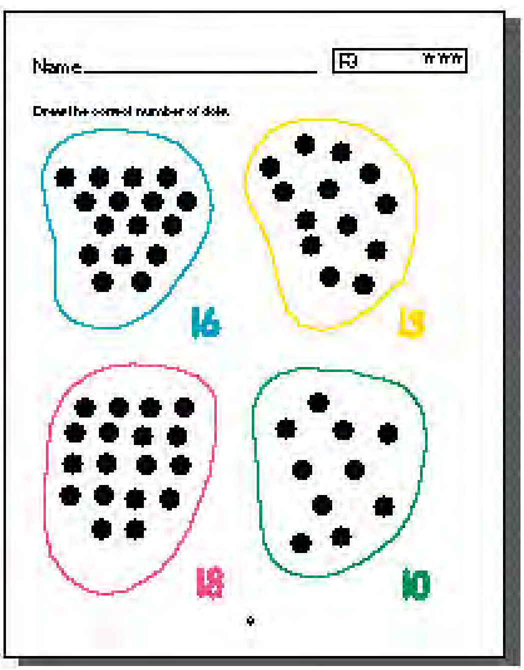
Reading Activity

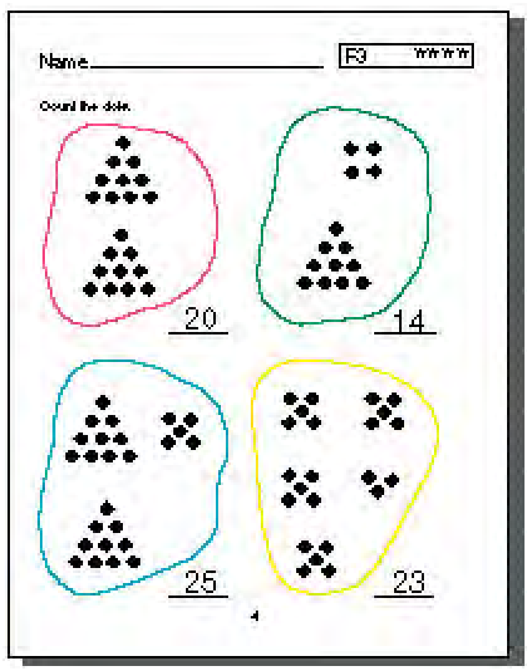
Read a book about birds building nests such as *Horton Hatches the Egg* by Dr. Seuss.

F3


Name
F3 ★
Draw the correct number of dots.
5
2
7
9
1


Name
F3 ★★
Count the dots.
4
3
5
7
2


Name
F3 ★★★
Draw the correct number of dots.
16
13
18
10
3


Name
F3 ★★★★
Count the dots.
20
14
25
23
4

F4 ONE-TO-ONE CORRESPONDENCE

Capsule Lesson Summary

Draw some colored dots for students and, in another color, draw dots for dogs. Pair the different colored dots to establish a one-to-one correspondence between the students and the dogs. Discuss varied diagrams of students and dogs using the terms *more* and *less*.

Materials

Teacher
- Colored chalk
- Storybook about dogs (optional)
- Counters (optional)
- Checkers (optional)

Student
- Paper
- Colored pencils

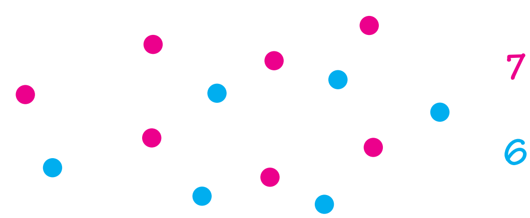
Description of Lesson

Note: Instead of drawing dots, you may prefer to conduct this activity using red and blue checkers or counters. An advantage of using counters is that you can move a red and a blue counter together to show a one-to-one correspondence.

Draw seven red dots on the chalkboard.

T: ***These red dots are for children. How many are there?*** (Seven)
Now I am going to draw some blue dots. They are for dogs.

Draw six blue dots.



S: ***Six dogs.***

T: ***Yes. Seven children and six dogs.***

Write 7 in red and 6 in blue beside the drawing.

T: ***Each child wants to take one dog for a walk. What do you think is going to happen?***

S: ***There aren't enough dogs.***

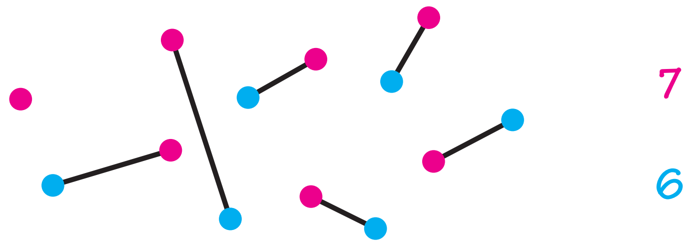
S: ***Two children will have to go together with one dog.***

Answers such as these indicate that your students have the right idea. In any case, be noncommittal and say,

T: ***Well, let's see. This child takes this dog.***

Show a red dot paired with a blue dot. While it would not be wrong to draw an arrow, it is unnecessary since the dogs and children are distinguished by the color of the dots.

Invite students to the board to finish pairing the dogs and the children. For instance,



If you were not very successful when you first asked, "What do you think is going to happen?" you can ask again when there are only two red dots and one blue dot left.

When the drawing is complete, ask some questions and insist that students use the picture to explain their answers.

T: ***Does every child have a dog?*** (No)
Does every dog have a child to walk it? (Yes)
In my story, there are seven children and six dogs.
Are there more dogs or more children?

S: ***Children.***

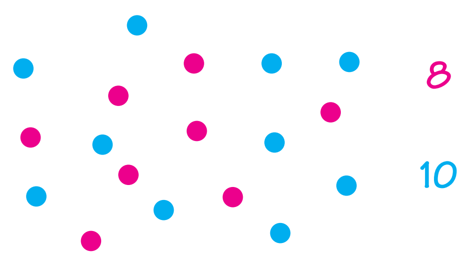
T: ***Right. Seven is more than six. Six is less than seven. There are more children. How many more?*** (One)

Erase the board and draw eight red dots and ten blue dots. Emphasize that the red dots again are the children and the blue dots are for dogs.

T: ***How many of each?***

S: ***Eight children and ten dogs.***

Write 8 in red and 10 in blue on the board.



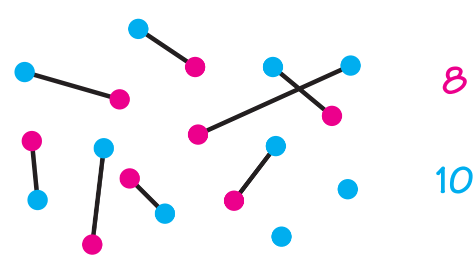
T: ***Are there more dogs or more children?***

S: ***More dogs.***

T: ***How many more?*** (There are two more dogs than children, but don't worry if this answer is not given now.) ***Let's check.***

Invite students to pair the children and dogs.

T: ***Does every child have a dog this time?*** (Yes)
Does every dog have a child to walk it? (No)
So you were right. Ten is more than eight.
Eight is less than ten.
There were more dogs than children.
How many more?



S: ***Two.***

Call on someone to point to the two dogs without children to walk them. Then erase the board.

T: ***In the first story, there were more children than dogs. In the second story, there were more dogs than children. I would like you to draw a picture for a story with the same number of children as dogs.***

You may need to help some students get started drawing nice red and blue dots. They could use red and blue checkers to make a picture. When most of the students have finished, ask some of them to show their drawings to the class. Comment on them; for example,

T: ***John, how many children are in your picture?***

S: ***Five.***

T: ***And how many dogs?***

S: ***Five.***

T: ***Very good! Sam, you have 10 children and 11 dogs. Does every child have a dog?***

S: ***Yes.***

T: ***Does every dog have a child to walk it? Look carefully.***

S: ***No.***

T: ***Look at Mary's drawing. There are many dogs, but we can easily see that every child has a dog and every dog has a child to walk it. Very good!***

Students may enjoy telling or writing other stories about their pictures. Suggest they take their pictures home to share with their families. You might also want to read a story like *The Puppy Who Wanted a Boy* by Jane Thayer.

Home Activity

Suggest parents/guardians provide opportunities to use matching (one-to-one correspondence) in answering more/less questions. For example,

- Put some spoons and forks on the table. Are there more spoons or forks?
- Put some coins (pennies and nickels) in a pile. Are there more pennies or nickels?
- Examine a game with two colors of markers or checkers. Are there more of one color or the other?

F5.1 NUMERICAL ACTIVITIES #2

Capsule Lesson Summary

Do some counting to associate a numeral with a number of objects, to use words such as *more* and *less*, to write number sentences, and to show the same number of objects in many ways.

Materials

Teacher
- Magnetic board
- Magnetic checkers

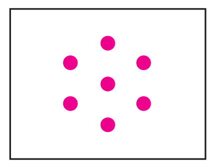
Student
- Paper
- Counters or checkers

Description of Lesson

Note: As soon as you feel that the class is losing interest in one of the activities, switch to the next one.

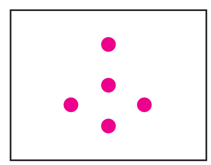
Exercise 1

Display seven magnetic checkers on a magnetic board.



T: ***These are red birds. What kind of birds are red?***
Like most birds, they are flying around.
How many birds are there? (Seven)

Remove two checkers being very obvious about what you are doing.

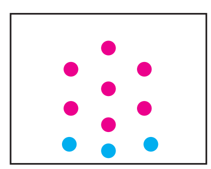


T: ***Are there still seven?*** (No)
Are there more or less than 7? (Less)
How many less? (Two)
How many birds are there now? (Five)

$$7 - 2 = 5$$

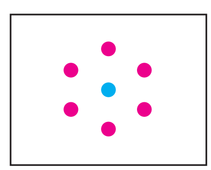
Write a number sentence on the chalkboard as you read, "seven minus two equals five." Do not overemphasize the number sentence. Treat it very informally.

Put the two checkers back and erase the chalkboard.



T: ***How many now?*** (Seven)
Suppose they are joined by some bluebirds.

Add three blue checkers, again being obvious about what you are doing.



T: ***Are there still seven?*** (No)
Are there more or less than seven? (More)
How many more? (Three)
How many birds are there now? (Ten)

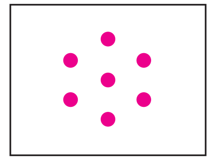
F5

Write a number sentence on the board as you read, "seven plus three equals ten."

$7 + 3 = 10$

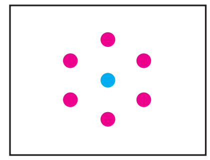
Do not overemphasize the number sentence.

Take the extra checkers off and erase the board.



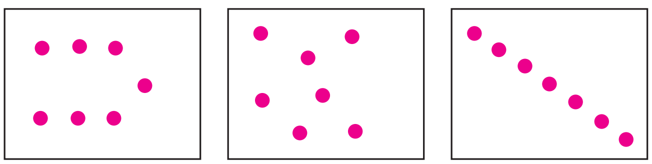
T: ***Here are the seven red birds again.***

Replace (again, being very obvious) a red checker with one of a different color.



T: ***Are there still seven?*** (Yes)

Return to the original seven red checkers. Move the checkers around without adding or removing checkers. You must be obvious about this.

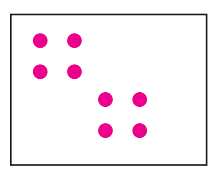


T: ***Are there still seven?*** (Yes)

Alternate moves that *change* the number with those that do *not change* the number. Each time, ask if there are still seven birds. After each move, go back to seven red checkers. You can make this exercise into a game by asking the students to raise their hands if they think the number is still seven, and to put their hands under the table if they think it is no longer seven.

Exercise 2

When the students are familiar with the previous game, ask them to transform a number themselves. Give individuals or small groups counters or checkers and a blank sheet of paper. Give directions such as:



T: ***Put eight checkers on your paper.***
Make it less than eight.
Make it more than eight.

Between moves, go back to the initial configuration.

F5.2 NUMERAL WRITING

Capsule Lesson Summary

Practice writing numerals.

Materials

Teacher
- Counting book (rhyme or song)
- Numeral cards
- Blacklines F5.2* and **

Student
- Numeral writing worksheets

Advance Preparation: Use Blacklines F5.2* and ** to make some numeral writing worksheets for students.

Description of Lesson

Share a brief counting activity or story together. You may like to use the demonstration numeral cards to work on numeral formation. Distribute numeral writing worksheets. Explain to the students that they are to complete the rows by putting the missing numbers in the empty squares. Circulate among the students as they are working. If a student has written a numeral incorrectly, point to a correct example of the numeral on the worksheet and ask the student to write the numeral correctly.

You can suggest that those who finish quickly write the numbers from 0 to 20 in order at the bottom of the second worksheet. If they can continue beyond 20, let them go as far as they wish.

The correct formation of numerals can be reinforced during handwriting time.

Home Activity

Suggest that parents/guardians provide opportunities for their child to practice writing numbers. For example, write the family phone number or address on a paper.

F6.1 WALKS ON ONE-WAY ROADS #1

Capsule Lesson Summary

Follow the arrows on a one-way road map and take some trips on the streets of a small town. Explore walks that are possible and impossible to make. Formulate and discuss a problem with the one-way road map.

Materials

Teacher
- Colored chalk
- Pointer
- *FG Poster #1*
- Toy car (optional)

Student
- Paper
- Colored pencils

Description of Lesson

Tape the *FG Poster #1* to the board. You may use the name of a student or well-known person to make this lesson more meaningful for your class.

T: ***This picture shows the roads of a small town. All the roads in this town are "one-way" roads which run in the direction of the arrows.***

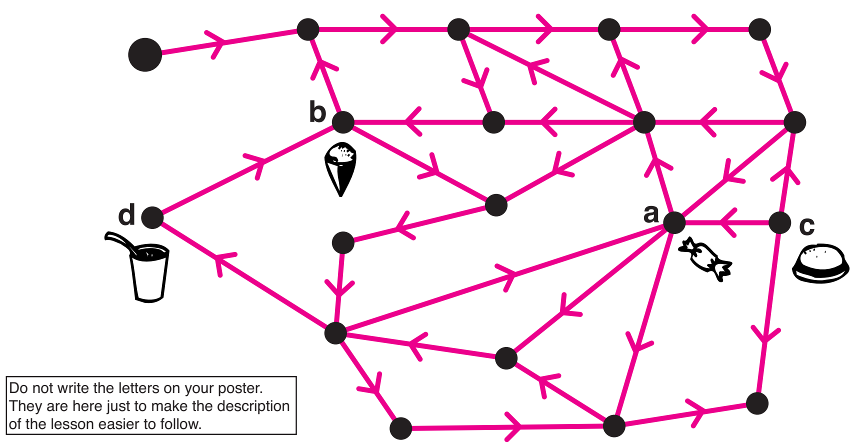
Ask a student to explain what a one-way road is.

T: ***What happens if you go the wrong way on a one-way road?***

S: ***A police officer gives you a ticket.***

T: ***I would like someone to take a ride through the town starting here*** (point to the big dot on the left of the map). ***The rest of the class can give a ticket by raising both hands if someone goes the wrong way.***

Let several students use a pointer or a toy car to "take rides" starting at the big dot. See how far they can go before they get to a dead end or get tired of riding. Invite students to trace rides until you feel the class has an understanding of what is meant by the arrow map.



T: ***This dot is for Carol's Candy Store*** (point to **a**). ***Who would like to take a ride from the big dot to Carol's?***

Allow several students to try this. There are several possible paths of various lengths. After one possible way is shown, ask for a different way.

T: ***This dot is for Dandy Dan's Ice Cream Parlor*** (point to **b**)***. Who can go from Carol's Candy Store to Dandy Dan's?***

Again, allow several students to trace paths. Ask for different ways.

T: ***This is Bruno's Burger Stand*** (point to **c**)**.**
Who can find a way from Dandy Dan's Ice Cream Parlor to Bruno's Burger Stand?

S: ***It's impossible! All the arrows point away from Bruno's.***

T: ***Poor Bruno! He may have to go out of business unless someone helps him. Can you suggest a way to help Bruno solve his problem?***

S: ***Change the direction of one of the roads.***

S: ***Build another road.***

Praise all responses but focus students on responses that actually solve Bruno's problem.

If the class is still interested, say,

T: ***In trying to get to Bruno's Burger Stand we did a lot of riding—enough to make a person very thirsty! Fortunately, there is a refreshment stand right here*** (point to **d**)**.**

Ask a student to trace a ride from **b** to **d**.

Note: The Cat and Mouse Game in Lesson F10 may be used for additional practice. Cut out large arrows and make paths on the floor for students to follow.

Center Activity

In a center, place a laminated copy of the *FG Poster* #1 and small toy cars.

Writing Activity

Invite students to draw their own one-way road map and to write about how to get around in their small town.

F6.2 DOT-TO-DOT PUZZLES

Capsule Lesson Summary

Practice recognizing and following numbers in order by completing dot-to-dot puzzles.

Materials

Teacher	• Blacklines F6 (a)–(f)
Student	• Dot-to-dot worksheets

Advance Preparation: Prepare several dot-to-dot worksheets of varying levels of difficulty. Use any worksheets you already have, or make worksheets from the blackline masters.

Description of Lesson

Distribute worksheets and ask students to draw a line from each number to the number that comes next when counting by ones.

After later lessons you may wish to use dot-to-dot worksheets that start at numbers other than 1, that involve counting by twos, fives, or tens, and that suggest counting backward.

Center Activity

Laminate dot-to-dot worksheets to place in centers.

Home Activity

Suggest parents/guardians use some connect the dot (dot-to-dot) pages. Suggest they work with their child to do one or two pages by counting backwards. You can send home one or two worksheets not used in class or recommend connect the dots (dot-to-dot) activity books.

F7.1 STAIRCASE REVIEW

Capsule Lesson Summary

Progressively build a staircase of C-rods using words such as *shortest* and *longer*. Count by ones and by twos.

Materials

Teacher
- C-rods
- Magnetic board

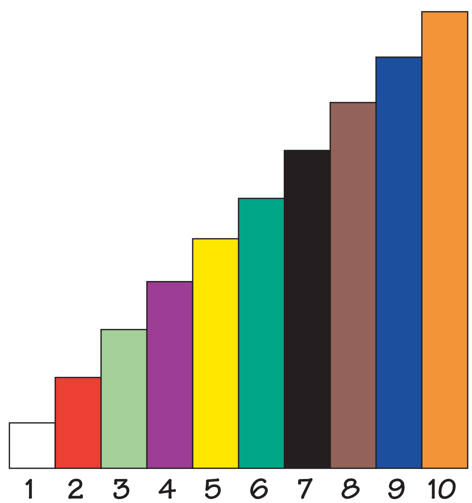
Student
- C-rod sets for individuals or groups

Description of Lesson

Review the colors of the C-rods by asking,

T: ***Who remembers the color of the shortest rod? The one just a little bit longer? And the next one?… The longest rod?***

As you are given answers, call on students to build a staircase with the rods on the board.



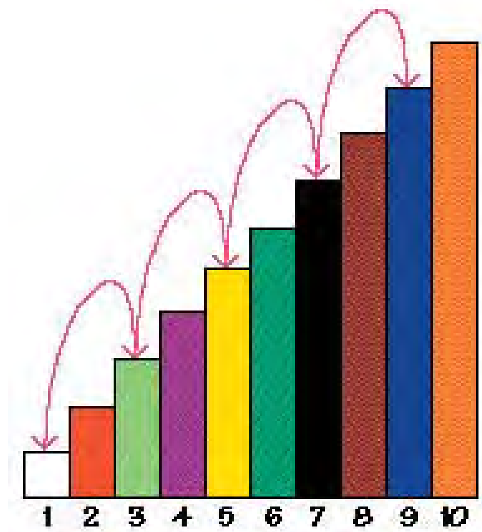
T: ***Let's imagine a grasshopper is going up and down these steps. Count with it as it goes from 1 to 10 and from 10 to 1.***

Repeat the counting, but this time imagine that the staircase continues; let the students count up to 25 or so. Then have them count backward.

T: ***Now let's imagine the grasshopper starts at 1 but jumps two steps at a time.***

Demonstrate climbing the stairs, two at a time, as the students count: 1, 3, 5, 7, 9.

F7



T: ***Now it comes down the same way.*** (Count: 9, 7, 5, 3, 1)

Repeat the same exercise with the grasshopper starting at 2 (or 0).

If your class is interested, repeat this exercise but imagine that the steps continue; ask the class to continue counting. Then, come down the imaginary steps the same way, ending at 2.

Group students (possibly pairs) and ask the groups to build a staircase with their C-rods and to repeat some of the counting exercises. Suggest another counting exercise in which one person covers (or takes away) the first two or three rods in the staircase. Now the counting starts with 3 or 4.

F7.2 THE LITTLE SCHOOL

Capsule Lesson Summary

Draw a number of dots which can be for students or teachers. Use arrows to show students running to their teachers. Do some counting exercises with this situation.

Materials

Teacher
- Colored chalk
- Pointer
- Storybook about starting school (optional)

Student
- Paper
- Colored pencils

Description of Lesson

Draw 19 dots spread out across the entire chalkboard. Be sure the dots and arrows (to be added) are clearly visible.

T: ***This story takes place in a little country school. There are not very many students in this school and only a few teachers. At the moment, it is recess and all the students and teachers are outside. The dots in this picture are for them.***

T: ***How many people are there altogether?*** (19)

If your students did not count the dots at the same time as you were drawing, ask someone to do so now. Encourage different students to start counting from different dots. Allow the class to give verbal assistance to the one who is doing the counting. Invite students to locate 19 on the classroom number line and on their desk number lines.

T: ***19 dots. What are they for?*** (Students and teachers)
Do we know for sure which dots are for students and which dots are for teachers?

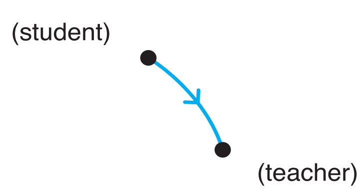
S: ***No, they all look alike.***

Your students might try to answer the previous question by guessing. In that case, point to a dot and say,

T: ***John thinks this dot is for a student, and Mary thinks it is for a teacher. There is no way to be sure!***

In any case, continue:

T: ***Let me go on with the story. Suddenly the bell rings. Of course, that means it's the end of recess. Each student runs to a teacher in order to be ready for class. I am going to show this with a blue arrow.***

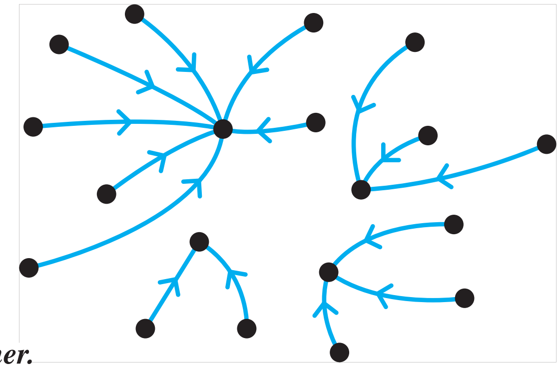


Draw one blue arrow and repeat:

T: ***This student runs to this teacher.***

Ask a student to designate which is the student and which is the teacher.

Then, ask the students to close their eyes while you complete the arrow picture.



Ask students to note various things in your picture; for example,

T: ***Point to a student. How can you tell that dot is for a student?***
Point to a teacher. How can you tell that dot is for a teacher?
Point to two students who have the same teacher.
This is a student (point to a "student-dot")***. Can you show me the teacher of this student?***
This is a teacher (point to a "teacher-dot")***. How many students does this teacher have? Show them all to me.***

If you were discussing the teacher who has seven students, count the seven student-dots and point to 7 on the number line.

T: ***Which teacher has the largest class? How many students are there in that class?*** (Seven)
Which teacher has the smallest class? How many students are in that class? (Two)

Point to the two teachers on the right of the picture.

T: ***What do you think about the classes of these two teachers?*** (They have the same number of students: three) ***Show me all the teachers. How many are there?*** (Four)

Let a student trace a string around the teacher-dots and then draw the string yourself.

T: ***How many students are there altogether?*** (15)

Point to the two teachers at the bottom of the picture.

T: ***Sometimes these two teachers take their classes out for a walk together. How many students do they have altogether?*** (Five)

Ask the same question for the two teachers at the top of the picture.

Let your students draw their own school story. A paper with a school house outline in one corner might help them remember the story later. Let them decide how many students and how many teachers there are. Encourage the students to make big dots, use the whole piece of paper, and use one color for all the arrows. If some students finish quickly, ask them to write something about their picture. For example, they might write some number sentences.

This would be a good time to read a book about getting to know the teacher at the beginning of the school year; for example, *First Day of School* by Helen Oxenbury or *My Teacher Sleeps at School* by Leatie Weiss.

F8 ADDITION STORY #1

Capsule Lesson Summary

Draw ten dots for pieces of candy. Use strings to show candies given to particular children. Explore different ways to distribute the candy and write number sentences for the different ways.

Materials

Teacher
- Colored chalk
- Counters

Student
- Paper
- Colored pencils
- Counters or candies

Description of Lesson

Draw ten dots on the chalkboard. Let the students count as you draw.

Note: Instead of drawing dots, this activity could be done as well with ten checkers or counters.

T: ***These dots are for candies. How many are there?*** (Ten)

T: ***We are going to give these candies to some children. You will decide which candies each child gets. Ahmed, which candies do you want to give the first child?***

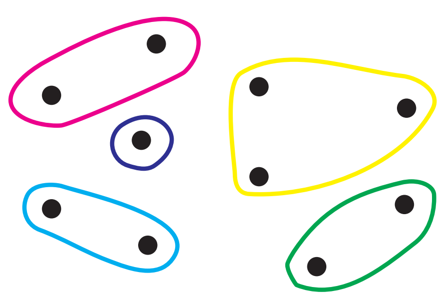
S: ***These two.***

Draw a colored string around the two dots suggested by the student. For example,

T: ***Molly, how many candies do you want to give the second child?***

S: ***Three.***

Instruct her to trace a string around the three candies. Then draw the string yourself. Continue calling on students to finish distributing the candies. Your completed drawing might look like this picture.



F8

T: ***Who would like to explain our story again?***

S: ***One child gets three candies, one child gets one candy, and three other children get two candies each.***

At the top of the board or beside the drawing, begin a number sentence.

T: ***How many candies altogether?*** (Ten)

Finish the number sentence.

$$3 + 1 + 2 + 2 + 2 = 10$$

Erase the board and form groups of three or four students. Provide each group with ten counters or wrapped candies. Invite groups to distribute candies any way they wish and to write number sentences to describe the distribution. Provide help if necessary, and make sure everyone has the right number. Groups who finish quickly can be asked to find another way of sharing ten candies.

Distribute unlined paper to the groups. Tell them to draw a total of ten dots and then to decide and show how ten candies could be distributed among their group. Ask them to write a number sentence to go with their picture. Display or share group pictures with the class, and put some number sentences on the board. Discuss and compare the different ideas expressed by the groups.

F9 LEFT SHOE–RIGHT SHOE

Capsule Lesson Summary

Draw dots for shoes and use "You are my right shoe" and "You are my left shoe" arrows to pair the shoes. Formulate problems and solutions using the diagram.

Materials

Teacher	• Colored chalk • Three or four pairs of shoes	**Student**	• Paper • Colored pencils

Description of Lesson

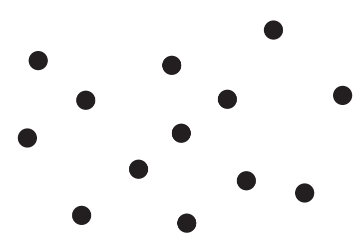
Begin the lesson with some discussion of and directions using *right* and *left*.

T: ***Raise your right hand.***
Point to your left shoe.
Raise your left hand.
Point to your right shoe.

Make sure everyone knows that a pair of shoes consists of one left shoe and one right shoe. Use real shoes to dramatize the story and invite students to participate by finding matching shoes.

T: ***I am going to tell you a story that happened in a tiny country school. The first graders of that school were going to have P.E. (or gym or recess). Of course, they had to wear sneakers (or tennis shoes or running shoes). They took off their regular shoes and put them neatly in pairs along the wall. Then, they put on their sneakers and went outside. While the children were away, someone played a joke on them. They went into the classroom, and mixed up all the shoes. Here are the shoes all mixed up.***

Draw dots for the shoes.



T: ***How many shoes?*** (13)

Sugggest students count the dots to check. Ask someone to point to 13 on the number line.

T: ***What do you think the children did when they came back into the room?***

Accept several suggestions until you get a response like the following:

S: ***They made up the pairs again.***

T: ***Correct. This is a left shoe*** (locate a left shoe in your collection and point to one of the dots)**.** ***What do we need now?***

S: ***The right shoe.***

F9

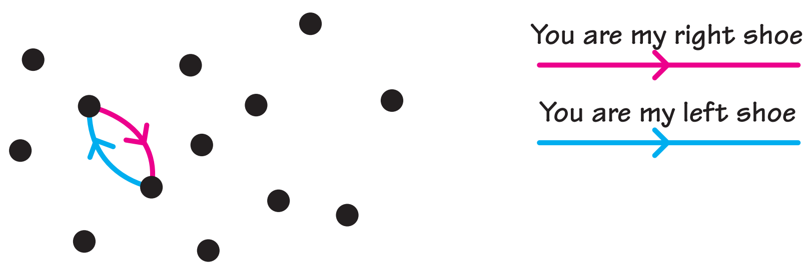
Invite a student to find the matching right shoe and to point to a second dot.

Draw one red arrow, starting at the dot to which you just pointed, and say,

T: ***The left shoe points to the right shoe and says, "You are my right shoe." What is the right shoe going to answer?***

S: ***"You are my left shoe."***

Draw the blue return arrow and write key arrows beside the drawing.



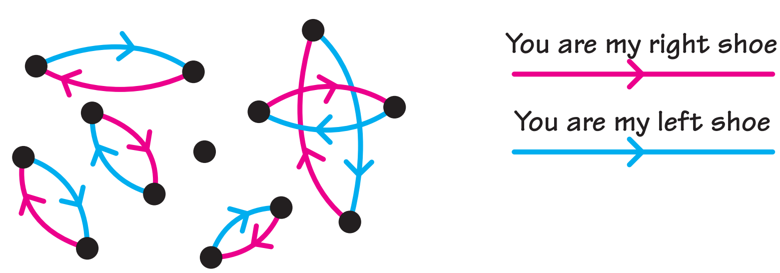
T: ***As I told you, it was a country school, and sometimes in the country children wear shoeboots.***
Here is a little right shoeboot (point to a dot)**.**

S: ***It will point to its left shoeboot.***

Designate another dot as being the left shoeboot; ask a student to trace a blue arrow and then a return arrow. Draw the arrows yourself.

Send students to the board to finish making up the pairs. They will have to decide which dot they want to be a left shoe and which they want to be its right shoe.

When this has been done, your drawing should resemble this one.



T: ***Look at the drawing. What happened?***

S: ***One shoe is left over.***

The students might enjoy telling what might have happened to the "lost" shoe.

T: ***Remember the red arrow is for "You are my right shoe."***

Point to a dot at the end of a red arrow and ask,

T: ***Is this a right shoe or a left shoe?*** (Right)

T (pointing to the end of a blue arrow)**:** ***What about this one?*** (Left)

T (pointing to the unpaired dot)**:** ***What about this one?*** (Can't tell)

T: ***Now, be careful. How many children do you think might be in the class?***

You may want the students to whisper in your ear. Ask them to show the answer with their fingers.

If many students answer "six," point to the single shoe and say,

T: ***But this shoe belongs to a child, too!***

A correct answer is seven (or more, if three or more shoes are missing).

Let someone who answered correctly explain why this is so.

Distribute unlined paper.

T: ***You are going to draw your own picture for a story about 11 shoes. Draw 11 black dots and then make the pairs, using arrows of two colors.***

This is a difficult task. The arrows might go in the wrong directions or be poorly drawn. Don't worry, but provide individual help where needed.

Reading Activity

Read a book to the class like *When Shoes Eat Socks* by Barbara Klimowicz.

Writing Activity

Make a list and write about things that come in pairs.

Home Activity

Suggest to parents/guardians that they discuss things that come in pairs. Use something that comes in pairs to count. For example, how many individual shoes do you own? How many fit your left foot? How many fit your right foot? How many pairs of shoes do you own?

F10 ADJUSTMENT/ASSESSMENT DAY #1

Note: See Section One, page 1-9, for a full explanation of the purpose of scheduled adjustment days. Worksheet F10 is available for a short, written assessment.

On this day, you may wish to repeat an earlier lesson either for a small group of students or for the entire class. Many of these lessons can be made to appear completely different by changing the story and/or the numbers in the lesson. If you omitted any exercises or worksheets from an earlier lesson, you may like to include these. This is also a good time to allow students to work in a center or on a project of your choice.

The following game activities may be appropriate for students whose numerical readiness is weak.

Numeral Card Shuffle

Use the numeral cards from 0 to 10. Shuffle them. Then ask a student to arrange them again in order. Repeat with other students.

Dot Card, Numeral Card, Counter Match

Put students in groups of three, each group having a set of dot cards, numeral cards, and counters. One student chooses a dot card. A second student selects some counters to "match" the dot card (same number). The third student selects a numeral card for the same number. Have students take turns being responsible for each set (dot cards, counters, numeral cards).

This activity can be varied by choosing from the sets in a different order (e.g., numeral card, then dot card, then counters.)

Numeral Card Game

Put students in groups of three to five. One student chooses a numeral card (showing one of the numbers from 0 to 10) and shows it to a second student. The second student "taps" that many times. If the second student taps the number correctly, he or she may choose the next numeral card. If a mistake is made, the student who spots the mistake chooses next.

Some variations of this activity are the following:

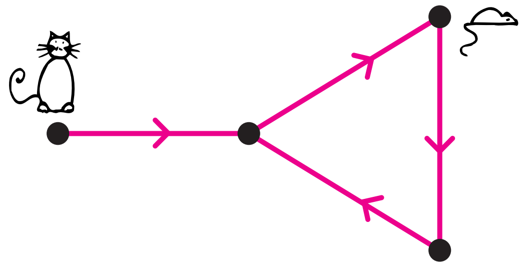
- The second student reads the numeral card and then points to it on the number line.
- Play the game using all of the numeral cards in the deck.
- One at a time, each student in the group taps the number in an interesting pattern. Here are several possible patterns for 5:

tap, tap, tap, tap, tap
tap, tap - - - tap, tap, tap
tap, tap - - - tap - - - tap, tap
tap, TAP, tap, TAP, tap

F10

Cat and Mouse Game

Draw this arrow picture on the board. Have small pictures of a cat and a mouse handy, each with a loop of tape or magnetic material on the back so that each can be attached to the board. Place the cat and mouse into the picture as shown.



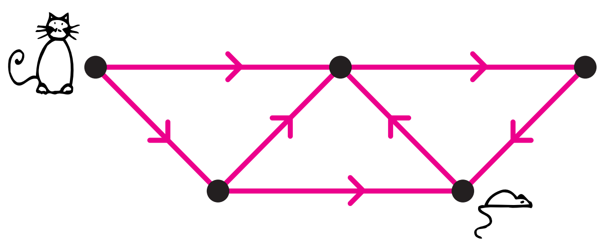
T: ***The cat and mouse can only run from dot to dot in the direction of an arrow. Can the cat get to the mouse? Show me how the cat might reach the mouse.***

Allow a student to trace the path from the cat to the mouse.

T: ***Try to put the cat and mouse in places so that the mouse will be safe.***

When a student has placed both the cat and mouse, check these new positions by asking if there is still a path by which the cat can reach the mouse. Continue until the mouse is safe.

This activity may be varied by changing the arrow picture. For example, a more sophisticated game might look like the following arrow picture.



Counting Songs and Finger Plays

Counting songs such as *Ten Little Kittens* and finger plays such as *Ten Red Apples* are fun to sing and play. When the students have learned the songs, you can suggest, for variety, that the numbers be changed. For example, try singing *Ten Little Kittens*, starting with 2 and counting only even numbers ("Two little, four little, six little kittens, ...").

Ten Little Kittens

One little, two little, three little kittens,
Four little, five little, six little kittens,
Seven little, eight little, nine little kittens,
Ten little kittens, my, my!

Ten little, nine little, eight little kittens,
Seven little, six little, five little kittens,
Four little, three little, two little kittens,
One little kitten, bye, bye!

Ten Green Frogs

Ten green frogs swimming in the pond
One got out, and then there were… (nine).

Nine green frogs swimming in the pond
One got out and then there were… (eight).

Eight green frogs swimming in the pond
One got out and then there were… (seven).

(And so on.)

This Old Man

This old man, he played one,
He played knick-knack on my thumb.
With a knick-knack, paddy-whack,
Give a dog a bone,
This old man comes rolling home.

Other verses:
two - - - on my shoe
three - - - on my knee
four - - - on my door
five - - - in my hive
six - - - with his sticks
seven - - - up to heaven
eight - - - on my gate
nine - - - on his spine
ten - - - all again

Ten Red Apples

Here I have five apples.
(Hold up five fingers on right hand.)
And here are five again.
(Hold up fingers on both hands.)
How many apples altogether?
Why, five
(Wiggle fingers on right hand.)
and five
(Wiggle fingers on left hand.)
Make ten!

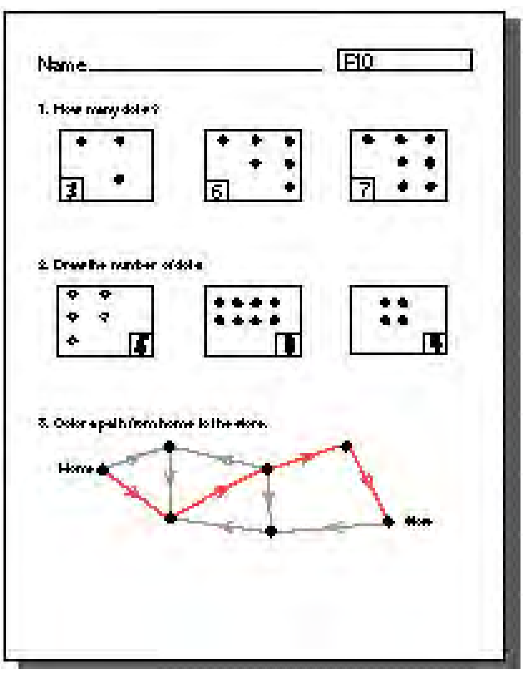
Ten Little Candles

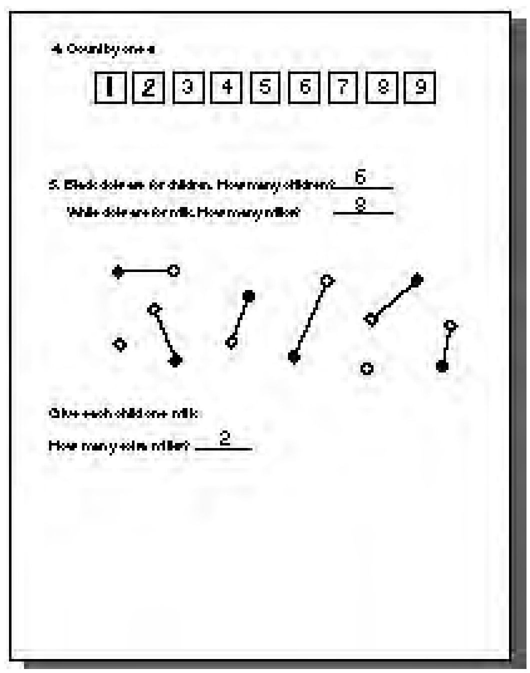
Ten little candles on a chocolate cake.
(Hold up 10 fingers.)
Wh! Wh! Now there are eight.
(Blow twice and hold up 8 fingers.)
Eight little candles on candlesticks.
(Hold up 8 fingers.)
Wh! Wh! Now there are six.
(Blow twice and hold up 6 fingers.)
Six little candles and not one more.
(Hold up 6 fingers.)
Wh! Wh! Now there are four.
(Blow twice and hold up 4 fingers.)
Four little candles–red, white, and blue.
(Hold up 4 fingers.)
Wh! Wh! Now there are two.
(Blow twice and hold up 2 fingers.)
Two little candles standing in the sun.
(Hold up 2 fingers.)
Wh! Wh! Now there are none!
(Blow twice and turn palms face up.)

Early Warning

Among the next nine classroom lessons are some which require extra preparation time, or which involve materials not included with the *CSMP* Classroom Set. The lessons are listed here for your convenience in preparing for them. A more detailed description of the needed materials can be found on the first page of each lesson. These special materials are listed here only once, even if they are needed more than once during the nine-day period.

F11.1 *Numerical Activities #3:* Magnetic board; fish bowl paper; counters
F11.2 *Favorite Fish Crackers Graph*: Several flavors of fish crackers; graphing mat
F12 *Introduction to A-Blocks #1*: A container for each student (to store A-Blocks)
F13 *The Pet Shop*: Fish crackers or small counters (approximately 500); paper muffin cups; work mats; shoe boxes (optional)
F14 *Taller Than and Shorter Than:* Pointer
F15 *Distributing Birthday Cards*: Month labels—each month written on a full page paper
F17.1 *Numerical Activities #4*: Two-color counters; paper cups
F18 *Brother–Sister Graphs #1:* Blue and red paper squares





F11.1 NUMERICAL ACTIVITIES #3

Capsule Lesson Summary

Do some counting exercises to associate a numeral with a number of objects and to write number sentences. In a story situation, find many facts for 5.

Materials

Teacher
- Colored chalk
- Magnetic board
- Magnetic checkers

Student
- Checkers or counters
- Fish bowl paper

Advance Preparation: Use Blackline F11.1 to make copies of a fish bowl for the students.

Description of Lesson

Exercise 1: Finger Games

Ask the students to show six fingers; then to show six fingers another way; then yet another way.

Ask the students to show four fingers on one hand and three fingers on the other.

T: ***How many fingers are shown altogether?***

Choose two students. Together, ask them to show nine fingers. Let them decide how to solve the problem. Afterwards, ask if it is necessary to have two students in order to show nine fingers. Proceed in a similar fashion for 12 fingers.

Exercise 2: Combinations to Make 10

T: ***Show me seven fingers.***

When this has been done, show seven fingers yourself and ask,

T: ***How many more fingers do you need to show ten fingers altogether?*** (Three)
Yes, seven and three more is ten.

Show this on your fingers as you say it.

Repeat the fact several times, each time using your hands to illustrate it. Write 7 + 3 = 10 on the board but do not stress the written number sentence.

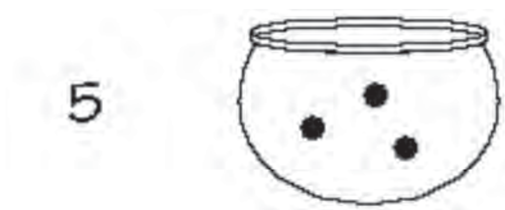
Repeat this exercise starting with six, eight, or nine fingers. Ask,

T: ***How many more fingers do you need to show ten fingers altogether?***

Exercise 3: Happy Fish

T: ***One of my friends owns a pet shop that specializes in all kinds of fish. As you know, fish need to have lots of water and swimming room if they are to be healthy and happy. So, my friend is very concerned about how many fish are in each bowl. He has decided that there should be exactly five fish in each bowl.*** (Write 5 on the board.) ***There is only one problem. My friend has a niece, Jody. She loves to help him clean out the bowls and change the water . . . but she can't count very well. Look, here is the first bowl she cleaned yesterday.***

Draw a fish bowl or a string and place magnetic checkers in it (if this is not possible, draw dots instead). Write 5 near the picture.



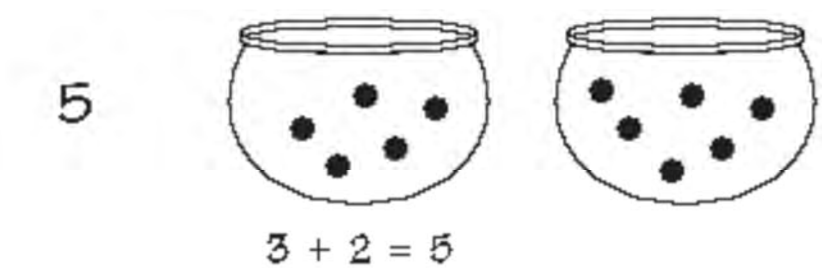
The students will probably notice that this bowl doesn't contain five fish. Ask them if they can help Jody . If necessary, ask questions such as:

T: ***How many fish are there in this bowl?*** (Three)
Is that too many or not enough? (Not enough)
What should Jody do? (Add two fish)

Place two more checkers (or draw two more dots) inside the string. Write 3 + 2 = 5 on the board. Again, do not emphasize the number sentence.

T: ***Three plus two is five.***

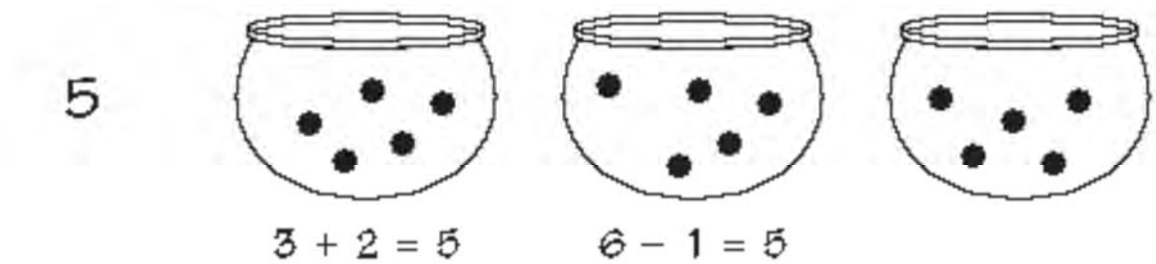
Give students checkers or counters (fish) and a paper (fish bowl) to use at their own places. Direct them to do what you do on the board. Draw a second string.



T: ***Here is a second bowl. What do you think about this one?***

S: ***There are too many fish. One should be taken out.***

When this has been done, write 6 - 1 = 5 on the board and draw a third string.



S: ***There are five fish in this bowl. It has the correct number.***

To correct a mistake, ask a student to count the checkers in the string being discussed.

Repeat this activity several times with different numbers of fish.

F11.2 FAVORITE FISH CRACKERS GRAPH

Capsule Lesson Summary

Make a real graph of favorite flavor crackers. Discuss the results by counting and comparing.

Materials

Teacher
- Boxes of several flavors of "fish" crackers
- Graphing mat

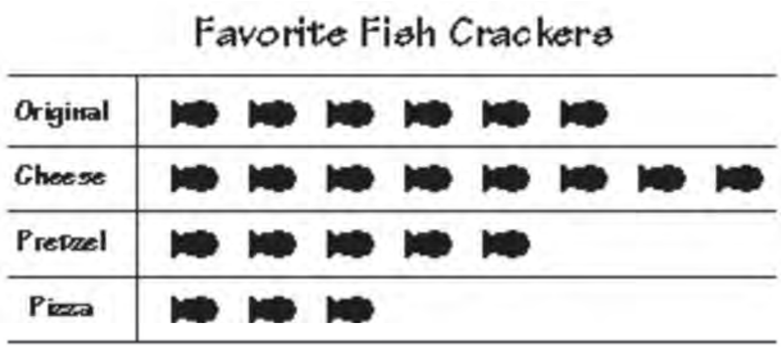
Student
- None

Advance Preparation: A graphing mat can be made from a robot walk grid sheet or drawn on a large sheet of chart paper.

Description of Lesson

Prepare several flavors of "fish" crackers for sampling and invite the students to taste each of the flavors you have. Tell them ahead of time that you want them to choose their favorite kind. Ask them to record their favorite in a real graph on your graphing mat.

One way to make a graph is shown below. Students place (glue, tape, etc.) a cracker of their choice (favorite) in the appropriate column.



Discuss and interpret the results. For example, ask some of the following questions, or ask students to suggest some things they learn from the graph.

T: ***Which flavor is most popular? . . . least popular?***
Do more of us like original crackers or pretzel crackers best? How many more?
Are any two flavors liked best by the same number of us?

F12 INTRODUCTION TO A-BLOCKS #1

Capsule Lesson Summary

Display A-blocks and examine their different attributes. Locate certain A-blocks from a description of their various attributes.

Materials

Teacher	• One set of A-blocks in a small box	Student	• One set of A-blocks in a container

Note: A-blocks may be replaced with any kind of attribute pieces, as long as they have at least three attributes (e.g., color, shape, and size).

Description of Lesson

Show the class a box in which you have one complete set of A-blocks.

T: ***In this box I have some pieces I call attribute blocks or A-blocks. The pieces are different colors, different shapes, and different sizes. What color pieces do you think I have?***

S: ***Blue.***

As each color is mentioned, show the class a piece of that color saying, for example,

T: ***Yes, I have some blue pieces.***

Of course, someone might guess a color not in the collection.

S: ***Orange.***

T: ***No, I do not have an orange piece. Do you have another guess?***

Repeat this process, letting students tell you the three different shapes. Tell the class your pieces have two different sizes; let them suggest calling the sizes “big” and “little.”

Show the students one of your A-block pieces.

S: ***It’s a circle.***

S: ***It’s yellow.***

Don’t ask for more attributes than those the students suggest. Show another A-block piece.

S: ***A red square.***

Continue in this manner. Be sure to include a triangle.

F12

Distribute A-blocks sets to the students and allow about ten to twenty minutes for free exploration. For instance, students might sort them or make designs or patterns. Praise any creative idea.

If your students start to lose interest in free play, direct them to more structured activities. For example,

T: ***Put all the pieces in the middle of your desk. Without making any noise, hold up a piece that I describe. Pay attention! First listen. Then, when I give the signal, pick up a piece.***

T: ***A little triangle. Go!***
A red circle. Go!
A blue square. Go!
A little, red triangle. Go!
A big, blue square. Go!

A complete attribute block set consists of 24 pieces. There is exactly one piece for each possible combination of the attributes. For example, one big red circle.

Size	Color	Shape
big	red	circle
little	blue	square
	green	triangle
	yellow	

T: ***Put all the red pieces together. How many red pieces are there?*** (Six)
How many blue pieces? (Six)

Some students will collect the blue pieces together and count them. Others might simply realize, without counting, there are six blue pieces just like there are six red pieces.

Repeat this counting exercise for circles and/or squares.

Before putting the A-blocks away, ask the students to sort them by color or by shape, so you can check to see that each set is complete. You may like to end the lesson with a game where the teacher describes a piece or a subset of pieces, and the student puts the piece or pieces away.

Extension Activity

Look around the room for things shaped like a circle, a square, or a triangle. Make a graph or chart of the things you find.

Writing Activity

Trace and color an A-block. Then write the three words to describe it under the picture.

Home Activity

Suggest that parents/guardians work with their child to list things they can find at home shaped like circles, squares, or triangles.

F13 THE PET SHOP

Capsule Lesson Summary

In a story context, group by fives. Organize the results using place value notions (base-5). This activity is mostly a grouping experience although it should contribute to thinking about place value.

Materials

Teacher		Student	
	• Demonstration materials similar to the student materials for use at the board or on an overhead projector.		• Fish crackers (or some kind of small counters, like beans) • Work mat • Paper muffin cups • Shoe box (optional)

Description of Lesson

Remind the class of the pet shop where your friend insists that there be exactly five fish in each fish bowl (see Exercise 3 in Lesson F11.1). Ask if they remember Jody, the girl who works at the pet shop and has some trouble putting exactly five fish in each fishbowl.

T: ***Today Jody is on vacation, so you are going to do her work at the pet shop putting fish into bowls.***

Provide pairs of students with a work mat, a small container of fish crackers (between 15 and 25), and several small paper muffin cups.

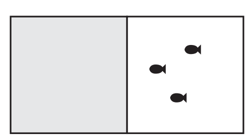
T: ***Before you begin, lets talk about the job. When new fish arrive at the pet shop, the workers must put them in bowls. They work on a mat like yours. The right side*** (white) ***has water and is for single fish and the left side*** (dark) ***is for bowls. As soon as a worker counts five single fish, they must put them in a bowl*** (muffin cup) ***and move the bowl to the dark side of the mat. Let's see how the job goes.***

Demonstrate at the board or on the overhead projector the job each pair of students will do.

Start with an empty mat.

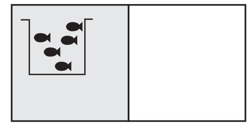
T: ***0 bowls and 0 single fish.***

Take fish out, one at a time, and place them on the right side of the mat. Occasionally say what you have so far.



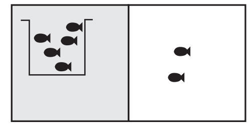
T: ***0 bowls and 3 single fish.***

As soon as you have five single fish, put them in a bowl and move it to the left side of the mat.



T: ***1 bowl and 0 single fish.***

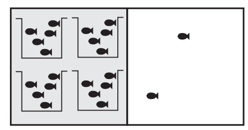
Continue with a couple more fish.



T: ***1 bowl and 2 single fish.***

T: ***You and your partner will get a container of fish. You must act like a worker at the shop. When you finish, tell us how many bowls you have and how many extra fish you have.***

Instruct the students to work in pairs pretending they are working at the pet shop. As you walk around, remind the students to put the fish, one at a time, on the mat. Encourage students to say aloud to each other what they have. Watch that as soon as there are five single fish, they are put into a bowl and moved to the left side of the mat. As groups complete the job, ask each group to read to the class what they have. For example,



S: ***4 bowls and 2 single fish.***

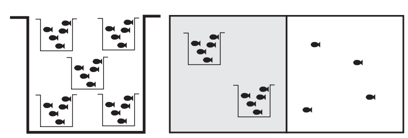
Some students may want to tell the class how many fish are in 4 bowls and 2 single fish. (22) Accept such information asking how they counted, but do not insist on such a count.

If the class is interested in this job, you can give each group 10 to 20 more fish and instruct them to continue working. At this point you can extend the pet shop story as follows.

T: ***My friend found that he quickly ran out of fish bowls when he got in a lot of fish. So, he decided that when he had filled five fish bowls he would put all the fish in the five bowls into a tank.***

Give each group an empty shoe box (or similar container) to be a tank. Put the box to the left of the mat. Ask that students move the five filled bowls into the box (so you can see that they are putting the fish from five bowls into the tank).

As the groups complete the job with their additional fish crackers, let each group announce what they have. For example,



S: ***1 tank, 2 bowls, and 4 single fish.***

If you would like your students to go further with this grouping work, you can suggest that two pairs work together organizing all their fish into tanks, bowls, and single fish.

Home Activity

Suggest that parents/guardians show their child how to use tally marks ( ) to record how many there are in various collections of things such as rubber bands or buttons.

F14 TALLER THAN AND SHORTER THAN

Capsule Lesson Summary

Draw dots for four students in your class. Complete an arrow picture using different colored arrows for the familiar relations *taller than* and *shorter than*. Let the students draw "I am taller than you" arrow pictures of their families. Have students justify their answers using the diagram.

Materials

Teacher		Student	
	• Colored chalk • Pointer		• Paper • Colored pencils

Description of Lesson

Call four students to the front of the room and draw a dot diagram of their positions. Write the appropriate name beside each dot. Explain that they are going to play a game.

Note: Use your judgment concerning the choice of students to participate in this game. Some may not be happy about being the tallest or the shortest. However, you should try to choose four students with fairly obvious height differences.

T: ***This game is called "I Am Taller Than You."***

Choose one of the students, not the tallest or the shortest, and ask,

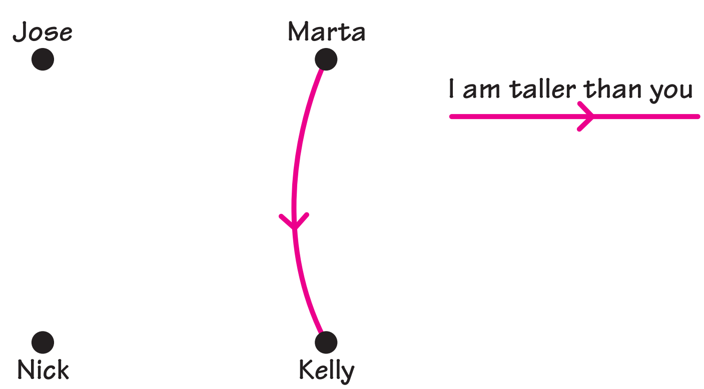
T: ***Marta, can you say "I am taller than you" to someone in this game?***

S: ***Kelly.***

T: ***Can Marta speak to Kelly?***

Stand Marta and Kelly back to back to let the class see if Marta really is taller than Kelly. If Marta is correct, let her point to Kelly and say, "I am taller than you."

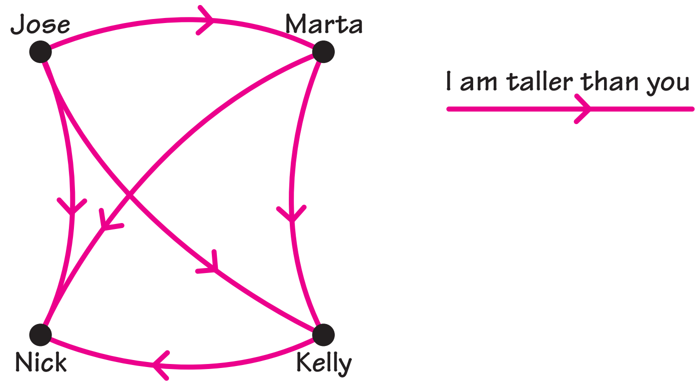
Invite someone to trace an arrow in the picture to show Marta is taller than Kelly. Draw the arrow yourself.



T: ***Is there anyone else that Marta can say "I am taller than you" to?***

Continue until all of Marta's possibilities have been tested to the satisfaction of the class. Let Marta point to whomever she can and say, "I am taller than you." As Marta points, you may want to let another student use a pointer to trace the corresponding arrows in the picture on the chalkboard.

Do the same for one of the other three students. Continue in this manner until all the "I am taller than you" arrows have been drawn. Your picture might look like this when complete.



When this part of the picture is finished, ask the four students to point to whomever they should. Jose will have to use his foot (or his head) to point to someone .

T: ***Who gets to talk the most?*** (Jose) ***How can you tell from looking at the picture?***

S: ***Jose gets to talk to everyone else.***

S: ***There are three red arrows starting at Jose.***

T: ***Who is the shortest person in the picture?*** (Nick) ***How can you tell from looking at the picture?***

S: ***There are no red arrows starting at Nick.***

S: ***He doesn't talk.***

S: ***There are three arrows ending at Nick, so he is the shortest.***

T: ***Can you imagine a game with the same people in which Nick could talk?***

S: ***"I Am Shorter Than You."***

If no one offers this response, ask Jose what he says to Nick. Then, ask Nick what he could answer.

T: ***Let's play "I Am Shorter Than You" in blue on this picture.***

Point to the picture on the board (but do not call the four students to the front of the room again).

T: ***Who sees a place to draw a blue arrow?***

Let a student trace the arrow with the pointer or his finger. If it is correct, draw the arrow.

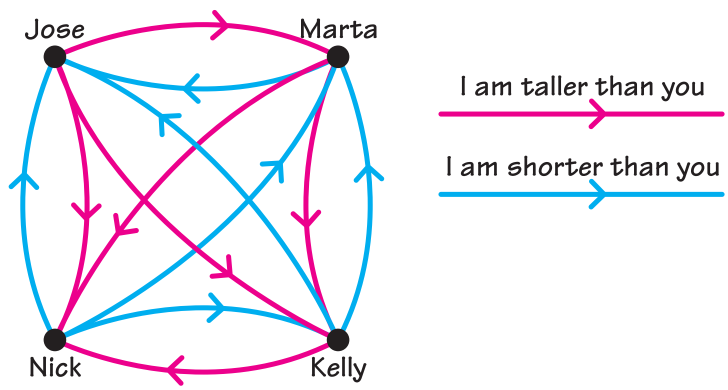
T: ***How do you know it is correct to draw a blue arrow there?***

S: ***Sue is shorter than Jose.***

S: ***In the last game, Jose was taller than Nick—so Nick is shorter than Jose.***

S: ***The red arrow shows Jose is taller than Nick, so Nick can talk to Jose and say, "I am shorter than you."***

Ask for other blue arrows until the picture is finished.



T: ***Who talks the most when we play "I Am Shorter Than You"?*** (Nick) ***How can you tell?***

S: ***There are three blue arrows starting at Nick.***

S: ***He talks to all the others in blue.***

S: ***Nick is the shortest.***

T: ***Who talks the least in blue?*** (Jose) ***How can you tell?***

S: ***Jose is the tallest.***

S: ***There are no blue arrows starting at Jose.***

Initially, the explanation given may be incomplete or only partially appropriate. Accept any explanation, rephrasing it with the appropriate part or completing it yourself, if necessary. Gradually the students will get better at verbalizing their responses.

Writing Activity

Distribute unlined paper and direct the students to draw "I am taller than you" arrow pictures for their respective families. They should use one dot for each family member and then draw the red arrows. Students with small families may want to put in a dot for an aunt or a grandfather or a pet. Those with large families may want to consider only brothers or sisters. Don't worry if some arrows are not drawn. Students who finish quickly can add "I am shorter than you" arrows.

After students draw a picture about their families, they can share their pictures in groups or write about their pictures.

Reading Activity

You may like to follow this lesson with a book such as *So What?* by Miriam Cohen.

F15 DISTRIBUTING BIRTHDAY CARDS

Capsule Lesson Summary

Construct a real graph of class birthdays. Inside a string, draw dots for birthday cards. Inside a second string, draw dots for students. Use arrows to show to which students the cards were delivered. Pose numerical questions about the story situation.

Materials

Teacher
- Colored chalk
- Month labels

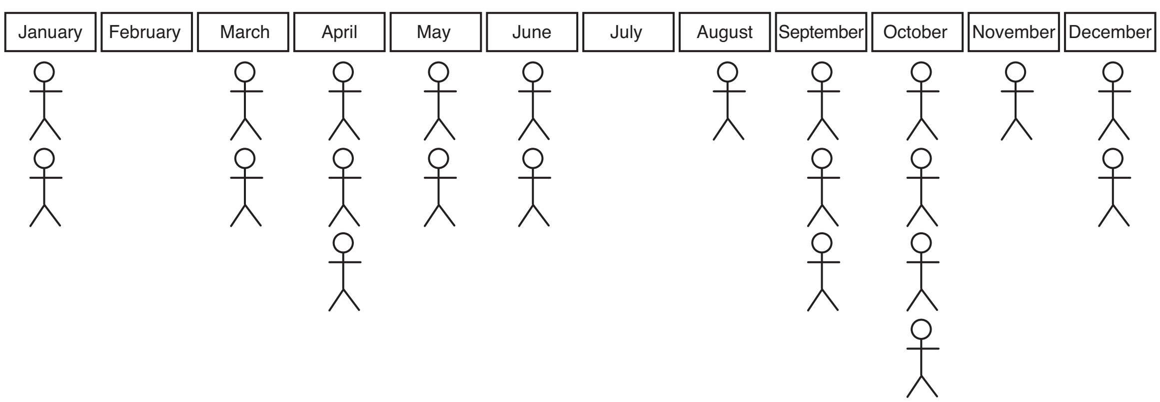
Student
- Paper
- Colored pencils

Description of Lesson

Begin the lesson with a discussion of birthdays.

T: ***How many of you have a birthday this month?***
What month do you think has the most birthdays for our class?
How could we find out?

Allow students to make suggestions, but direct the data collection toward constructing a real graph. One way to do this is to make full page labels for the twelve months. Lay these in a row on the floor or tape them to the board. Then invite students to stand next to the label for their birthday month. Organize the students in a straight line next to the label.



Discuss and interpret the results by answering the initial questions and finding other things that can be learned from the real graph. You may like to encourage some students to formulate questions that they can answer by looking at the graph. In order to keep a concrete representation of the real graph, students can leave a piece of paper (with their name or perhaps a self-portrait) at their place in the graph. This will make it easier to formulate or answer questions looking at the graph.

After the graphing activity, ask the students to return to their places and continue a discussion of birthdays.

T: ***How do you celebrate your birthday?***

Let several students respond. If no one mentions birthday cards, ask,

F15

T: ***Do you receive birthday cards?***

S: ***Yes.***

T: ***Who brings them?***

S: ***The mailcarrier.***

T: ***I have a story about delivering the mail to a street on which several children live. Not all the children have their birthdays this month, but a few of them received cards this morning. Here are the cards the mailcarrier brought.***

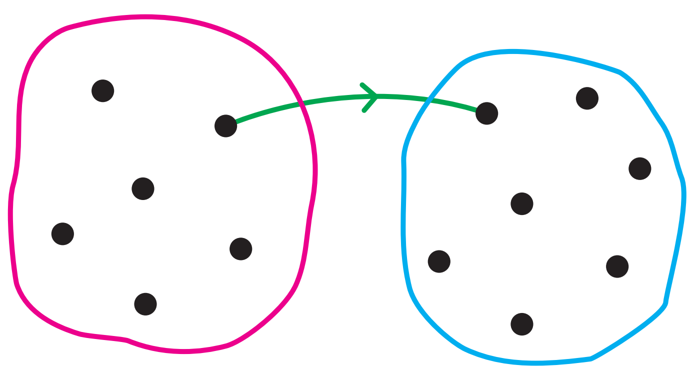
Draw a string with six dots in it on the left side of the chalkboard. (See the red string in the illustration below.)

T: ***How many cards are there?*** (Six)
The mailcarrier delivered the cards to some of the children who live on that street. Here are the children.

Draw a blue string with seven dots in it. Draw the strings far enough apart so that you can draw arrows with arrowheads in the space between the strings.

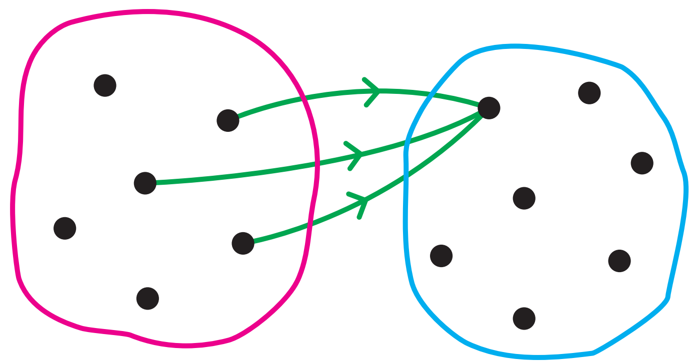
T: ***How many children?*** (Seven)
Bill (substitute the name of a student in the class who has a birthday this month, if there is one) ***lives on that street. Here is Bill*** (point to a dot in the blue string)**.**
How could we show that this card (point to a dot in the red string) ***is delivered to Bill.***

S: ***Use an arrow.***

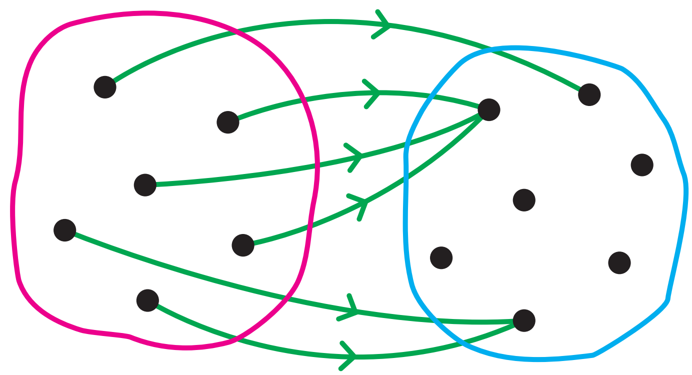


T: ***Do you think Bill received only one card? Let's see.***

Draw two more arrows.



T: ***How many cards did Bill receive?*** (Three)
The mailcarrier has more cards to deliver. How many more? (Three)
Here is how those cards are delivered.



For the following questions, encourage students to use the picture to explain their answers.

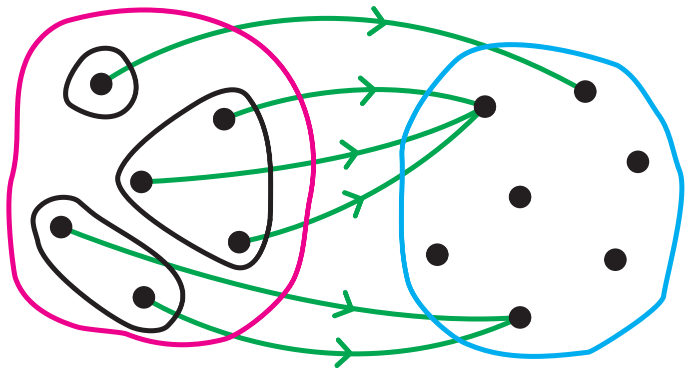
T: ***How many children received cards?*** (Three)
How many cards did Bill receive? (Three)
Who can point to them?
Let's draw a string around Bill's cards.

T: ***How many cards did this child*** (point to the dot at the bottom of the blue string) ***receive?*** (Two)
Who can point to them?
Let's draw a string around them.

How many cards did this child (point to the dot at the top of the blue string) ***receive?*** (One)
Who can point to it?
Let's draw a string around it.

A completed drawing is shown below.

F15



T: ***Are there more cards or children?*** (Children)
Did every child receive a card? (No)
How many children did not receive cards? (Four) ***How can you tell?***

S: ***Four dots have no arrows ending at them. Maybe they didn't receive cards because their birthdays are not this month.***

T: ***How many cards would it take for every child to receive a card?***

Writing Activity

Distribute unlined paper. Instruct the students to draw five black dots in one string. These are for birthday cards. Then ask them to draw six dots, for children, in another string. Suggest they deliver the cards as they wish. If you prefer, those who finish quickly can draw the picture for another story in which each child receives at least one card. You may ask some students to share their pictures with the class or to write about their pictures.

Reading Activity

You may like to follow this lesson with a book such as *I Love You Mary Jane* by Lorna Balion.

F16.1 RHYTHMS AND PATTERNS

Capsule Lesson Summary

Associate a pattern of dots with a pattern of tapping sounds, and use these patterns to explore different representations of numbers. Listen and mimic patterns of taps.

Materials

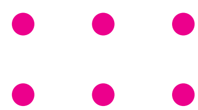
Teacher
- Colored chalk
- Tapping device such as a pen or a pointer

Student
- Paper
- Colored pencils
- Checkers
- Unifix® cubes (optional)

Description of Lesson

Exercise 1

Draw the following dot pattern in red on the chalkboard.



T: ***How many dots?*** (Six)

Ask the class to be very quiet and to pay close attention. Using a ball point pen, chalk, pointer, or other device, begin to tap producing nice, sharp noises.

Give three quick taps, then pause, then three more quick taps.

tap, tap, tap—tap, tap, tap

It is essential that you tap in two groups of three taps.

T: ***How many taps?*** (Six)

If the students do not answer correctly, ask them to pay close attention while you repeat the taps. Do not be concerned or surprised if you have to try this several times before you get a correct answer.

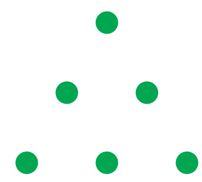
Then try another tapping pattern: two quick taps, a pause, then four quick taps.

tap, tap—tap, tap, tap, tap

T: ***How many taps?*** (Six)

F16

Draw the following dot pattern in green next to the dot pattern already on the board.



Tap this pattern: one tap, pause, two taps, pause, three taps.

tap—tap, tap—tap, tap, tap

T: ***How many taps?*** (Six)
Which picture was I tapping? (Green)

The students may not understand the question. If not, tap again in a "one, pause, two, pause, three" pattern and say,

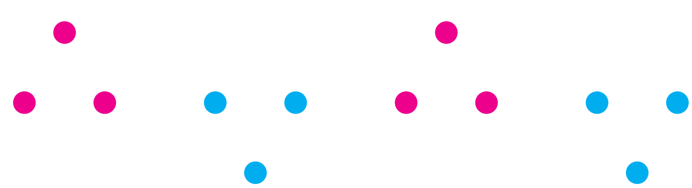
T: ***Did that sound like the red picture or the green?***

If several tries do not produce a response, tap in the same rhythm hitting a dot on each tap (e.g., the top dot—tap—step back; the middle dots—tap, tap—step back; the bottom dots—tap, tap, tap).
If this is going well, you can tap in a "two-two-two" pattern and ask which picture goes with the tapping. In this case it would be about the red picture (viewed as two dots in each of three columns).

Extension: Ask students to draw a pattern from what they hear.

Exercise 2

Give students checkers for representing patterns. Erase the pictures you have drawn so far and draw this design of dots on the chalkboard.



T: ***Make this pattern on your table. Show me what you think would come next.***

When many students show a red checker or a group of three red checkers, draw the next dots in the pattern on the board.

Continue asking "What comes next?" until you have 18 or 21 dots.

T: ***What pattern do you see?***

S: ***There are three red and three blue and three red and three blue . . . and so on.***

S: ***There's a red checker above and then a blue checker below.*** (Point to the dots as this pattern is described.)

Reiterate the pattern, adding an inflection to your voice to emphasize the repetition in the pattern: three red, three blue, three red, three blue, and so on.

T: ***Who would like to tap this pattern?***

Invite several students to tap the pattern. Then let students invent patterns for others to tap.

Extension: Let students use manipulatives such as Unifix® cubes to create patterns from what they hear.

Exercise 3

Erase the board.

This time, you will tap a rhythm rather than a visible pattern. The students are to discover, after listening, what the rhythm is.

For example, tap in a "three-two" rhythm.

tap, tap, tap—tap, tap—tap, tap, tap—tap, tap—tap, tap, tap—tap, tap

Then ask who would like to do the same. Again, this is difficult for the students and it will probably take several trials to get a correct imitation of your tapping. Between the students' attempts, repeat the pattern. Be very dramatic—ask for perfect quiet and attention. Accentuate the pattern by tapping more rapidly but with longer pauses between the groups. You might want to use two different tapping devices such as chalk for the "two-taps" and a stick or pencil for the "three-taps."

Repeat with a different pattern if you wish.

Note: The secret to tapping activities seems to be partly in the dramatics. Always demand "pin dropping" silence before tapping. In fact, if your class is especially noisy, try using Exercise 3 as a five minute quieting down device sometime.

Each of the parts in this activity can be used separately at any time.

F16.2 A COUNTING SNAKE

Capsule Lesson Summary

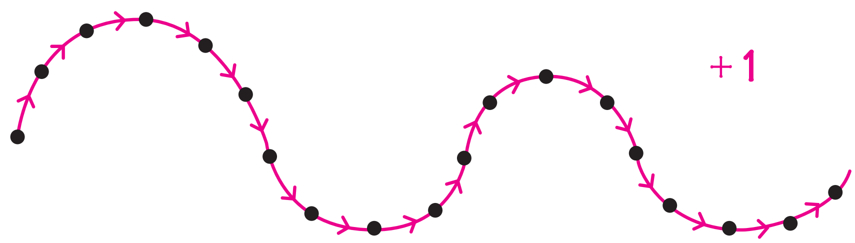
Counting by ones, label the dots of an arrow picture. Use the arrow picture to introduce a numerical relation (+1) and to practice writing the numbers in counting order.

Materials

Teacher	• Colored chalk	Student	• Worksheet F16.2

Description of Lesson

Draw this arrow picture on the chalkboard.



The arrow picture should be as large as possible and should appear to go off the chalkboard. The exact number of dots is not important. Allow the students to comment on the shape while you are drawing the arrow picture.

T: ***This is a counting snake. These dots are for numbers.***

Point to 0.

T: ***Here is the number 0. When we count by ones, what number comes next after 0?*** (1)

Write 1 near the appropriate dot.

T: ***What number comes after 1?*** (2)
What number comes after 2? (3)

Continue labeling the dots as you are given the correct numbers.

When you reach the number 5, don't write anymore numbers in the picture. Point to the succeeding dots and ask the students what numbers they are for.

Distribute Worksheet F16.2 and explain to the students that they should label the dots in the counting snake, just as you did on the board. Stress that each dot is for a number and they should put the number as close to the dot as possible. Students who have trouble can refer to the number line.

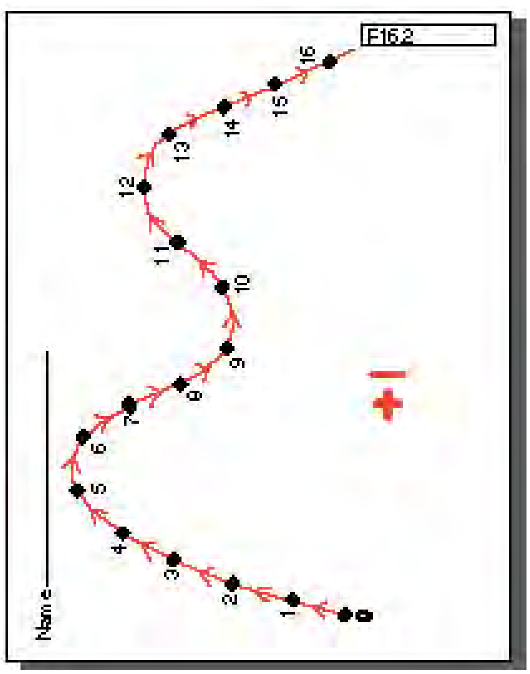
F16

Students who finish quickly can draw their own counting snake on the back of the worksheet. Give them the first number in their counting snake, varying this number according to each student's ability. Students can also complete dot-to-dot puzzles starting at numbers other than 0 or 1. Examples are included in the blacklines for Lesson F5.2.

Home Activity

Suggest to parents/guardians that they practice counting starting at a number other than 1 with their child. For example, count by ones starting at 12. Find opportunities to ask, for example,

- What number is 1 more than 21?
- What number is 1 less than 15?
- What number is 19 + 1?



F17.1 NUMERICAL ACTIVITIES #4

Capsule Lesson Summary

Given a specific number, find facts for that number using possible arrangements of two-color counters. Investigate whether some arrangements occur more or less often.

Materials

Teacher	• Colored chalk	**Student**	• Paper • Two-color counters • Paper cup

Note: Cardboard checkers (white on one side, red on the other) or dry lima beans painted on one side can be used in place of the two-color counters.

Description of Lesson

Organize the class in groups of three or four students. Provide each group with a paper cup and about 30 (a multiple of 6) two-sided counters. Demonstrate the following steps to students in each group instructing them to take turns:

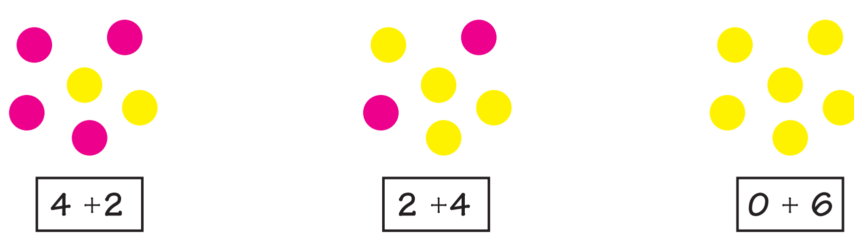
- Put six counters in the cup and shake.
- Carefully spill the counters onto a paper.
- Read the result as a combination, for example, two red and four yellow.
- Leave the counters on the paper just as they landed.

Within a group, each student should have at least one turn, and the group should use all of their counters (roughly five rounds). Begin to collect information from the groups. Ask students to report a result saying the number of reds first.

T: ***Kara, tell us one way the counters landed in your group.***

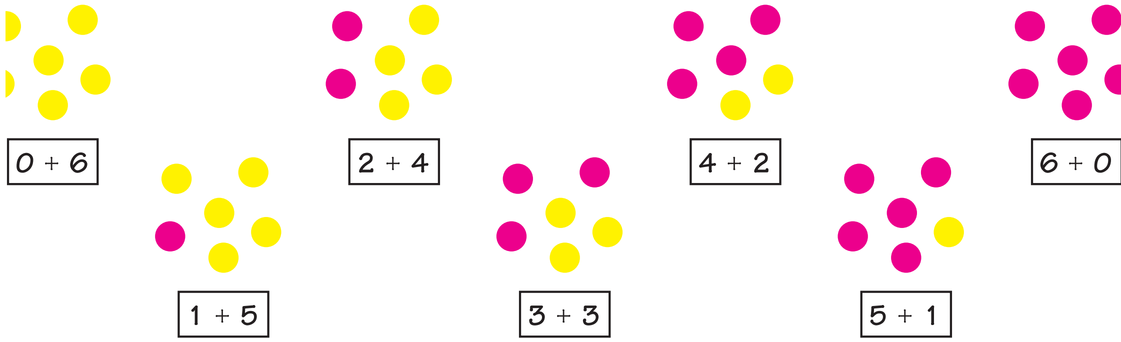
S: ***Four red and two yellow.***

Record the result 4 + 2. Collect several results; then ask each group to record their results and label each arrangement of counters, for example,



As a class, look for all the possible arrangements and make a list on the board. Let the groups report their arrangements and each time a new arrangement is found, add it to the list. For example,

F17



If one of these arrangements does not occur in your class, you may want to suggest the groups look for other possible arrangements. This is not necessary, however.

T: ***Did some of these arrangements come up more often than others?***

Encourage a discussion of this question. Then collect data from the groups on how many of each arrangement they got. Let students comment on arrangements that occur more or less often.

This activity can be repeated at another time with a different number of counters, say 4, 7, or 10. If there is sufficient interest, a group can be assigned to look for all the possible arrangements for a specific number.

F17.2 GOLDY #1

Capsule Lesson Summary

Use a story situation to introduce the symbols for *less than* and *more than*.

Materials

Teacher	• None	**Student**	• Worksheets F17.2* and **

Description of Lesson

Tell the following story making it as imaginative as possible.

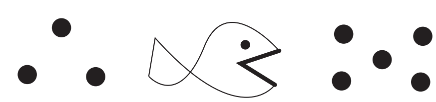
T: ***Goldy is a very large fish who lives in a very large aquarium with smaller fish. The smaller fish swim together in "schools." Being such a large fish, Goldy gets very hungry and eats the small fish.***

Draw this picture of dots on the chalkboard.

T: ***The dots are for fish. How many fish are in this school*** (point to the three dots on the left)***?***
How many are in this school (point to the five dots on the right)***?***
If Goldy swims toward one school of fish, the other school swims away. So, if you were Goldy and very hungry, which school would you go after?

Direct the responses so that the school with more fish is always chosen. Students should compare the numbers of fish (dots) in the two schools.

T: ***We'll show that Goldy goes after the school with five fish.***

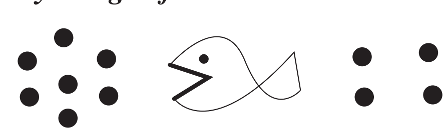


Draw Goldy between the schools of fish. Goldy's mouth should stand out.

Now draw this picture.

T: ***How many fish are in this school*** (point to the dots on the left)***?*** (Seven)
How many are in this school (point to the dots on the right)***?*** (Four)
Who would like to show us which school of fish Goldy will go after?

Draw Goldy, making sure the open mouth suggests that Goldy is ready to eat the larger school.



After having gone through several examples, tell the students that from now on you are just going to draw Goldy's mouth.

Do several examples like the following, each time having a student come up to the board to draw in Goldy's mouth.

Distribute Worksheets F17.2* and ** and instruct students to draw Goldy's mouth.

F17

Writing Activity

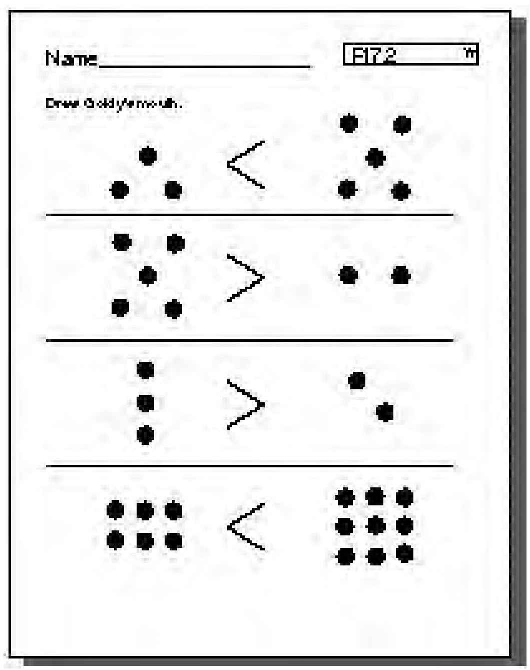
Invite students to draw a picture of Goldy making a choice between two schools of fish. Then ask them to write about the picture. As an alternative, you can tell a story about Goldy and ask the students to illustrate your story. Students may enjoy drawing Goldy and emphasizing the mouth with glitter, paint, or macaroni.

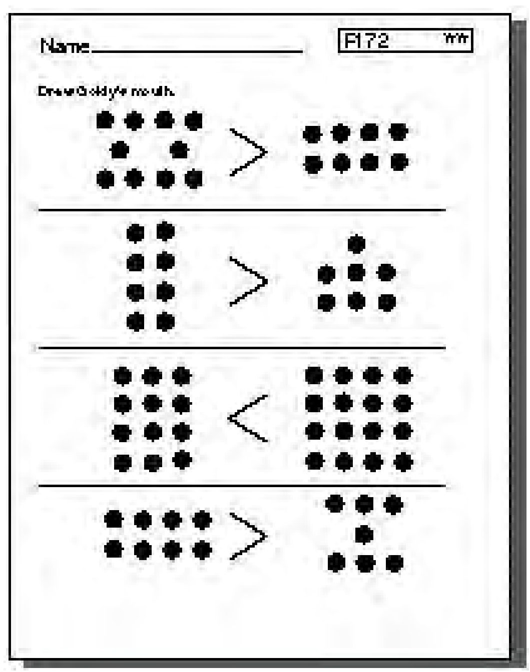
Center Activity

Make cards with two groups of dots and a reversible Goldy. Put these in a center for additional practice.

Reading Activity

You may like to follow this lesson with a book such as *Swimmey* by Leo Leoni.





F18 BROTHER-SISTER GRAPHS

Capsule Lesson Summary

Collectively graph the number of brothers and sisters each student has, and pose questions to aid students in interpreting the data. Draw a number of dots for children on a playground, and draw arrows for "You are my sister." Use the arrow picture to examine which dots are for boys and which are for girls.

Materials

Teacher
- Colored chalk
- Pointer
- Tape

Student
- Blue and red paper squares (approximately 2" x 2")

Description of Lesson

Exercise 1

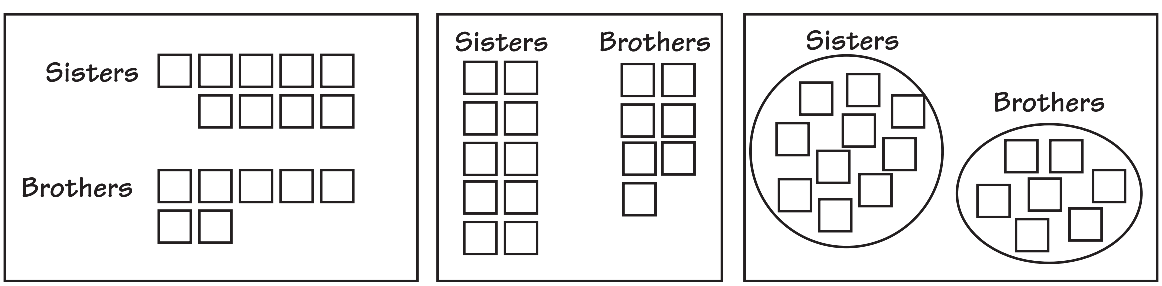
Begin the lesson with a short discussion about siblings.

T: ***How many brothers and sisters do you think all of us in this class have altogether?*** (Estimate)
Do you think we have more sisters or more brothers?
How could we find out?

Allow students to make suggestions, but direct the data collection toward constructing a graph.

Distribute several red and blue paper squares to the students and instruct them to write the name of a sister on a red square and the name of a brother on a blue square. Students should prepare one paper square for each sister and each brother they have. If students have trouble writing names, ask that they draw a picture on the paper square of their sister or brother; you can add their name. Invite students to put their squares in a class graph showing sisters and brothers of all those in the class.

Note: Your class graph can be organized horizontally, vertically, or with two strings. For example,



After the class graph is complete, help the students to interpret the data, and, in particular, to answer the initial questions. You may like to encourage students to formulate questions that can be answered by looking at the graph.

Exercise 2

For this exercise, it will be important to draw a large, clear arrow picture with well-spaced dots and thick arrows. Begin by drawing 15 dots on the chalkboard. Follow the layout presented below, but don't put the arrows in yet. Also, don't expect all of the students to follow the entire lesson. Be patient. There will be other lessons on this idea.

T: ***These are children on a playground. Some are boys and some are girls. Who would like to come up and count them?***

Let several students do the counting using a pointer to identify each dot as they count.

T: ***There are 15 children. Can we be sure which ones are boys and which are girls?***

There should be general agreement that, since all the dots look alike, there is no way to tell.

T: ***The children are playing a game which might help us tell some of the boys from some of the girls. The game is called "You Are My Sister."***

Draw one of the red arrows (illustrated below) and say,

T: ***This child*** (point to the starting dot) ***points and says, "You are my sister."***

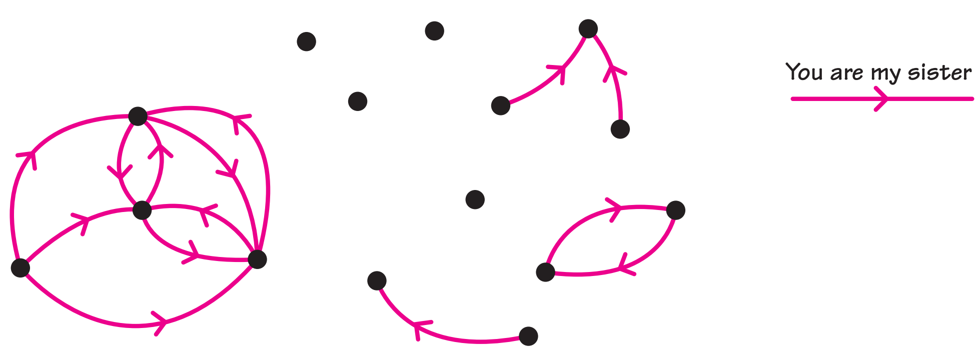
T: ***Can you see a girl in our picture?***

S: ***The dot on the left.***

T: ***How do you know?***

S: ***Because the arrow ends there. She is someone's sister.***

Complete your drawing.

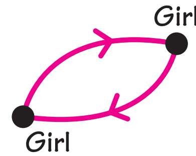


T: ***The children have played their game. I have drawn all the red arrows. Can someone point to a girl?***

Let the students point out which children must be girls, according to the arrow picture. If a student makes a mistake, let another student explain it.

You may find it helpful to write "Girl" next to the dots for girls as they are discovered.

From the arrow picture, it is possible to deduce that seven dots represent girls. If your students lose interest in the problem before finding all seven girls, just proceed with the lesson. There will be other opportunities to finish the problem.

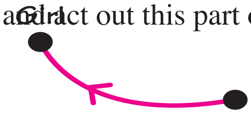


Draw the students' attention to this part of the picture.

T: ***How are these children related?***

S: ***They are sisters.***

Invite two girls to come to the front of the class, pretend they are sisters, and act out this part of the diagram by pointing to each other and saying, "You are my sister."



Next, draw the attention of the class to this part of the picture.

T: ***Remember, I told you in the beginning that all the red arrows were drawn. What do we know about these two children?***

If a student answers that the two children are sisters, ask two girls to act out the parts. The students will see that, since there is no return arrow in red, they cannot be sisters.

S: ***That child says, "You are my sister."***

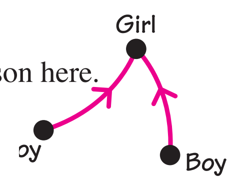
T: ***This, then, is the sister*** (point to the dot on the left)***. What about the other dot?***

S: ***Her brother!***

Have a boy and a girl act out the situation.

T: ***Now we know that this is a boy (***point to the dot on the right)***. Are there any other dots we know are for boys?***

Your class may not be ready for this. If they do not respond, end the lesson here.



If they discover the two boys in this part of the arrow picture, ask,

T: ***Who knows how these two boys are related?***

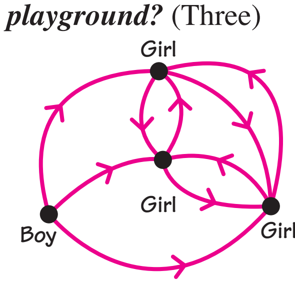
S: ***They are brothers.***

T: ***We have found three boys. Are there any other dots that must be for boys?***

There is one (see below). If your students find it, point to it and say,

T: ***Right. This is a boy. How many sisters does he have on the playground?*** (Three)

If your students do not find the last boy, direct their attention to this part of the picture.



T: ***How are these four children related?***

S: ***Three sisters and one brother.***

F18

From the arrow picture, it is impossible to know if the other four dots are boys or girls.

T: ***The children on the playground have another pointing game. Can you think what it might be?***

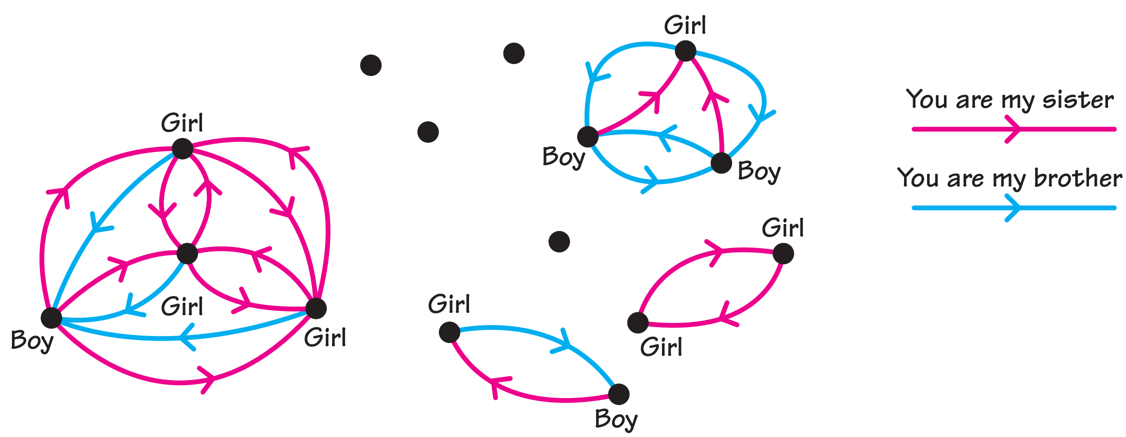
If no one suggests "You Are My Brother," suggest it yourself.

T: ***We can show them playing this game with blue arrows. Can anyone show us where we could draw an arrow for "You are my brother"?***

When a correct arrow is traced, draw it yourself. Ask the class how they can be certain that this blue arrow should be drawn, but do not expect a well-phrased answer.

There are two types of situation for which blue arrows may be drawn. In one, a boy is pointing to his sister (in red), the sister is pointing back (in blue). In the other, two boys are pointing to the same girl (in red); since they both have the same sister, they are brothers—and point to each other (in blue).

In this picture, you will find all the blue arrows that can be added to the original arrow picture.

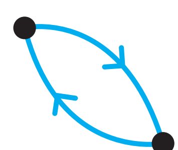


If your students experience difficulty finding blue arrows, focus their attention on specific parts of the drawing and ask how the children are related.

T (pointing at two isolated dots)**:** ***Is it possible for us to know about these two dots?***

S: ***No; we can't tell whether those children are girls or boys.***

Complete the drawing by adding two more blue arrows between any two isolated dots.



T: ***Now, what do these blue arrows*** (point to the "new" blue arrows) ***tell us?***

S: ***The two children are boys.***

S: ***They are brothers.***

T: ***Now the picture is finished. All the blue arrows are drawn. All the red arrows are drawn. What do we know about this child*** (point to one of the isolated dots)***?***

S: ***That child has no sister and no brother.***

T: ***That could be, but maybe this child just has no brother or sister on the playground.***

F19.1 HIDDEN CHECKERS #1

Capsule Lesson Summary

Cover some checkers in a pattern and associate a numeral with the number of visible checkers. Use various patterns and coverings to explore different representations of a number. Write number sentences for these different representations.

Materials

Teacher
- Chalk
- Large sheet of paper
- Magnetic checkers
- Overhead projector (optional)

Student
- Checkers
- Cup

Description of Lesson

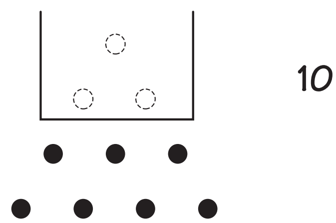
Place ten checkers on the board or, if you prefer, on the overhead projector. A possible configuration is illustrated below. All the checkers should be clearly visible, but you must be able to cover several of them with a sheet of paper.

T: ***How many checkers are there?*** (Ten)

Ask someone to write 10 on the board; then ask the students to close their eyes.

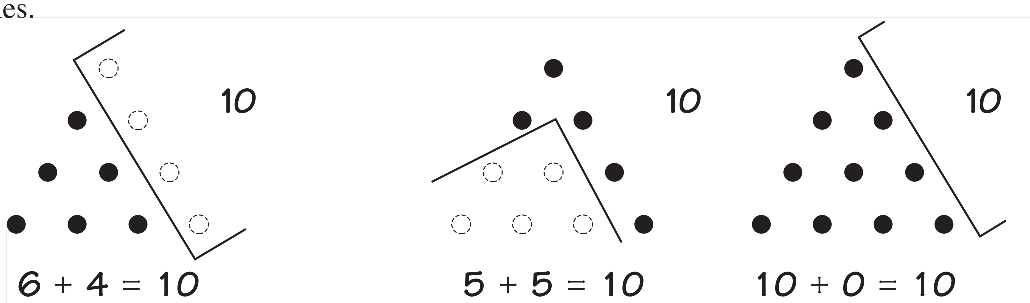
Using a piece of paper, hide some checkers and ask your students to open their eyes again.

T: ***How many checkers can you see?*** (Seven)
How many checkers are hidden? (Three)



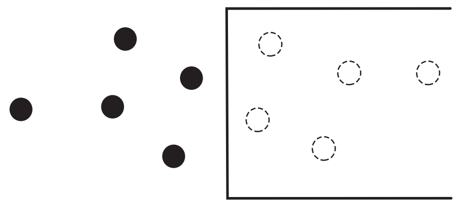
Write 7 + 3 = 10 and 10 – 3 = 7 on the board.

Repeat this activity several times at a brisk pace. Use the following examples or any similar examples.



F19

Variation: Arrange the checkers so that they do not form a symmetric pattern, or use a different number of checkers.



Organize the students in groups of six. Provide each student with ten checkers and a cup. Instruct the groups as follows: Each student hides some of their ten checkers under the cup and puts the display (with some checkers visible and some hidden under the cup) in front of them. Taking turns, the other group members try to guess how many checkers are hidden. After guessing, they confirm their guess, for example, three checkers (not hidden) and seven checkers (hidden; lift the cup to check) is ten checkers.

F19.2 ADDITION STORY #2

Capsule Lesson Summary

Draw a number of dots for apples and use strings to show apples given to a particular horse. Explore different ways to distribute the apples and write corresponding number sentences.

Materials

Teacher
- Colored chalk

Student
- Paper
- Colored pencils
- Counters (optional)

Description of Lesson

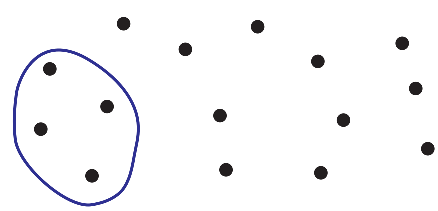
Note: Feel free to personalize this story or change it to reflect something happening in your school or community. You may also prefer to use actual objects—such as apples—as well as drawing the picture with dots.

Draw 15 dots on the chalkboard. Encourage students to count as you draw.

T: ***These are apples. How many apples?*** (15)
We are going to give these apples to some horses. You will decide which apples each horse gets. Sally, which apples would you like to give to the first horse?

S: ***These four.***

Draw a colored string around the four dots the student has selected.

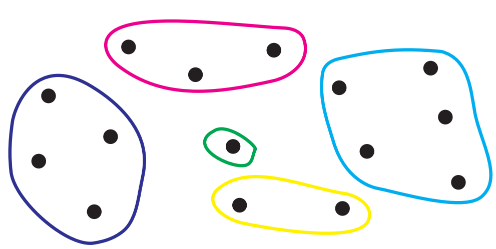


T: ***Paul, how many apples would you like to give to the second horse?***

S: ***Five.***

Invite the student to trace a string around the five apples; then draw it on the board yourself.

Continue in this manner until all the apples have been distributed. Your completed drawing might look like this one.



T: ***Who would like to explain this story again?***

S: ***One horse got four apples, one horse got five apples, one horse got two apples, one horse got three apples, and one horse got one apple.***

At the top of the board or beside the drawing, begin the addition sentence.

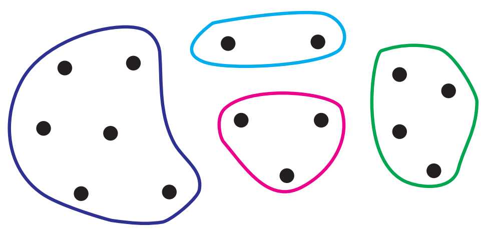
T: ***How many apples altogether?*** (15)

Complete your number sentence.

$$4 + 5 + 2 + 3 + 1 = 15$$

Erase the board and hand out unlined paper. Instruct each student to draw 15 dots (or use 15 counters) and to distribute the apples any way they wish. If you prefer, students can work in pairs and do the distribution together. Students who finish quickly should be asked to find another way to distribute the apples using the back of their papers or another sheet.

After a while, ask the students to stop drawing. Invite a student or pair of students to show their drawings to the class and explain the distribution. For example,



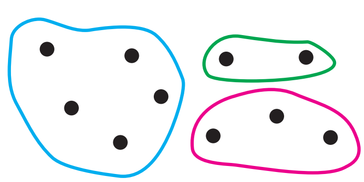
$6 + 2 + 3 + 4 = 15$

S: ***In my (our) drawing one horse got six apples, one horse got two apples, one horse got three apples, and one horse got four apples.***

Do this for several pictures. Your board should be full of number sentences for 15. If students have difficulty writing the number sentences, write some yourself.

Home Activity

Suggest the following activity for parents/guardians to do with their child. Put ten pennies (or checkers) on a paper. Distribute the pennies to two (or three or four) imaginary people. It's okay to give different numbers of pennies to different people. Observe that when you add the numbers of pennies given to each person, the total is 10. For example,



$5 + 2 + 3 = 10$

F20 ADJUSTMENT/ASSESSMENT DAY #2

Note: See Section One, page 1-9, for a full explanation of the purpose of scheduled adjustment days. Worksheet F20 provides for a short, written assessment.

Today you may wish to repeat an earlier lesson either for a group of students or for the entire class. Many of the lessons can be made to appear completely different by changing the story and/or numbers in the lesson. If you omitted any exercise or worksheets from an earlier lesson, you may like to include these. This is also a good time to allow students to work in centers or on a project of your choice.

The following game activities may be appropriate for students whose numerical readiness is weak or to provide more opportunities to do mental mathematics.

Who Stole the Cookie?

Distribute numeral cards to the students. Sing the song *Who Stole the Cookie* using numerals rather than students' names. The student with the appropriate numeral card holds it up and responds in the song. For example,

T: ***Who stole the cookie from the cookie jar?***

All: ***8 stole the cookie from the cookie jar.***

S (holding *8*)**:** ***Who me?***

All: ***Yes, you!***

S (*8*)**:** ***Couldn't be.***

All: ***Then, who?***

S (*8*)**:** ***12 stole the cookie from the cookie jar.***

S (holding *12*)**:** ***Who me?***

Continue as long a there is interest or through eight to ten numbers.

Something About

Choose a number (for example, 4) and invite students to tell you something about the number. You may need to get it started with one statement.

S: ***2 + 2 = 4.***

S: ***4 is 1 more than 3.***

S: ***4 is less than 10.***

S: ***There are four people in my family.***

S: ***4 is between 3 and 5.***

If many statements are alike, make another statement yourself to suggest other possibilities.

Additional activities for improving the students' numerical readiness include those listed in F10 *Adjustment/Assessment Day #1*.

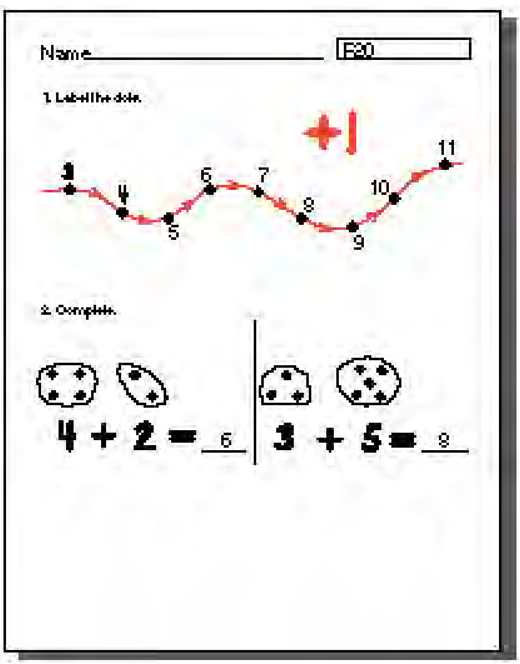
If your class is experiencing little difficulty with the *CSMP* curriculum, you may wish to omit this adjustment day and continue immediately with F21.

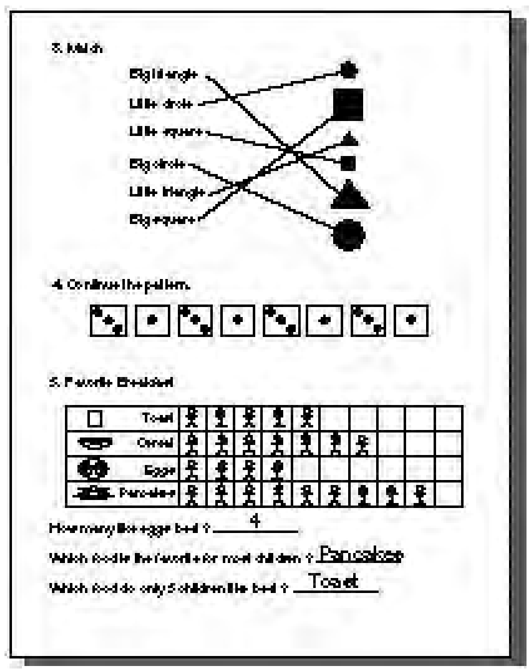
F20

Early Warning

Among the next nine classroom lessons are some that require extra preparation time, or which involve materials not included with the *CSMP* Classroom Set. The lessons have been listed here for your convenience in preparing for them. A more detailed description of the needed materials can be found on the first page of each lesson. (These special materials have been listed here only once, even if they are needed more than once during the nine-day period.)

F22 *Counting Calculator #1*: Calculators
F23.2 *Estimation*: Bag of peanuts (or other materials); 0–100 number line
F24.1 *Guess My Rule with A-Blocks #1*: Masking tape
F26 *A Game with Strings*: Two pieces of string (or yarn), each a different color, for each student
F27.1 *C-Rod Trains*: C-rods





F21 INTRODUCTION TO A-BLOCKS #2

Capsule Lesson Summary

Locate an A-block from a complete description of the block. Discover a hidden block by asking questions which may be answered "yes" or "no." Examine the similarities and differences between two A-blocks.

Materials

Teacher
- One set of A-blocks
- Colored chalk

Student
- One set of A-blocks in a container for each student

Description of Lesson

Start the lesson with five or ten minutes of free play. Then, ask the students to put all the A-block pieces in the middle of their desks.

Exercise 1

T: ***Without making any noise, hold up the piece I call for. Listen carefully and wait for my signal to pick up a piece.***

T: ***A big, red square. Go!***
A small, yellow triangle. Go!

Be sure to ask for some attributes by using negations.

T: ***A red triangle… not big. Go!***
A small square… not blue and not red. Go!

Also try using *or*.

T: ***A small circle… red or blue. Go!***
A big, red piece… triangle or square. Go!

Continue as long as interest remains high.

Exercise 2

Hide one piece behind your back, in your pocket, or in a container.

T: ***I have hidden a piece and you have to guess which piece it is. You may ask questions that I can answer "yes" or "no."***

S: ***Is it red?***

T: ***No, but that is a good question.***

S: ***Is it green?***

T: ***Yes; good question.***

S: ***Is it big?***

T: ***Yes; good question.***

S: ***Is it blue?***

T: ***No.***

After a sufficient number of questions have been asked, say,

T: ***Now, can anyone guess my piece?***
Tell me why you think that is the piece.

Repeat the game using a different piece. If the students understand the game well enough, you may want to let a student hide the piece and answer the questions.

Exercise 3

Select any two pieces. The students should explain the ways in which the two are alike and the ways in which they are different. For instance, if you choose a big, red triangle and a little, red circle, the students should say,

S: ***They are both red.***

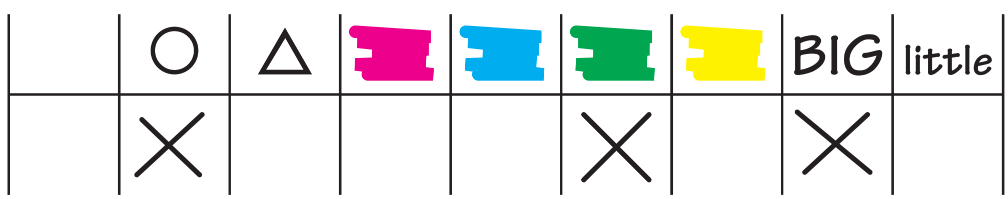
S: ***One is big and one is little.***

S: ***One is a triangle and one is a circle.***

Repeat several times.

Exercise 4

T: ***This game is like the first one in which you picked up a piece I asked for. This time, I won't call out which piece I want; instead, I will give you directions using this chart.***



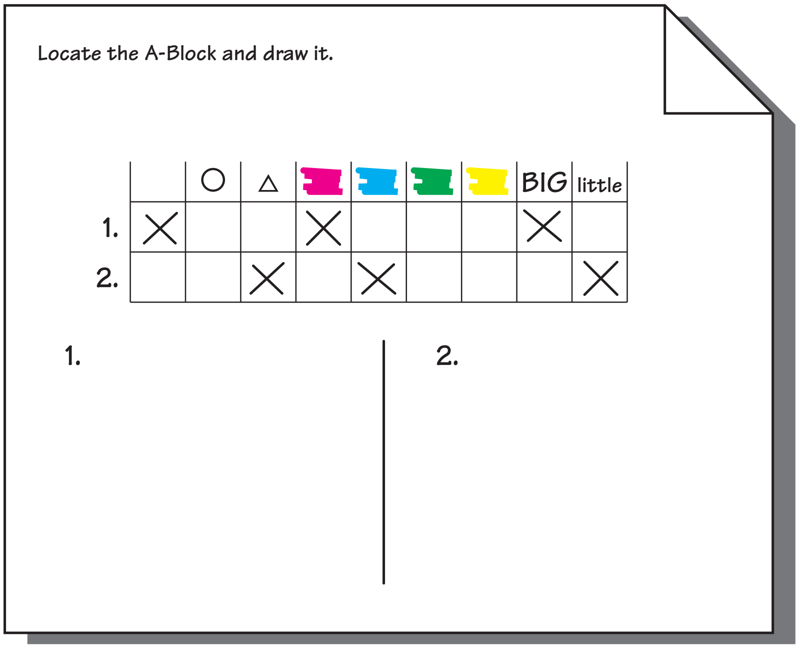
T: ***Which piece do I want?***

S: ***A circle, green and big.***

Repeat this game several times, asking students to hold up the piece you, or a student, request. Alternate by letting one student hold up a piece while others mark its attributes.

Center Activity

Task cards, following the format of Exercise 4, can be made and placed in a center for further practice. For example,



F22 COUNTING CALCULATOR #1

Capsule Lesson Summary

Explore the calculator and locate various keys. Learn how to enter and clear numbers from the display. Teach the calculator to count by ones. Use the counting calculator to count-on.

Materials

Teacher	• Overhead calculator or calculator poster or transparency	Student	• Calculator

Advance Preparation: Use Blackline F22(a) to make a calculator transparency if you like.

Description of Lesson

Exercise 1

Display the overhead calculator (or the poster or transparency). If no type of overhead calculator is available, use a regular calculator and circulate through the class as numbers are put on the display.

T: ***Let's try to locate some of the parts of a calculator. What key*** (button) ***turns the calculator on?***

Ask students to point out the "on" key (if available), number keys, display, power source, and "clear" key.

As much as possible, allow students to give names to the various parts of a calculator, but agree on names you will use to communicate about calculators.

T: ***How would we put 7 on the display?***

S: ***Press*** $\boxed{7}$.

T: ***How would we put 10 on the display?***

S: ***Press*** $\boxed{1}$ ***and then*** $\boxed{0}$.

T: ***What happens when you press the clear key?***

S: ***0 comes back on the display.***

S: ***You erase the 10.***

Locate all the number keys in order.

T: ***Can we put some other numbers on the display?***

Let students choose other numbers to put on the display; for example, their favorite number, the room number, or the number of students in the class.

F22

Distribute a calculator to each student or perhaps to groups of two or three students. Ask students to enter a number and then to clear before entering another number. They might enter, for example, their age, the number of windows in the room, the lunch count, the date, or some specific one- or two-digit numbers. If students are working in groups, one student might choose a number while another student enters the number. Allow five to ten minutes for this activity or other free exploration.

T: ***Put the number 5 on your display. 5 has one digit.***
What are some other one-digit numbers?

S: ***2 or 7 or 0.***

Introduce two- and three-digit numbers as well, counting the digits each time. Practice naming and putting on some two- and three-digit numbers.

T: ***What is the most digits we can have in a number displayed on the calculator?***

Let students investigate for awhile until they find that the display will hold no more than eight digits.

Exercise 2

Direct students to set aside their calculators while you have a class discussion. Use the overhead calculator or one class calculator.

T: ***Can someone tell us how to count?***

S: ***1, 2, 3, 4, 5, and so on.***

Discuss the counting process, for example, when you choose a starting number, the next number is one more (if you are counting by ones). Model the counting process with blocks, students, or other counters.

Do this again with counters on the overhead as you "teach" the overhead calculator to count.

T: ***Let's see how we can teach the calculator to count. With what number should we start the counting?***

S: ***1 (or 0).***

T: ***Put the starting number on the calculator.***
How do we get the next number?

S: ***Add 1.***

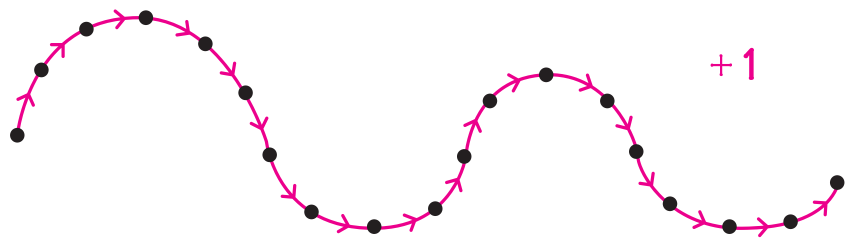
S: ***Say "2."***

T: ***Each time the next number is one more, so let's tell the calculator to add one. Press*** $\boxed{+}$ $\boxed{1}$.
Now I think the calculator can count.

Choose a student to press $\boxed{=}$ repeatedly (but slowly) as you model counting with blocks or counters next to the calculator.

T: ***So we teach a calculator to count by:***
(1) putting on the starting number;
(2) pressing $\boxed{+}$ $\boxed{1}$ ***; and then***
(3) pressing $\boxed{=}$ $\boxed{=}$ $\boxed{=}$ $\boxed{=}$ ***and so on.***

Draw a +1 arrow picture on the chalkboard.



T: ***A counting calculator can follow a counting snake.***

Call on students to label the dots in the arrow picture as you watch the calculator count again.

Invite students to teach their own calculators to count. Groups can take turns with one student "teaching" while another checks by performing step 3; then they trade roles. Let students play with counting for a few minutes. Many will like to see the calculator counting up to "big" numbers.

Exercise 3

T: ***Sometimes we start counting at numbers other than 0 or 1. For example, how would we tell the calculator to start counting at 15?***

S: ***Put 15 on the display. Press*** $\boxed{+}$ $\boxed{1}$ ***and then*** $\boxed{=}$ $\boxed{=}$ $\boxed{=}$ ***etc.***

Model counting-on with blocks or counters as a student teaches the calculator to count starting at 15 (count-on from 15). You may also refer to the +1 arrow picture and put 15 at the starting dot.

Repeat a counting-on exercise, starting from, for example, 28, and model the process with the number line. In this case one student can press the $\boxed{=}$ key while another points to numbers on the number line.

As a follow-up to this exercise, prepare copies of the +1 arrow picture on Blackline F22(b) to give to pairs of students. Tell them to color the arrows as they like. Then invite the students to choose a starting number to put at the first dot in the arrow picture, to teach the calculator to count starting at that number, and to label the other dots as they follow the count on the calculator.

Exercise 4 (optional)

T: ***Sometimes we want to start counting at some number and to stop counting at another. Let's make the calculator start counting at 16 and stop at 25.***

S: ***Put 16 on the display. Press*** $\boxed{+}$ $\boxed{1}$***. Then press*** $\boxed{=}$ $\boxed{=}$ $\boxed{=}$ ***and so on until we see 25 on the display.***

T: ***Let's keep track how many times we press*** $\boxed{=}$***.***

F22

As one student presses the keys on the calculator, other students count how many times $\boxed{=}$ is pressed. Write this as a number sentence on the chalkboard.

$$16 + \underline{\ 9\ } = 25$$

press $\boxed{=}$ nine times

In the groups, instruct students to take turns with the calculator solving several counting-on problems.

$$38 + \_\_ = 50$$

$$27 + \_\_ = 35$$

$$53 + \_\_ = 62$$

Home Activity

Suggest to parents/guardians that they ask their child to show them how to teach a calculator to count.

Note for parents/guardians that if a calculator does not add 1 each time they press $\boxed{=}$ as in step 3, it may be that the calculator does not have an automatic constant feature. They can try another calculator or borrow one that does have this feature.

Suggest to parents/guardians that they use the counting calculator to count-on starting at a number other then 1; use the counting calculator and predict what number will come next when you're at, for example, 36; predict which number you will see if you're at 42 and press $\boxed{=}$ three more times.

F23.1 FINGERS

Capsule Lesson Summary

Do some counting exercises to associate a numeral with a number of objects, to write different names for a number, and to work with the notion of place value.

Materials

Teacher	• Chalk	**Student**	• None

Description of Lesson

Parts of this lesson, or variations of it, may be used often as quick, five-minute activities. Variations might include the use of various other counting manipulatives (see Lesson 17.1.)

Exercise 1

Use each hand for a separate addend whenever possible. The following example is for 7. All finger combinations for 7 can be shown with separate addends on each hand except 6 + 1, 1 + 6, 0 + 7, and 7 + 0.

T: ***Show me seven fingers. Good. Barbara is showing 7 as 5 + 2.***

Write 5 + 2 = 7 on the board.

T: ***Can anyone show me seven fingers another way?***

Comment on the ways the students show 7 and write each new way on the board. When the students have given you all the ways they can think of, go on to another number.

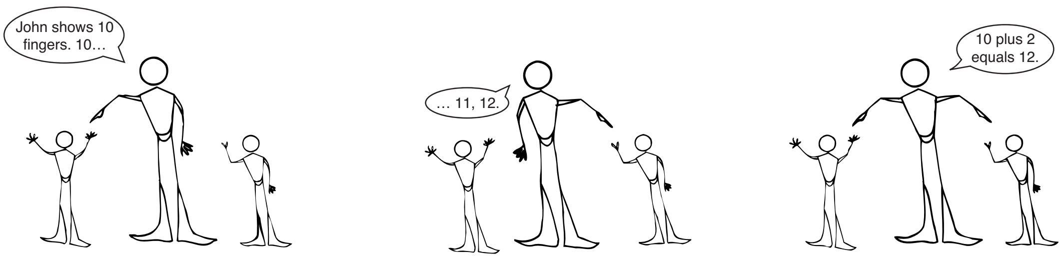
It is not necessary to show all the finger combinations. If you already have, for example, 5 + 2 = 7 listed and someone shows you 2 + 5 = 7, accept this as a different way and write it on the board also.

Exercise 2

Ask a student to show seven fingers; ask another student to show nine fingers; then ask a student to show 12 fingers. There may be some confusion, but the class should tell you that a single person has only ten fingers. Some inventive students may pair themselves to show 12 fingers. Call on two student to show the class 12 fingers. (You may want to pair off the students and let each pair figure out how they can show 12 fingers.) Allow the students to solve the problem by themselves. If necessary, let them discuss it and count their fingers to find out how to show 12. When this has been done to the satisfaction of each pair of students, ask if the presentation is correct. Count with the class to check. (If you paired off all the students, pick just one pair to count.) If the pair of students is not correct, let someone explain what they might do. Count again by ones to show it is now correct. Point to each finger as you count.

T: ***Here we have 12 fingers. I know a faster way to count these fingers.***
How many fingers does John show? (Ten)
So I just have to count the two more fingers shown by Sally.

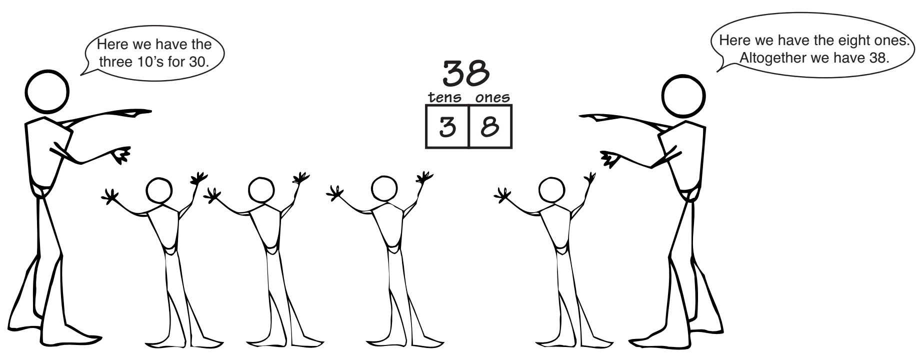
Point to John's tenth finger, then to Sally's fingers.



If a pair of students each shows six fingers, compliment them and point out to the class that this also shows 12. Count the fingers with the class if you feel this will be helpful. Say, "6 plus 6 equals 12." You may want to take this opportunity to ask for other ways to show 12.

Exercise 3

In this lesson and future lessons of this kind, when a numeral is written on the board, you can let the students stand in groups in front of the digits to emphasize the place value. For example,



Send two students to the board. Ask one student to write a two-digit numeral and the second student to read it. If the student cannot read it, ask another student to help. Invite the whole class to say the number with you.

Ask how many students will be needed to show that many fingers. Send the correct number of students to the front of the class and instruct them to show the correct number of fingers.

If the number is less than 30, count the fingers with the class by ones. Emphasize the *10* and *20* as you count. Then, count again by tens and add the extra ones. If the number is more than 30, count by tens and then the extra ones. For example, to count 64 fingers, hold up the first student's hands and say "10," hold up the second student's hands and say "20." Continue until you have said "60." For the last student, count each finger by ones: "61, 62, 63, 64."

F23.2 ESTIMATION #1

Capsule Lesson Summary

Estimate how many peanuts are in a bag. Count the peanuts by grouping in tens and compare the actual count with the estimate.

Materials

Teacher
- Bag of unshelled peanuts (50–100 peanuts)
- 0–100 number line
- Work mat

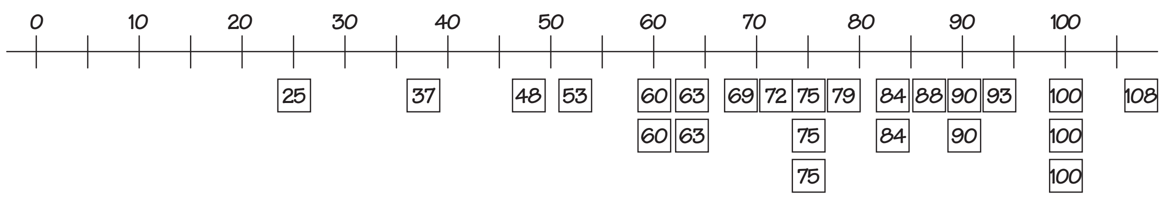
Student
- Slip of paper

Advance Preparation: You may choose materials other than peanuts such as candies, counters, or cubes. See the description of a work mat in Lesson F13. Draw or make a 0–100 number line to put on the board accessible to students.

Description of Lesson

Show the class your bag of peanuts. Explain that this is a bag of peanuts in the shell (circus peanuts). Show the students one unshelled peanut and describe this as one peanut. Ask for estimates of the number of peanuts in the bag. Explain that although they may not know the exact number, by making an estimate they will try to use information to come close.

After a few guesses, instruct students to write their estimates on slips of paper. Then invite them to place the paper appropriately on the number line that is drawn on or taped to the board. For example,



Assist students in placing their estimates as necessary. Don't worry about perfect placement.

T: ***Now, let's try to find out exactly how many peanuts are in this bag. How can we do that?***

S: ***Count them.***

Dump the peanuts onto the floor. Invite students to help count. Let one student count out ten peanuts and push them aside in a pile; then let other students do the same, until all the peanuts are in piles of ten with possibly a few left over. Count the piles together (for example, 6 tens) and the leftovers (for example, 3 ones). You may want to put the piles on the left side of a place value work mat and the leftovers on the right side. This will relate counting to place value grouping and further prepare for Lesson F28.

T: ***How many peanuts are there?***

S: ***63.***

F23

Compare the estimates to the actual number of peanuts.

- Were most of the estimates more or less than the actual number?
- Did anyone guess the exact number?
- Were there any estimates that were off by less than five?

Extension Activity

If you are planning to have a carved pumpkin in your room for Halloween, repeat this lesson at that time. Let students look into the pumpkin before the seeds are removed and make their estimates .

Home Activity

Suggest that parents/guardians find opportunities to estimate. For example, estimate how many candies, like M&Ms, there are in a small package. If they then do an actual count, suggest comparing the count to the estimates. Also, suggest that they might group by tens to organize the counting.

F24.1 GUESS MY RULE WITH A-BLOCKS #1

Capsule Lesson Summary

Find A-block pieces that are the same or differ from a given piece in specified ways. According to a secret rule, place a sequence of A-blocks on the board. Let the students guess what the pattern might be.

Materials

Teacher	• One set of A-blocks • Masking tape	Student	• A-block set

Description of Lesson

Each student should have their own set of A-blocks. Allow a few minutes for free play before doing the exercises below.

Exercise 1

Instruct the students to place the A-blocks in front of them so that they can easily locate different pieces. Hold up any A-block piece.

T: ***Find and hold up a piece that is the same color as this one.***

Allow pieces that are like your piece in color only, as well as pieces that are like yours in color and in another way.

Repeat your request for the following:

- A piece that is the same shape
- A piece that is the same color and a different shape
- A piece that is a different size
- A piece that is a different color and a different size
- A piece that is the same size, same color, and a different shape
- A piece that is different in all three ways
- A piece that is the same in just one way

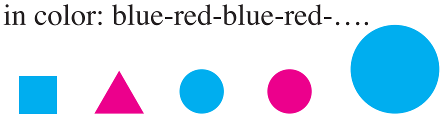
Exercise 2

Note: If you have a magnetic board, you may wish to use a set of A-blocks that you have "magnetized" with the adhesive magnetic material provided with the A-Block String Game kit. If you use masking tape instead, make sure the board is as clean as possible for good adhesion.

T: ***I'm going to put some A-blocks on the board. Each time I put one up I will follow a rule. See if you can guess what my rule is.***

F24

Display the following A-blocks, one at a time, from left to right. These pieces may by any size or shape, as long as they alternate in color: blue-red-blue-red-….



T: ***Which piece do you think I could put up next? When I count to three, hold up a piece that you think could go next. Ready? One, two, three.***

Let a student come up and select an A-block piece from your set to go next. If the student selects, for example, a small, red triangle (or any red piece), say,

T: ***That block does follow my rule.***

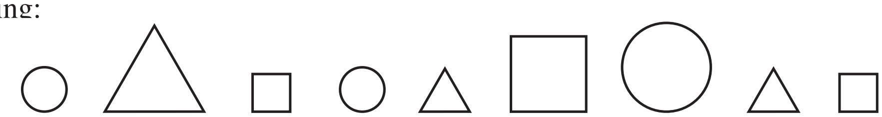
Place the suggested block on the board. If a student selects a piece of a color other than red, say,

T: ***That block does not follow my rule.***

Every sequence of blocks follows some rule, although the rule may be an arbitrary one (such as blue-red-blue-red-blue-green/blue-red-blue-red-blue-green/etc.). There are really no wrong answers in this lesson so be careful not to tell students they are wrong, only that a block does not follow your rule.

Continue asking students to select blocks following the alternating color pattern. When you feel most everyone knows your rule (i.e., recognizes the pattern), ask someone to say the rule aloud.

Remove all the blocks and repeat the exercise with a different rule. Be sure to tell the class that you are using a different rule. One sequence whose rule is not too much more difficult than the first rule is the following:



Color and size are irrelevant here; shape is what matters. You may have to continue the sequence even further before the circle-triangle-square pattern becomes evident. This time, you may want to let students who think they know the rule whisper it to you or judge the choice for a next piece.

Center Activity

Make task cards that ask students to place pieces that follow a pattern. Put these cards in a center.

Extension Activity

Use other materials (e.g., Unifix® cubes, pattern blocks, etc.) to do similar patterning activities. Or let students cut out or trace shapes that follow certain patterns.

Capsule Lesson Summary

Draw two strings, one for birthday cards and the other for children, and a specified number of dots in each string. Instruct the students to copy this drawing. Using mathematical terms such as *all*, *each*, and *exactly*, give rules for students to draw arrows showing cards delivered to children.

Materials

Teacher	• Colored chalk • Blackline F24.2 (optional)	• Colored pencils
Student	• Paper	

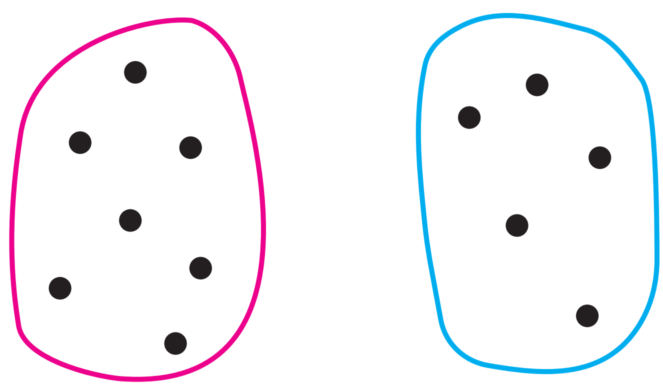
Description of Lesson

Note: It is important that your students learn to follow directions and use several pieces of information to solve problems. Begin the lesson by explaining to the students that they should listen carefully because you will only give the instructions once. Let a student repeat your instructions, but then they should work individually.

Remind the students of the mailcarrier who delivered birthday cards in Lesson F15.

T: ***Today, you will each be the mailcarrier who delivers birthday cards to the children, but you must follow certain rules. First, there are exactly seven cards and five children.***

Draw these dots and strings on the board.



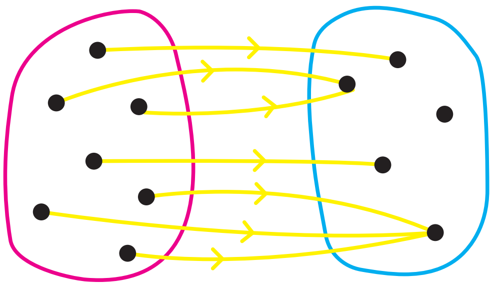
Instruct students to copy the picture putting seven dots, for cards, in a red string and five dots, for children, in a blue string. Remind students to make big, well-spaced dots. Blackline F24.2 is available if you prefer to give students the dot picture already drawn. Then students need only color the strings.

T: ***Next, all the cards*** (point to the red string) ***must be delivered, but each card may go to only one child*** (i.e., no two children may receive the same card)***. One last rule: Exactly one child does not receive a card.***

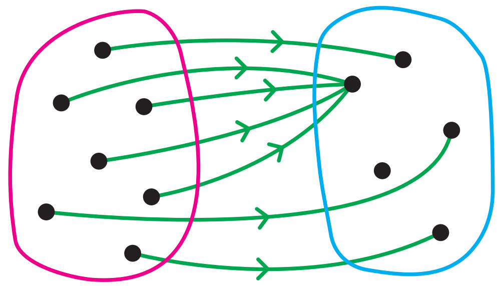
Ask a student to repeat the rules. Remind the students to use one color for the arrows.

F24

When most of the students have finished their pictures, you may wish to let some explain their drawings to the class. Many correct drawings are possible. Any picture is correct if exactly one child receives no cards; all the cards are delivered; and seven cards and five children are shown. For example,



or



F25.1 COUNTING ACTIVITY #1

Capsule Lesson Summary

As a class, do some counting exercises; count forward, backward, and by twos. Vary the activity by challenging separate rows or tables to do the counting.

Materials

Teacher		Student	
	• None		• None

Description of Lesson

Short counting activities such as the ones in this lesson may be done whenever you have a few extra minutes (e.g., in the lunch line or before the bell).

T: ***Let's see how well the class can count, but we won't all count together. The first person I point to will say "one," the second will say "two," then each person I point to will say the next number. Let's see if we can do it without making any mistakes.***

Walk up and down each row or around each table pointing to the students, in order, until each has participated. Make corrections if necessary.

If there is much hesitation or are many mistakes during this activity, tell the students you believe they can do better and begin again. If the activity is successful, try a similar exercise in which you point to the students at random.

T: ***Now let's see how well each table (or row) can count.***

Call on students around each table (or from the front to back of each row) using one or two of the following variations:

- Count by twos.
- Count backward from some number.
- Count by tens.

Make corrections as necessary.

Home Activity

Suggest that parents/guardians practice counting with their child. Count by twos and by tens, and count backward from some number.

F25.2 COUNTING CALCULATOR #2

Capsule Lesson Summary

Review how to teach the calculator to count by ones. Teach the calculator how to count backward and associate counting backward with a –1 arrow picture.

Materials

Teacher
- Overhead calculator
- Blocks or other counters
- Blackline F25 (optional)

Student
- Calculator

Description of Lesson

Display the overhead calculator. Review how to teach the calculator to count by ones, first starting at 0 or 1 and then starting at some other number.

T: ***Suppose we taught the calculator to count and we made it stop at 25. Could we teach the calculator to count backward starting at 25 and going back to 1*** (or 0)***?***

Discuss what it means to count backward. Some students may like to show that they can count backward from 10 to 0. Model counting backward with blocks, students, or other counters.

T: ***Let's teach the calculator to count backward. Suppose we want it to start at 25.***

Put 25 on the display and put out 25 blocks or counters.

T: ***How do we get the next number?***

S: ***Take away*** (subtract) ***1.***

S: ***Say "24."***

Model with the blocks or counters.

T: ***When we count backward, each time the next number is one less. So let's tell the calculator to subtract one. Press*** $\boxed{-}$ $\boxed{1}$***. Now I think the calculator can count backward.***

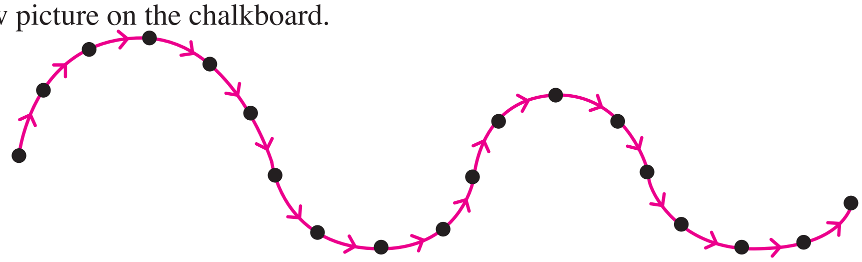
Choose a student to press $\boxed{=}$ repeatedly as you model counting backward with the blocks or counters. Stop before or at 0.

T: ***So we teach a calculator to count backward using these steps:***

1. Put on the starting number.
2. Press $\boxed{-}$ $\boxed{1}$***.***
3. Press $\boxed{=}$ $\boxed{=}$ $\boxed{=}$ ***and so on.***

F25

Draw an arrow picture on the chalkboard.



T: ***Do you remember that a counting calculator can follow a counting snake? What kind of arrows would the snake have to be counting backward?***

S: ***–1 arrows.***

Label the arrow –1. Then put 25 at the beginning of the arrow picture. Call on students to label the other dots as you watch the calculator count backward from 25 again.

Distribute calculators and invite students to teach their calculators to count backward. Some students may like to start the counting at a "big" number like 100.

Note: Students who do not stop before or at 0 will see negative numbers on the display. This may be confusing if they think the numbers are now increasing. You may suggest that they always stop at 0.

You may like to use the blackline from Lesson F22 to prepare a counting backward snake (color and label the arrows –1) in which students can label the dots starting at some fairly "big" number.

Extension Activity

In this lesson, or perhaps in another counting backward lesson, you may want to pose some problems that use counting backward to find out how many to take from one number to get another. For example,

$$21 - \square = 15$$

Model this process with blocks or counters, or model by counting backward on the number line.

Home Activity

Suggest to parents/guardians that they ask their child to show how to teach a calculator to count backward.

Suggest that they then use the calculator to count backward and, occasionally, to predict what number will come next when they are at, for example, 28. Also they can predict what number they will see if they are at 17 and press $\boxed{=}$ two times.

F26 A GAME WITH STRINGS

Capsule Lesson Summary

Instruct students to place A-blocks in a string according to their attributes. Using two strings, challenge students to place each A-block according to its attributes.

Materials

Teacher
- Colored chalk

Student
- One set of A-Blocks for each group of three or four students
- Two pieces of string (or yarn) in different colors for each group

Advance Preparation: Tie the ends of each piece of string (or yarn) together to form a loop.

Description of Lesson

Note: Do not give away the "secret" of overlapping the strings! If no one finds it, stop the lesson as indicated and play the game again on the next free day. This lesson may be too easy for students who discovered overlapping sets in kindergarten, in which case you may want to do an adjustment day activity as well on this day.

Divide the class into groups of three or four and give each group a set of A-blocks. Allow several minutes of free play while you distribute one loop of string to each group.

T: ***Make a big loop with the string on your desk. Put all your green pieces inside the string.***

Quickly check that each group has formed a loop with the string and has placed all their green pieces inside.

T: ***Now, take the green pieces out… and put all the circles inside the string.***

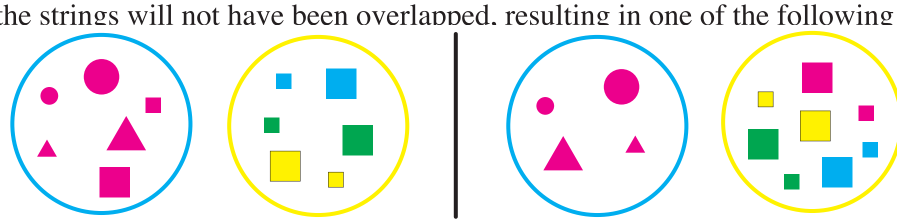
Walk around the room to see how well this is being done. Give each group a second loop of string (in a different color).

T: ***Place all the blue pieces inside one string and all the yellow pieces inside the other.***

After checking and helping where necessary, continue.

T: ***Empty the strings. Now put all the red pieces inside one string and all the square pieces inside the other.***

Most likely the strings will not have been overlapped, resulting in one of the following situations.



Note: Some pieces are not pictured here.

F26

In the first situation, you should pick up a red square and say,

T: ***Isn't this a square? The other string is for squares.***

When the students move the red squares to the other string, ask,

T: ***But, what is the first string for?*** (Red pieces)
Are all the red pieces inside the first string? (No)

In the second situation, pick up a red square and say,

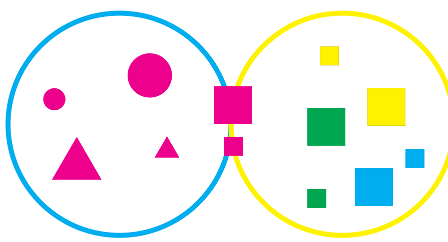
T: ***Isn't this red? The first string is for red pieces.***

When the students move the red squares to the first string, ask,

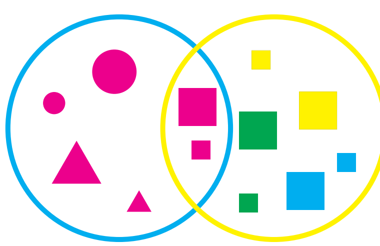
T: ***But, what is the other string for?*** (Squares)
Are all the squares inside that string? (No)

Walk around the room making similar comments to each group. Some students may suggest putting half the red squares in one string and half in the other. Point out that all the squares, not just some, must be inside the string for the squares and all the red pieces must be inside the string for the red pieces.

Some groups may suggest pushing the strings very close together and putting the red squares on the string such as this:



Remind the students that the red squares must be inside, not on, both the string for the red pieces and the string for the squares. Be patient; do not reveal the secret. Eventually someone will suggest overlapping the two strings . . .

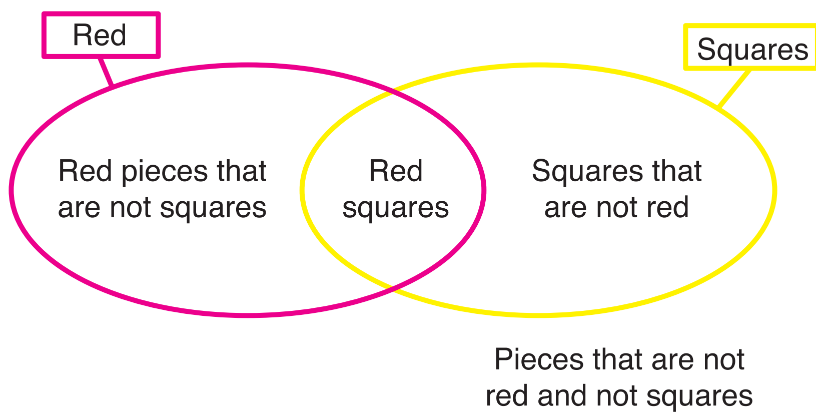


… which will allow the red squares to be put inside both strings.

If it appears that no one will discover overlapping at this time, stop the lesson here. Ask the students to think about the problem, and try this activity again on an adjustment day. A similar problem is considered in Lesson F39.

If overlapping is discovered, draw two overlapping strings on the board. Label one string for red pieces and one for squares. Hold up a piece and let someone come to the board and place it. Select at least one piece from each of the following four categories:

- Red pieces that are not squares
- Squares that are not red
- Red squares
- Pieces that are not red and not square



F27.1 C-ROD TRAINS

Capsule Lesson Summary

Review the C-rod staircase and assign numbers to each rod from 1 (white) to 10 (orange). Build a variety of trains and associate them with number sentences.

Materials

Teacher	• Demonstration C-rods
Student	• C-rods

Description of Lesson

Exercise 1

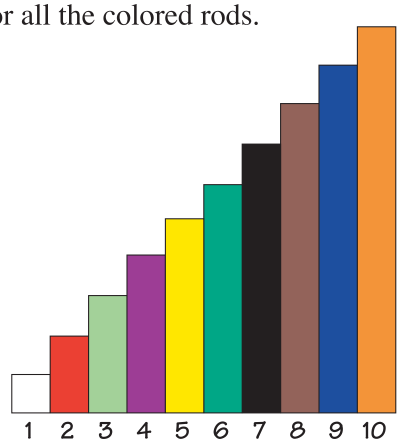
Organize the class in groups of two or three students. Provide each group with a set of C-rods. Allow a few minutes for free play with the rods; then instruct the groups to build a staircase like the ones they have built in earlier lessons. Build a demonstration staircase on the board.

Remind the students of climbing the staircase and counting up and down.

T: ***Let's say the white rod is 1. I'll write* 1 *under it. What number is the red rod?***

S: *2.*

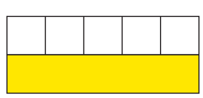
Identify numbers from 1 to 10 for all the colored rods.



Leave this display on the board during the rest of the lesson.

T: ***The yellow rod is 5. Let's check how many white rods are needed to build a yellow rod.***

Commonly, students will call such constructions a "train" of white rods. Encourage the groups to build a train of white rods the same length as a yellow rod.



S: ***Five whites make a yellow.***

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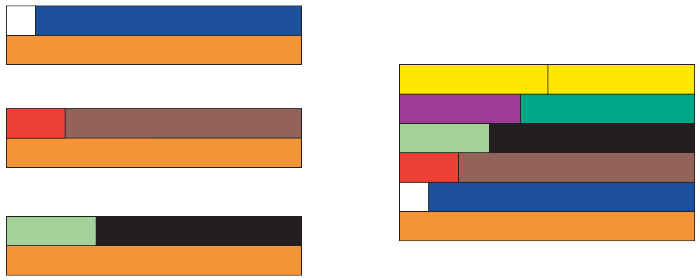
Check a couple of other colored rods.

T: ***Now, in your groups, try to find as many ways as you can to build a train the same length as the orange*** (10) ***rod using just two rods.***

Some groups may organize their work in one of the following ways:



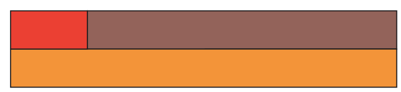
After allowing sufficient time for most groups to find many possible trains, discuss their findings. Let student report from their groups.

S: ***A red/brown train is the same as an orange rod.***

T: ***What numbers are the red and brown rods?***

S: ***2 and 8.***

Display the train and write a number sentence to correspond with it.



2 + 8 = 10

Discuss all the trains that are found among the groups. If students want to consider brown/red as different from red/brown, accept this and write both number sentences, 8 + 2 = 10 and 2 + 8 = 10.

Exercise 2

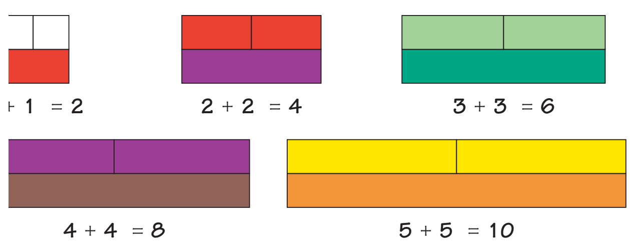
Repeat the train building part of Exercise 1 but suggest using more than two rods. For example,

2 + 6 + 2 = 10

Let groups work on finding different possibilities as long as there is interest.

Exercise 3

Observe that an orange rod length can be made with two yellow rods (5 + 5 = 10). Ask whether there are other colored rods that can be made with two of another colored rod? Encourage groups to find all the possibilities.



F27.2 GOLDY #2

Capsule Lesson Summary

Use a story situation to determine which of two groups has more objects. Introduce the symbols <, >, and =, and use them to write number sentences.

Materials

Teacher	• None	**Student**	• Worksheets F27.2* and **

Description of Lesson

Exercise 1

Ask a student to tell the class the story of Goldy.
To review, draw two groups of dots on the board.
Invite a student to come up and draw Goldy's mouth.

After doing a few more examples announce that, from now on, instead of drawing dots for the fish, you will write a numeral to show how many fish there are in each school. Put an example on the board.

$$7 > 5$$

T: ***How many fish are there in this school*** (point to 7)***?*** (Seven)
How many fish are there in this school (point to 5)***?*** (Five)
Who can show us the school of fish Goldy would go after?

Instruct a student to draw Goldy's mouth.

T: ***Yes; Goldy wants to eat the school with*** **more** ***fish.***

Point to the symbols as you read the number sentence.

T: ***Seven is more than five.***
Five is less than seven.

Repeat this activity several times. Ask students to read the completed number sentence each time. For example,

$2 < 4$	Two is less than four. Four is more than two.	$3 > 1$	Three is more than one. One is less than three.

Write on the board: $4 \qquad 3 + 1$

Allow the students to discuss this situation briefly.

T: ***Goldy can't decide which school of fish to go after because four fish is the same as three fish plus one fish. We will put an "equals" sign between the numerals*** (do so)***. Now, who can read this number sentence?***

S: ***Four is equal to three plus one.***

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Repeat this activity several times. Ask the class why Goldy prefers the chosen school of fish, and ask students to read the completed number sentence each time. For example,

T: ***Why do you think Goldy would go after the school with six fish?***

S: ***2 + 2 = 4, and 6 is more than 4.***

$$6 > 2 + 2$$

Six is more than two plus two.
Two plus two is less than six.

Note: If necessary, show students how to record an addition fact to help decide how to draw Goldy's mouth.

$$6 > \overbrace{2 + 2}^{4}$$

Another example of this activity is the following:

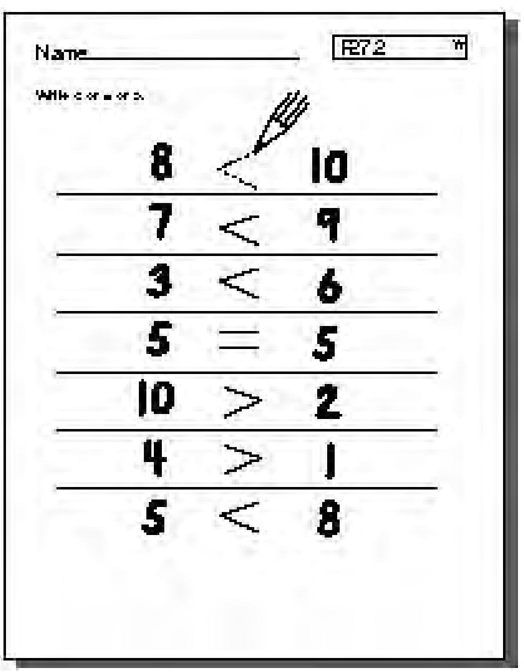
$$4 + 1 < 10$$

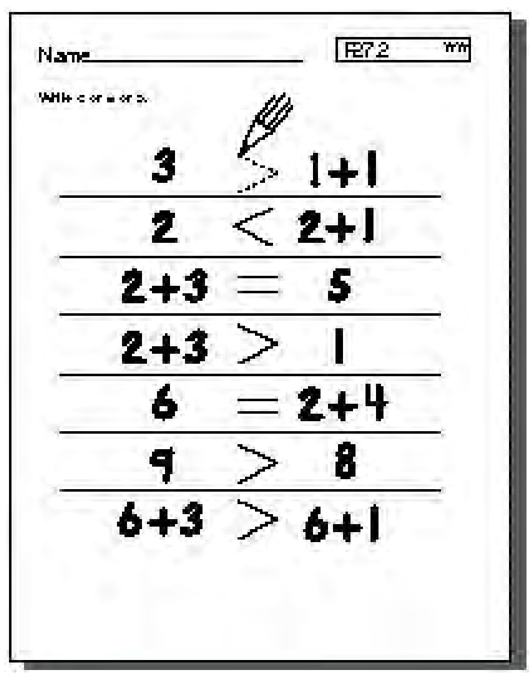
Four plus one is less than ten.
Ten is more than four plus one.

T: ***Why do you think Goldy would go after the school with ten fish?***

S: ***4 + 1 = 5, and 10 is more than 5*** (or 5 is less than 10).

Worksheets F27.2* and ** are available for the remainder of class time.





Capsule Lesson Summary

In a story context, group by tens. Organize and read the results using place value (base 10).

Materials

Teacher		Student	
	• Demonstration materials similar to the student materials for use at the board or on an overhead projector.		• Rings (O-rings, cereal loops, or candy rings) • Work mat • Ring stands (small wood dowels, or toothpicks stuck in a clay or plasticine base) • Shoe box

Description of Lesson

Begin the lesson by asking the class how many fingers a person normally has. Then tell them about the ring man.

T: ***The ring man has hundreds of rings. Each day he selects rings to wear so that he has one ring on each finger. How many rings does the ring man wear each day?***

S: ***Ten; he has ten fingers.***

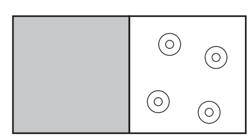
T: ***The ring man wants to know how many days he can go without wearing the same ring twice. He wants to organize his rings so that he wears different rings each day. How can he do this?***

S: ***Put them in piles of ten and choose a different pile each day.***

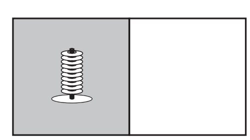
T: ***You are all going to help the ring man organize his rings today. Instead of piles, we will put ten rings*** (one for each finger) ***on a ring stand. Your job will be to decide how many rings are in your container and how many days the ring man can go without wearing the same ring twice.***

Pair the students and prepare to give each pair a work mat, a container of rings (40 to 50), and several ring stands. At the board or on the overhead projector, use similar materials to model the job each student pair will do.

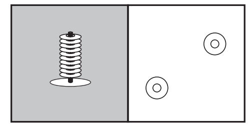
Take rings out, one at a time, and put them on the right side of the work mat. Occasionally read what you have so far, for example, “zero tens and four single rings,” or ask students to read it.



As soon as you have 10 single rings, put them on a ring stand and move it to the left side of the work mat saying, “one ten and zero single rings.”



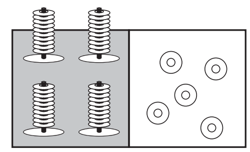
Continue with a couple more rings, saying,



T: ***1 ten and 1 single ring. How many rings?*** (11)
1 ten and 2 single rings. How many rings? (12)

Instruct the students to work in pairs pretending they are working for the ring man. Before they start, you may like to ask students to estimate how many rings are in their containers. As you walk around, remind students to put the rings on the mat, one at a time, and count to 10. Encourage students to read to each other what is on the mat . Watch that as soon as there are 10 single rings, students put them on a ring stand and move it to the left side of the mat.

As groups complete the job with their rings, ask each group to read to the class what they have. For example,



S: ***4 tens and 5 single rings.***

T: ***How many rings did you have?***

S: ***45.***

Ask students how they counted and encourage them to count 4 tens (10, 20 , 30, 40) and five ones (41, 42, 43, 44, 45). That is, 4 tens (40) plus 5 equals 45.

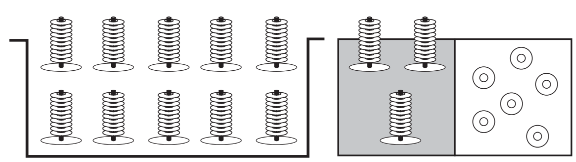
If the class is still interested in the story, you can extend it. The extension takes them to hundreds and many students will not be ready. However, working in groups, most students can contribute even though they cannot read the numbers.

T: ***The ring man works just ten days each month. He would like to organize his rings further to see monthly supplies as well as daily. How could he do that?***

S: ***Put ten rings stands together in a box.***

Group three pairs of students together and give each group an empty shoe box. Ask the groups to use all their rings and organize them for the ring man. You may have to help several groups get started as they bring all their rings together. Get students started by setting up the work area with a box and one mat, but let them work together to solve the problem themselves.

As groups complete the job, let them announce what they have. For example,



S: ***1 box, 3 tens, and 6 single rings.***

T: ***How many rings in a box?***

S: ***100*** (count by tens to check).

T: ***So you have 1 hundred, 3 tens*** (30)***, and 6 rings.***
How many rings altogether?

S: ***136.***

Extension Activity

The class might like to find how many rings they have altogether. This can lead to a discussion of how many days or months the ring man could go without wearing the same ring twice.

Home Activity

Suggest to parents/guardians that they find a collection of between 50 and 100 things to count with their child. For example, they might use a deck of cards. Then suggest parents/guardians organize the counting by grouping in tens; that is, make piles of ten cards each and have two cards left over. Then count: 10, 20, 30, 40, 50, 51, 52.

F29 THE NUMBERS SPEAK #1

Capsule Lesson Summary

Review the relations *more than* and *less than*. Investigate the *is less than* relation in several arrow picture situations.

Materials

Teacher	• Colored chalk	Student	• Colored pencils • Unlined paper

Description of Lesson

Exercise 1

Tell your class that you are going to play a game and that they should not answer unless you point to them. Below is a sample dialogue.

T:	***3 is less than. . .***	**S:**	***5.***
	5 is less than. . .		***9.***
	9 is less than. . .		***10.***
	10 is less then. . .		***11.***
	11 is less than. . .		***12.***
	12 is less than. . .		***20.***
	20 is less than. . .		***50.***
	50 is less than. . .		***100.***
	100 is less than. . .		***200.***
	200 is less than. . .		***1,000.***
	1,000 is less than. .		***500.***
	No, 1,000 is not less than 500.		
	1,000 is less than. . .		***2,000.***

If your students begin to give consecutive numbers, you might suggest a skip to encourage them not to restrict themselves. You may want to have a student write one of the larger numbers on the board or to write one yourself if none of the students is able. When you think the numbers are getting too great, change to an *is more than* game.

T:	***Now listen carefully***		
	2,000 is more than. . .	**S:**	***1,000.***
	1,000 is more than. . .		***100.***
	100 is more than. . .		***50.***
	50 is more than. .		***40.***
	40 is more than. . .		***25.***
	25 is more than. . .		***4.***
	4 is more than. . .		***0.***

Continue this activity for five or ten minutes. Refer students to the number line if they have difficulty with these activities.

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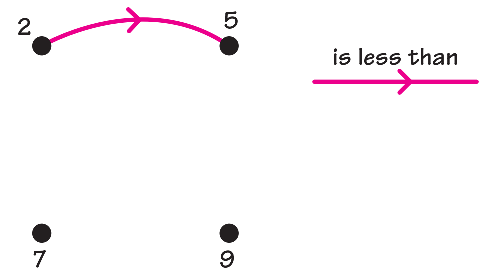
Exercise 2

Draw and label the dots as you tell this story.

T: ***Once upon a time, there were four numbers. One of the numbers was 2; another was 5; and the other two were 7 and 9. One day 2 looked at 5 and said, "What could 2 say to 5?" Should it say, "I am less than you," or "I am more than you"?***

S: ***"I am less than you."***

Draw a key arrow for *is less than* and the arrow showing *2 is less than 5*.



Trace the arrow as you say, "2 is less than 5."

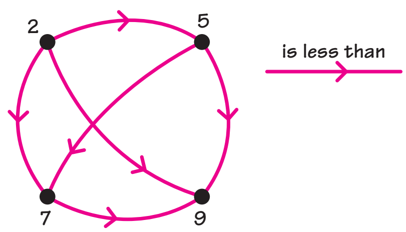
T: ***Can we draw some more red arrows?*** (Yes)
Who can show us a red arrow from some number that says, "I am less than you," to another number?

Call on a volunteer to trace an arrow. If it is traced correctly, draw it yourself. After the arrow has been drawn, trace it saying, for example, "2 is less than 7."

Continue allowing students to trace *is less than* arrows (or to draw them, if you prefer). After each arrow has been drawn, trace it and explain what it means, or ask a student to explain what is being said.

If a student suggests an incorrect arrow, explain what is being said via that arrow; for example, "7 is less than 5." This will probably cause your class to protest and the error will be corrected. If a student traces an arrow correctly but has difficulty with the direction, you may wish to trace the arrowhead for the student or even draw the arrow lightly on the board.

Continue until all the arrows have been drawn.



T: ***Which number speaks to all the other numbers?*** (2)
Which number cannot speak to any other number here? (9)
How many numbers does 5 speak to? (Two)

Exercises 3 and 4 can be presented as cooperative group work.

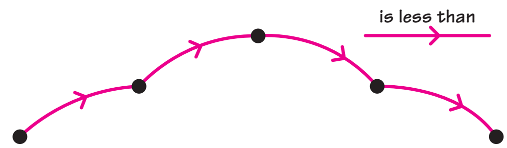
Exercise 3

Erase the board except for the key arrow. Draw five dots, spreading them out across the board.

T: ***These dots are numbers. How many numbers?*** (Five)
Do we know which numbers they are? (No)

T: ***These numbers are saying, "I am less than you."***

Draw *is less than* arrows in your picture.



T: ***Which of these numbers is the least?***
How do you know?

The students should point to the last dot on the left.

T: ***Which of these numbers is the greatest? How do you know?***

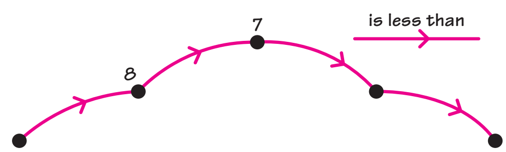
The students should point to the last dot on the right.

T: ***Let's see which numbers these could be. Who would like to label a dot?***

Make it clear that a student can pick any dot and any number. Point to that dot. (The following dialogue assumes a student chose to put 7 at the middle dot.)

T: ***If this number were 7, what could these other numbers be?***

Call on another student to come up and label a dot. If the student is incorrect, let the class find and correct the mistake. For example,



T: ***What is 8 saying to 7?***

S: ***"I am less than you."***

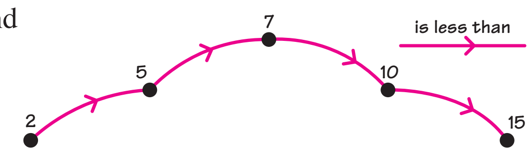
S: ***8 is not less than 7!***

T: ***Correct. That dot cannot be for 8 because 8 is not less than 7.***

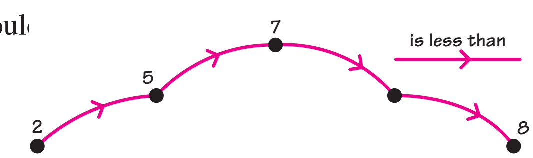
Erase the 8 from the arrow picture.

T: ***What could these other numbers be?***

Continue until the class has labeled all the dots and checked for correctness by "reading" the arrows. For example,

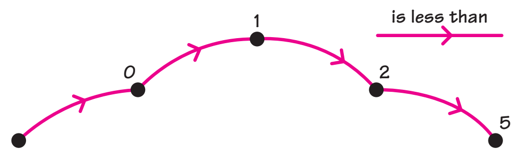


Note: It is possible for situations to develop that woul whole numbers. For example,



Most first graders will not be aware of numbers that are both more than 7 and less than 8. They may conclude that there is no number between 7 and 8. In this case, you should say, "Since you don't yet know any number between 7 and 8, let's erase 8 and try again." If a student suggests a number, such as 7½, between 7 and 8 accept this answer as correct but do not emphasize it.

F29



Here is another example of such a situation.

Most first graders will not be aware of numbers that are less than 0. They may conclude that there is no number less than 0. In this case say, "Since you don't yet know any number less than 0, let's erase these numerals and try again." If a student suggests a number that is less than 0, such as a negative number, accept the answer as correct but do not emphasize it.

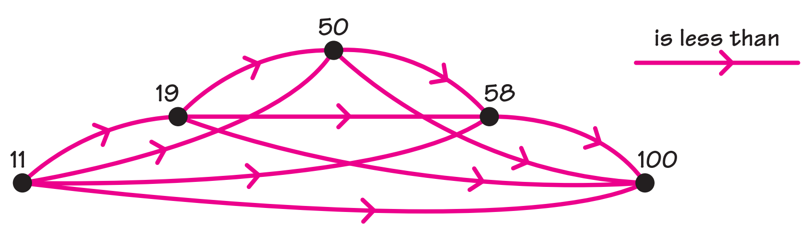
Repeat this exercise two or three times.

Exercise 4

Do not erase the board after Exercise 3. Use the last arrow picture, complete with labels, for this exercise.

T: ***Look very carefully at this arrow picture. Can we draw some more red arrows? Remember that the red arrows are for* is less than.**

Ask volunteers to come to the board and trace red arrows. If an arrow is traced correctly, either you or the student should draw it on the board. You may want to ask some of your students to tell what a particular arrow means. The arrow picture below shows all of the red arrows that can be drawn regardless of the numbers used. Do not insist that your class find all of these arrows.



Erase the board, and distribute unlined paper and colored pencils. Ask that the students draw five dots on their papers. Tell them that they may choose any numbers they like for these dots. While they are labeling their dots draw a key arrow for *is less than*, on the board in whatever color the students will be using. Ask the students to draw as many arrows as possible.

Students who finish quickly can draw another arrow picture on the back of their papers with six numbers.

Center Activity

Laminate task cards with problems patterned after Exercise 3 to place in a center for additional practice.

Extension Activity

Exercise 1 can be adapted for mental measurement.For example, play the game by looking around the room and comparing length or mass measures.

T:	***My desk is longer than…***	**S:**	***This book***
	This book is longer than…	**S:**	***A pencil***
	A pencil is longer than…	**S:**	***An eraser.***

F30 ADJUSTMENT/ASSESSMENT DAY #3

Note: See Section One, page 1-9, for a full explanation of the purpose of scheduled adjustment days. Worksheet F30 is available for a short, written assessment.

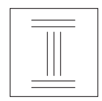
On this day, you may wish to repeat an earlier lesson either for a group of students or for the entire class. Many of the lessons can be made to appear completely different by changing the story and/or the numbers in the lesson. If you omitted any exercises or worksheets from an earlier lesson, you may like to include these. This is also a good time to allow students to work in centers or on a project of your choice.

The following game activities may be appropriate for students whose numerical readiness is weak.

Number Designs

Provide students with the same number (for example, 7) of objects such as toothpicks or beans. Instruct students to make a design with their objects and possibly display the design on a colored card by gluing the objects to the card. Then invite students to describe their designs and encourage the use of numbers. If appropriate, write some number sentences for the designs.
For example,

S: ***My design is like the letter* I. *It has two toothpicks across the top, three toothpicks up and down in the middle, and two toothpicks across the bottom.***



$2 + 3 + 2 = 7$

You may also like to make a big display of different designs for a number.

Read My Mind

Choose a number and offer clues such as:

T:	***I am thinking of a number between 8 and 10.***	**S:**	***9.***
T:	***I am thinking of a number less than 25 and more than 23.***	**S:**	***24.***
T:	***I am thinking of a number less than 50.***	**S:**	***40.***
T:	***My number is also less than 40.***	**S:**	***35.***
T:	***My number is more than 35.***	**S:**	***38.***

Choose an object in the room and offer clues such as:

T: ***I see something that is longer than this pencil but shorter than my book.***

S: ***The stapler.***

S: ***The eraser.***

T: ***I am thinking of something in this room that can roll.***

S: ***That piece of chalk.***

S: ***The ball.***

T: ***Now, I am thinking of a student who is sitting close to the window, is not a boy, and is wearing sneakers.***

S: ***Susan.***

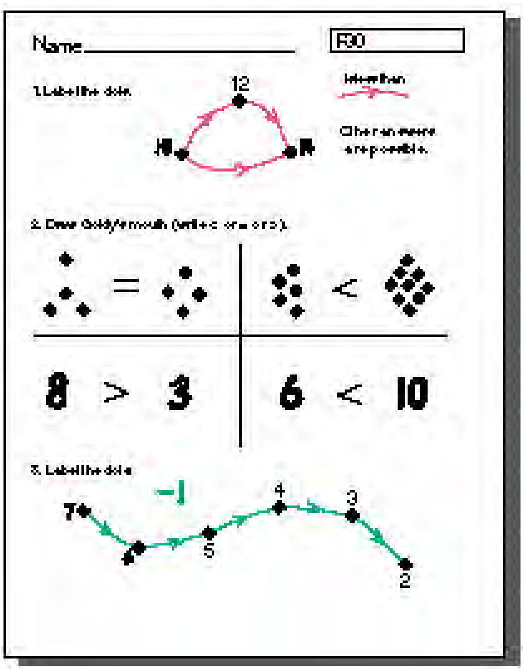
F30

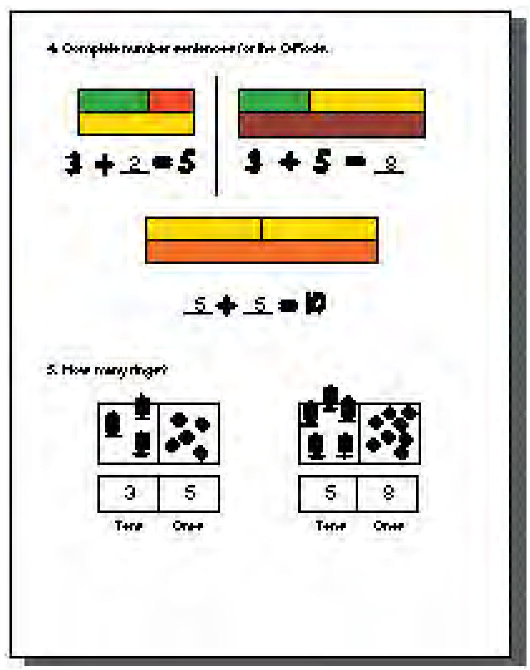
If your class is experiencing little difficulty with the *CSMP* curriculum you may wish to omit this adjustment day and continue immediately with F31.1 *0–109 Numeral Chart #1*.

Early Warning

Among the next nine classroom lessons are some that require extra preparation time, or involve materials not included with the *CSMP* Classroom Set. The lessons have been listed here for your convenience in preparing for them. A more detailed description of the needed materials can be found on the first page of each lesson. (These special materials have been listed here only once, even if they are need more than once during the nine-day period.)

F31.2 *Walks On One-Way Roads #2*: Pointer
F33 *Place Value (Base 10)*: Base-10 blocks or other place value manipulatives
F35 *Coin Values:* Coins; “purses”
F36.1 *Geometric Solids:* Collection of geometric solids; parent letter
F36.2 *+2 Snake*: Calculators
F39.2 *Graphing Geometric Solids:* Graphing mat; solids brought from home





F31.1 0–109 NUMERAL CHART

Capsule Lesson Summary

Use the 0–109 numeral chart to practice reading numbers, to do some counting exercises, and to explore some number patterns.

Materials

Teacher	• 0–109 numeral chart • Blackline F31.1	Student	• 0–109 numeral chart

Advance Preparation: Use Blackline F31.1 to make student copies of the 0–109 numeral chart

Description of Lesson

Note: During and after this lesson, the 0–109 numeral chart should be on display in the classroom. You may want students to have a 0–109 chart at their places.

Many exercises are possible. Try to choose some that are challenging to your class. Continue as long as student interest remains high.

You can ask your students to try the following:

- Read a given column. What do you notice? (All the numbers end with the same digit)
- Read a given row. What do you notice? (All the numbers start with the same digit)
- Read a column from bottom to top.
- Read a row from right to left.
- Start at 0 and read every other numeral (count by twos).
- Start at 1 and read every other numeral (count by twos).
- Count backward, starting with various numbers.
- Find a numeral that you read aloud.
- Listen to you read the first row and tell how you are counting (by ones); do the same exercise with the second, fifth, and last rows.
- Listen to you read the last column and tell how you are counting (by tens); do the same exercise with the first and fifth columns.

Home Activity

Make a 0–109 numeral chart for each student to take home. Suggest to parents/guardians that they use the chart to practice reading numbers and looking for patterns. For example:

- Read a row of numbers. What patterns do you notice?
- Read a column of numbers. What patterns do you notice?
- Read a diagonal of numbers. What patterns do you notice?
- Cover one or several numbers. Guess which number(s) are covered.

F31.2 WALKS ON ONE-WAY ROADS #2

Capsule Lesson Summary

Students practice following the direction of arrows in a one-way road map.

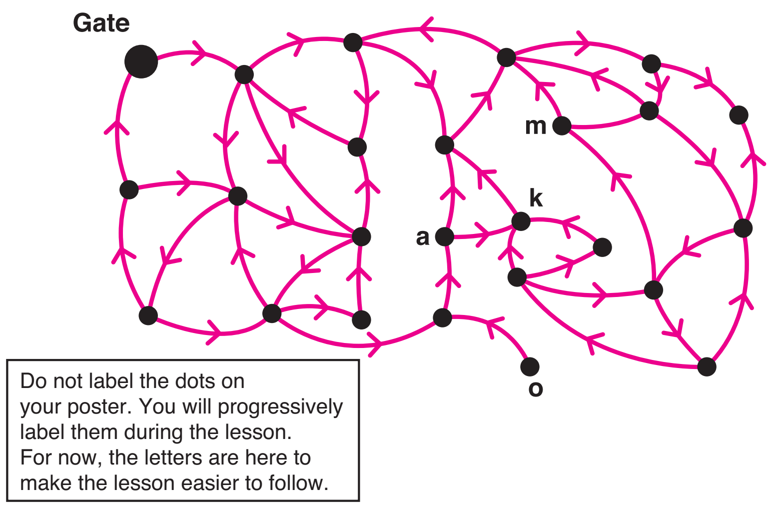
Materials

Teacher
- *FG Poster* #2
- Pointer
- Colored chalk

Student
- None

Description of Lesson

Tape the *FG Poster* #2 onto the board.



T: ***This is the map of a zoo. The large dot is for the entrance gate to the zoo.***

Label the large dot **Gate** as shown above.

T: ***All the arrows are paths in the zoo. The paths are all one-way paths, and the arrows show which way you may walk on the paths.***

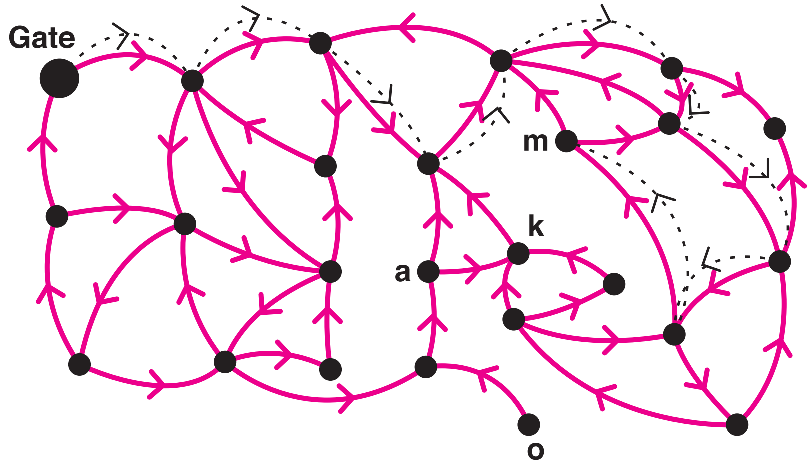
Let the students discuss what one-way roads or paths are; call on several students to use the pointer to "take walks" around the zoo, starting at the gate and walking until they reach a dead-end or become tired. As in Lesson F6.1, you may wish to involve the whole group by encouraging them to "protest" (by raising both arms) when someone walks against the arrows.

Point to **m** and label it "Monkey Motel" on your poster.

T: ***The monkeys at this zoo live here. Their cage is called* Monkey Motel. *Who would like to take a walk from the gate to the Monkey Motel?***

F31

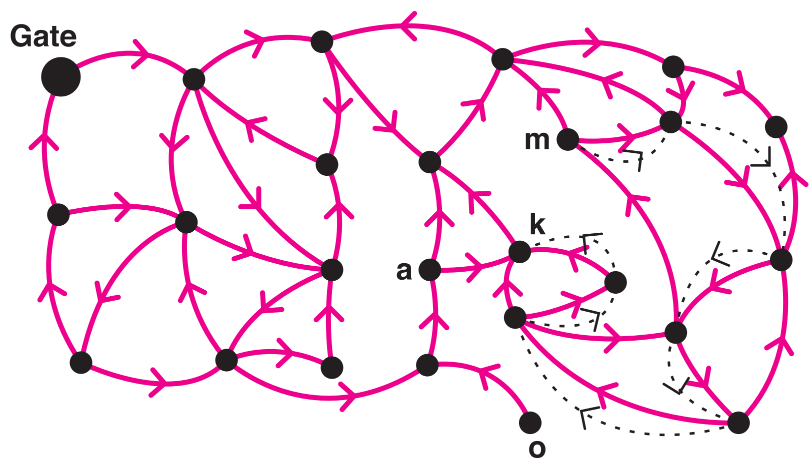
Let several students take walks. Remind them, when necessary, that they may walk only in the direction of the arrows. There are several walks from the gate to Monkey Motel. When a student discovers one of them, ask if someone can find another way. The dotted path shows a correct walk.



Point to **k** in the previous illustration, and label it "Kangaroo Castle" on your poster.

T: ***This cage is called* Kangaroo Castle. *Which animals do you think live here?***

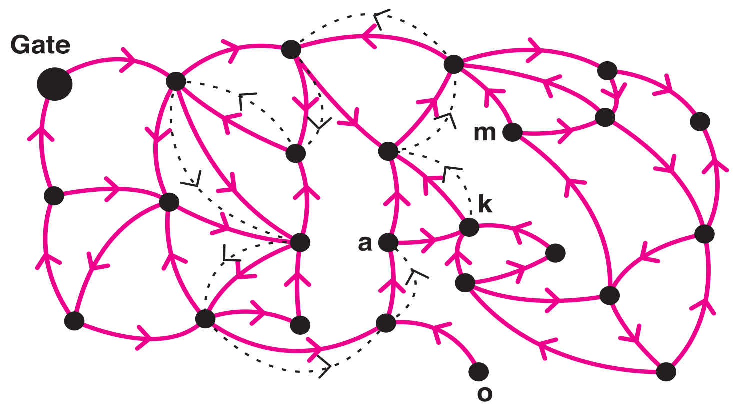
Ask some students to take walks from the Monkey Motel to the Kangaroo Castle; there are several correct walks.



Point to **a** and label it "Alligator Alley" on your poster.

T: ***This cage is called* Alligator Alley. *How many of you have seen an alligator?***

Ask several students to take walks from Kangaroo Castle to Alligator Alley.



Point to **o** and label it "Ostrich Oasis" on your poster.

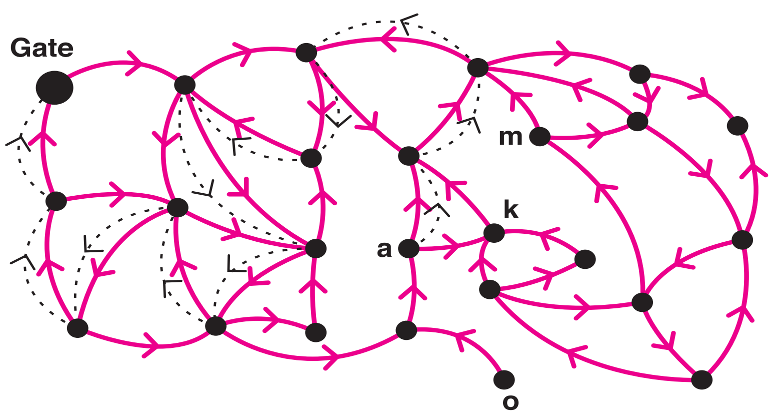
T: ***This cage is called* Ostrich Oasis. *Who knows something about ostriches?***

Let the students spend a minute or two discussing their experiences; then ask several students to find walks from Alligator Alley to Ostrich Oasis. There is no such walk because there is only a path directed away from Ostrich Oasis. See if a student can discover this and explain it.

T: ***Do you think the ostriches are unhappy because no visitors can come to their cage? What could the zoo do to correct this problem?***

Students may suggest changing an arrow or building a new road.

Finally, ask for walks from Alligator Alley to the gate; there are several possible walks.



Reading Activity

You may like to follow this lesson by reading an animal alphabet story such as *Alphabet* by Jan Garten or a story about zoos such as *Visit to the Zoo* by Sylvia Tester or *Who Lives at the Zoo*? by Lisa Bonforte.

F32.1 GUESS MY RULE WITH A-BLOCKS #2

Capsule Lesson Summary

Place a sequence of A-blocks on the board, according to a secret rule. Challenge the class to guess the secret rule. In small groups, students devise rules for a sequence of A-blocks and present the pattern as a "guess my rule."

Materials

Teacher	• One set of A-blocks • Masking tape	**Student**	• A-block set

Note: If you have a magnetic board, you may wish to use a set of A-blocks that you have "magnetized" with the adhesive magnetic material provided with the A-Block String Game kit. If you use masking tape instead, make sure the board is as clean as possible for good adhesion.

Description of Lesson

T: ***I'm going to put some A-blocks on the board. Each time I put one up it will follow a rule. See if you can guess what my rule is.***

The first rule should be based on color. Try a pattern such as yellow, yellow, blue—yellow, yellow, blue—and so on. The size and shape of the pieces are irrelevant. The rule is two yellows, one blue.

After five or six pieces have been placed on the board, encourage the students to guess which piece could be the next one. You may ask them to hold up a piece from their set that could come next.

If a student suggests a piece that follows the rule, say,

T: ***Yes; that piece could be next.***

If a student suggests a piece that does not follow your rule, say,

T: ***That piece does not fit my rule. You may be thinking of a different rule.***

Emphasize with the students that their rules are as good as yours, but in this game they must try to discover your rule.

When students think they have discovered the rule, ask them to whisper it to you; students who have found the rule can be judges for the others' choices. When you feel that most of the class knows your rule, let someone announce it aloud.

Remove all A-blocks from the board and begin again with a new rule. One rule which is especially challenging is big, little—big, little—and so on.

F32

If you think many of your students are ready to devise their own rules for some sequence (pattern) of A-blocks, you can arrange for them to work in groups of three or four with one set of A-blocks per group. In the group, one student plays the role of rule maker and the others try to guess the rule in a way similar to the class activity. Interchange roles as appropriate.

F32.2 ONE OUT OF SEVEN

Capsule Lesson Summary

Use the languages of strings and arrows to tell a story about a family of dogs. Answer numerical questions relating to the story.

Materials

Teacher		Student	
	• One copy of the storybook *One Out of Seven*		• One copy of the storybook *One Out of Seven* for each pair of students • Counters

Description of Lesson

This story about a family of dogs not only uses the powerful mathematical languages of strings and arrows, but also deals with number recognition and can be used as an introduction to addition.

For this story we advise you to pass out the storybooks at the beginning of the lesson so that your students can see the illustrations as you go along. Treat this story as you would any other story you might read to your class. Many of the questions you might ask have already been included in the storybook itself. However, you may want to make note of the following points:

- As a general rule, make sure you students have enough time to look at the drawing on a page before you continue reading the story.
- Do not over emphasize the mathematical aspects of the story.
- Do emphasize the string and arrow pictures in relation to the storyline.

Page 2

Pause after "What has happened?" to give your students the chance to compare the two dot pictures and perhaps notice, on their own, that one dog is missing.

Page 3

Do not force the students to count the dots in each string if they recognize, without counting, how many there are.

Pages 3, 4, and 8

As you read the number sentences on each of these pages, have the students illustrate them with their fingers or counters.

When you have finished reading the story, allow a little time for students to talk about or draw pictures having to do with the story. Your students may enjoy having their own copy of the storybook to read. If it is not the intention of your school to purchase a new set of storybooks each year, collect the storybooks so that they may be used next year. Do, however, give your students ample opportunity to look through them.

Capsule Lesson Summary

Recall the ring man story to revisit base 10 place-value concepts. Model numbers between 10 and 100 with place value manipulatives.

Materials

Teacher
- Base-10 blocks (or other place value manipulatives)
- Work mat

Student
- Base-10 blocks (or other place value manipulative)
- Work mat

Description of Lesson

Remind the students about the ring man story (Lesson F28).

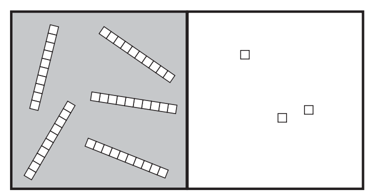
T: ***How would we organize 53 rings for the ring man?***

S: ***Put 10 at a time on ring stands.***

S: ***5 ring stands (10, 20, 30, 40, 50) and 3 single rings.***

Let students recall how to count out groups of ten. Tell them that today, instead of rings and ring stands, they are going to count with blocks (base-10 blocks or whatever place value manipulatives you have). At the board demonstrate counting to 53, grouping tens as you do. Emphasize the trade of 10 single blocks for a ten block and relate this to putting 10 rings on a ring stand.

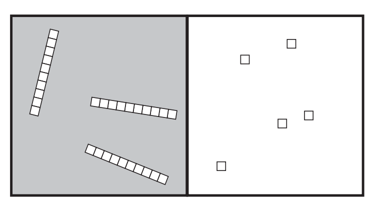
Read this configuration as five tens and three ones, or fifty-three.



5 3

Group the students (two or three to a group) and give each group a number of unit objects (between 30 and 90) to organize. Suggest that groups try to estimate the number before organizing (counting). As they complete the assigned number, let one student in the group choose a number for the others to organize. As you circulate encourage students to read numbers on the mat and to write the number on a piece of paper below the mat. For example,

Read this configuration as three tens and five ones, or thirty-five.



3 5

Also, as appropriate, suggest to students that they put numbers between 10 and 20 on their mats.

F33

Some students will surely want to use numbers greater than 100. As this happens, remind students that the ring man liked to put ten ring stands (ten tens) together in a box. Likewise, the work mat can be extended to include a hundreds place. At this point, you may not want to push the hundreds place.

Home Activity

Suggest to parents/guardians that they find something to purchase in packages of ten (for example, a book of ten postage stamps or a package of ten cookies). Then, with their child, they can decide how many packages to buy if they need 38 (or 52). Recommend that they read numbers like 38 as "thirty-eight" as well as "three tens and eight ones."

F34 MINICOMPUTER INTRODUCTION #1

Capsule Lesson Summary

Use the Minicomputer to represent the numbers 1 through 10 and to explore the representation of numbers greater than 10.

Materials

Teacher
- Minicomputer set†;
- C-rods
- Base-10 blocks or other place value manipulative

Student
- None

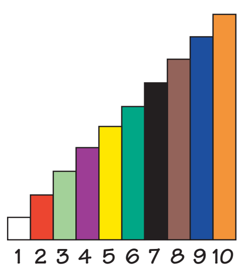
Note: The demonstration Minicomputer boards may be suspended from the top of your chalkboard, or they may be propped on the chalk tray. However they are displayed, it is important that students can see and reach them easily. If the Minicomputer boards are suspended, numbers can be written on the chalkboard below the Minicomputer. When the Minicomputer boards are propped on the chalk tray, numbers can be written on the chalkboard above the Minicomputer. Try to arrange for the Minicomputer to be prominently displayed in the classroom throughout the school day.

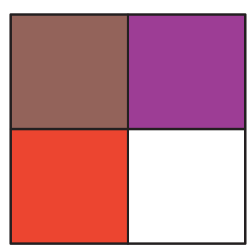
Description of Lesson

This first introduction to the Minicomputer should be an informal but challenging one. There will be several other lessons introducing the Minicomputer, and each of them will include a review of the configurations first presented in this lesson. Do not be worried or surprised if your students fail to master the Minicomputer after only one lesson.

Exercise 1

Display a Minicomputer board and a staircase with the C-rods.





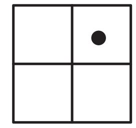
T: ***Show me the C-rod for 4.*** (Purple). ***Show me four fingers. Trace a 4 on your desk. That's one way to write 4. I'm going to show you how to put 4 on the Minicomputer.***

Point to the Minicomputer.

T: ***This is called the*** **Minicomputer.** ***We can put numbers on the Minicomputer using checkers.***

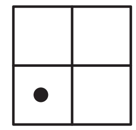
†A Teacher's Minicomputer set consists of four demonstration Minicomputer boards and a sufficient number of magnetic checkers.

F34



Put one checker on the purple square of the ones board.

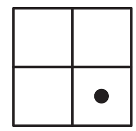
T: ***This is the number 4 on the Minicomputer.***



Move the checker to the red square of the ones board.

T: ***This is the number 2 on the Minicomputer.***

Ask students to show the C-rod for 2 (red) and to show two fingers.

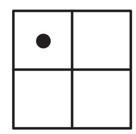


Move the checker to the white square of the ones board.

T: ***This is the number 1 on the Minicomputer.***

Again, ask for the C-rod for 1 (white) and one finger.

Review the configurations for 4, 2, 1 and then for 1, 2, 4 on the Minicomputer. Do this a couple of times letting students tell you the numbers.



Move the checker to the brown square of the ones board.

T: ***What number do you think this is?***

Some students will probably guess 3 or 5.

T: ***No, it's not 3*** (or 5).

Pause. Review 1, 2, 4 again and then pause as you put the checker on the brown square. After a moment a student may suggest 8. If not, simply say,

T: ***This is 8.***

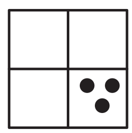
This would be a good time to relate the colored squares of the Minicomputer to the C-rods of the same color.

Move the checker quickly from one square to another on the ones board and ask the class to call out each number. In doing this, follow the doubling pattern: 1, 2, 4, 8. Visually suggest the doubling pattern by putting two checkers on the white square and saying, "1 plus 1 is 2." Then, take off the two checkers and put one checker on the red square. Repeat for *2 plus 2 is 4* and *4 plus 4 is 8*. You may also ask students to show *1 plus 1 is 2* with fingers, and so on.

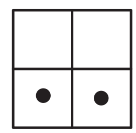
T: ***Who can put 3 on the Minicomputer?***

If you have volunteers, ask them to tell you, first, how many checkers they will need. (Two and three are both possible answers.) If no one knows how to put 3 on the Minicomputer, say, "To show 3, you'll need at least two checkers." If this hint does not help, hold up two fingers on one hand and your thumb on the other hand. Alternately wave the two fingers and the thumb saying, “2 plus 1 is 3.”

With this hint, someone should be able to put 3 on the Minicomputer. Ask a volunteer to put the checkers on the Minicomputer. There are two correct ways to put 3 on the Minicomputer.



or



If a student places three checkers on the white square, lift the checkers one-by-one and say, “1 plus 1 plus 1 is 3.” Ask if someone can show 3 another way.

If a student places one checker on the red square and one checker on the white square, lift each checker as you mention it and then replace it quickly on the board.

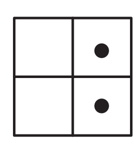
T: ***What number is on the red square?*** (2) ***What number is on the white square?*** (1) ***2 plus 1 is 3. 1 plus 2 is 3.***

Remove the checkers from the Minicomputer.

T: ***Who can put 5 on the Minicomputer?***

As you ask this question, hold up your hand and show five fingers. Ask volunteers to tell you, first, how many checkers are needed. (Two, three, four, and five are all correct answers.) Ask a volunteer to place the checkers on the Minicomputer. For each correct solution, orally sum the numbers represented by the individual checkers as you did for 3. Whenever more than two checkers are used, ask for another way until you get the standard configuration.

When the checkers are in this position, lift each checker as you mention it and replace it on the board quickly.



T: ***What number is on the purple square?*** (4) ***On the white square?*** (1) ***4 plus 1 is 5. 1 plus 4 is 5.***

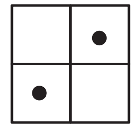
Remove the checkers from the Minicomputer.

If the students are interested and are enjoying the lesson, continue with Exercise 2.

F34

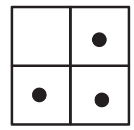
Exercise 2

T: ***Can anyone put 6 on the Minicomputer?***



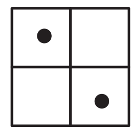
Accept all correct answers. If more than two checkers are used, ask for another way until you get the standard configuration.

T: ***Can anyone put 7 on the Minicomputer?***



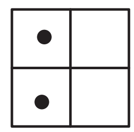
Accept all correct answers. If more than three checkers are used, ask for another way until you get the standard configuration.

T: ***Can anyone put 9 on the Minicomputer?***



Accept all correct answers. If more than two checkers are used, ask for another way until you get the standard configuration.

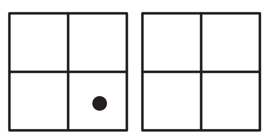
T: ***Can anyone put 10 on the Minicomputer?***



Someone will probably suggest this configuration.

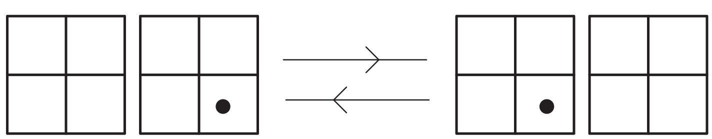
T: ***There is a way to show 10 with only one checker, but we will need another board.***

Display a second board (the tens board) and place one checker on its white square. As you remove checkers from the ones board say, “8 plus 2 is 10,” and place the checker on the tens board. Write 1 below (or above) the tens board and 0 below (or above) the ones board. Use base-10 blocks or other place value manipulatives to show and reinforce a trade of 10 ones for 1 ten and 0 ones.



1 0

Move a checker back and forth from the white square on the ones board to the white square on the tens’ board. As you do this, lead the class in saying “one-ten-one-ten-one-ten.”



1 1 0

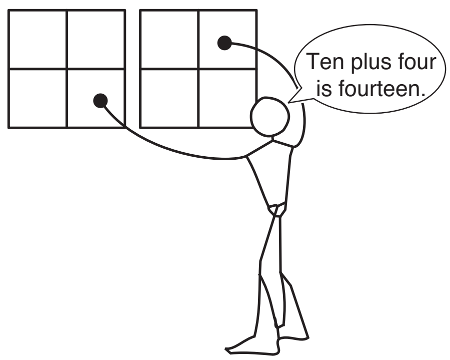
If the class is interested and is enjoying the lesson, continue with Exercise 3.

Exercise 3

The purpose of this activity is to provide the students the freedom to explore this new tool. There will be more review activities in later lessons.

Ask the class if someone can put a number on the Minicomputer that is more than 10. If some students volunteer to put numbers on the Minicomputer, let them do so. If no one volunteers, put 14 on the Minicomputer yourself.

T: ***What number is this?*** (14)
Ten plus four is fourteen.



T: ***Who would like to write 14 on the chalkboard?***

Invite a student to write 14 to one side of the Minicomputer. You can write 1 below (or above) the tens board and 4 below (or above) the ones board. Use base-10 blocks or other place-value manipulatives to model 14 as one ten and four ones.

Repeat this activity with several other numbers, again asking first for volunteers.

Note: Some teachers have asked us why we do not write the values of the various squares on the Minicomputer. The ease with which young children learn to represent numbers on the Minicomputer is facilitated by the use of color and positional representation. Students who are often frustrated by a preponderance of numeral writing are able to employ the Minicomputer in their investigation of the world of numbers. Writing the values on the various squares of the Minicomputer may add an unnecessary, complicating factor which detracts from the positional representation and can hinder the awareness of this positional representation.

F35 COIN VALUES

Capsule Lesson Summary

Learn to recognize coins and the value of a penny, nickel, and dime. Make coin trades for equal amounts. Find combinations of coins to make a given amount of money. Match combinations of coins that have the same value.

Materials

Teacher	• Coins (pennies, nickels, dimes)	**Student**	• Coins (10 pennies, 2 nickels, 1 dime) • Purse

Note: Use real or play coins. The purse can be any container for putting coins into.

Description of Lesson

Begin the lesson with a discussion of the coins. Let students name the various coins and tell you their values. You may want to examine the coins and observe how they are different or the same. During the discussion write the names and values on the chalkboard.

Continue with a discussion of trades. For example, bring two students to the front of the room; give one a nickel and the other some pennies.

T: ***How many pennies should I give Carlos so that he can trade with Meg and still have the same amount of money?***

Emphasize trades (equal amounts) by inviting students to do them a couple times. Look at trades of 5 pennies for a nickel, 10 pennies for a dime, 2 nickels for a dime, and 5 pennies and 1 nickel for a dime. You may also want to include three- or four-way trades; i.e., 10 pennies for 2 nickels, for 1 nickel and 5 pennies, or for 1 dime. Some students may confuse the number of coins with their value. In your discussion, include some cases where trades cannot be made.

Organize the class into groups of three or four students each. Provide each group with coins (10 pennies, 2 nickels, 1 dime) and a "purse." Instruct the groups to sort their coins. Then ask that someone in the group hold up the correct coin as you call out its name or value. Make sure everyone in a group participates.

T: ***Now, I would like each group to put exactly 7¢ into the purse.***

Invite someone from each group to show the class how they solved the problem.

S: ***Our group put 7 pennies in our purse.***

S: ***We put 1 nickel and 2 pennies in our purse.***

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Again, ask the students to put various amounts of money into the purse using, for example, 11¢, 15¢, 18¢, 20¢, and 23¢.

T: ***What is the greatest amount of money I can ask you to put into the purse?***

S: ***30¢. If we put in all the coins*** (10 pennies, 2 nickels, 1 dime) ***that would make 30¢.***

T: ***What is the least amount of money I can ask you to put into the purse?***

S: ***0¢. We could put nothing in the purse.***

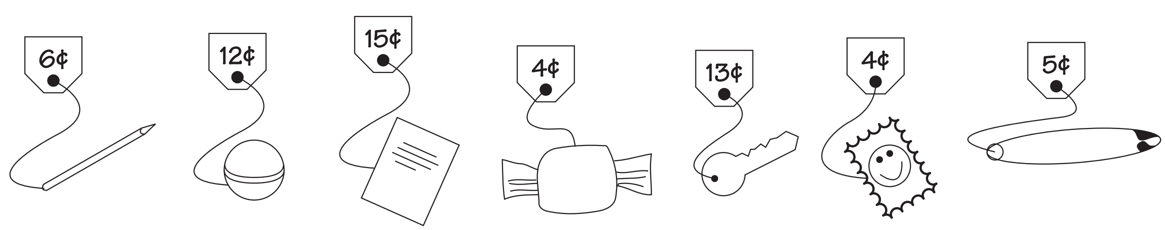
Collect the purses and coins from the groups. As you do this, tell the class you are going to put some amounts in the purses and they have to try to match purses with equal amounts. For example, using nine purses, put 17¢ in three purses three different ways; put 21¢ in three purses three different ways; and put 25¢ in three purses three different ways. Then, redistribute the purses among the groups and invite them to find another group to trade with; one with the same amount of money.

Center Activity

Place coins in a manipulative center for free exploration. Task cards, for combining coins to make given amounts of money, can also be placed in the center. Other task cards can show a collection of coins for which the amount must be written.

Home Activity

Suggest to parents/guardians that they give prices to some small items around the house.
For example,



Parents then give coins to their child and the child uses the coins to “purchase” these items;
for example, to buy the pencil the child shows which coins make exactly 12¢.

F36.1 GEOMETRIC SOLIDS

Capsule Lesson Summary

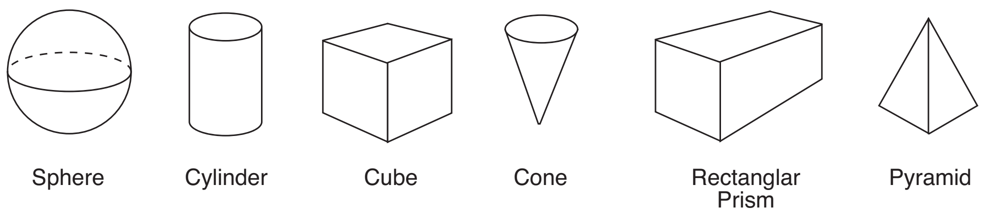
Describe some geometric solids and investigate some of their properties. Find some familiar objects that have shapes like these solids.

Materials

Teacher	• Collection of geometric solids • Blackline F36.1	**Student**	• Geometric solids (if available) • Letter to parents/guardians

Description of Lesson

Display a collection of geometric solids. If possible, provide each pair of students with a collection of solids and allow several minutes for free play.



Begin a discussion by asking students to describe some of the solids. Encourage students to give names to the solids and to recall things they know that look like some of these solids. If you think your students would like to hear the mathematical terms for these solids, use the vocabulary, but do not expect students to recall it.

Instruct the students to work in pairs answering some of these questions:

- What could you make with some of these solids?
- Which solids can you roll?… stack?… slide?
- Which solids have a flat side?… look the same from all directions?
- What things in the room look like one of these solids?
- Choose two solids. How are they alike? How are they different?

Pairs of students can work on the first question.Then, as you circulate, pose some of the other questions for different pairs to investigate.

Prepare a letter similar to the one on the next page to send home with the students. A copy of this letter is available on Blackline F36.1. Tell the class you would like them to bring some things from home that have one or more of these shapes. Solicit some ideas from the students to help them think about what they might look for at home.

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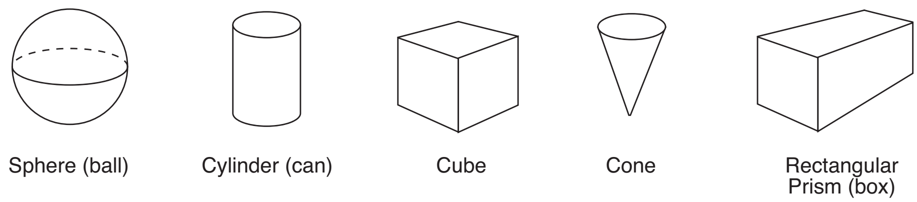
Dear Parent/Guardian:

Please help your child locate several objects at home that have one or more of these shapes.



Then, help your child choose one or two of these objects to bring to school. Please do not let your child choose an object that may be damaged or is valuable.

We will be making a graph with these objects, so they will need to remain at school for a week or more.

Thank you for your help.

Sincerely,

F36.2 +2 SNAKE

Capsule Lesson Summary

Use a snake with +2 arrows to associate adding two and counting by twos. Teach the calculator to count by twos and follow the +2 snake.

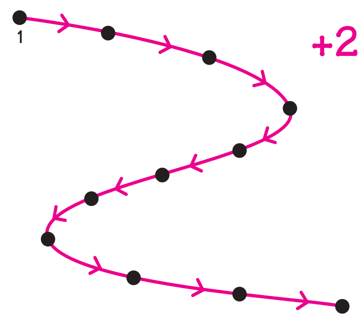
Materials

Teacher	• Colored chalk • Overhead calculator	**Student**	• Worksheet F36.2 • Calculator

Description of Lesson

Exercise 1

Distribute copies of Worksheet F36.2 and draw the arrow picture from the worksheet on the chalkboard.



T: ***The red arrows are for +2. When we follow a red arrow we must add two.***

T (pointing to the dot labeled 1)**:** ***Hold up one finger.***
Now add two; hold up two more fingers. (Trace the first +2 arrow as you say this.)
How many fingers are you holding up altogether?

S: ***Three.***

T: ***Yes. One plus two is three.***

Ask a student to come to the board and label the second dot 3. Instruct everyone to label the same dot on their worksheets.With your left index finger, point to the first dot; with your right index finger, trace the arrow from the first to the second dot saying,

T: ***One… plus two… is three. This dot is for 3.***

T: ***Now, we wish to add two again*** (trace the next +2 arrow)**.**

Point to *3* on the number line and count up two more spaces.

T: ***Three plus two is five.***

Invite a student to label the third dot 5 while everyone labels the same dot on their worksheets. Point to the second dot and trace the second arrow as you say,

T: ***Three… plus two… is five.***

Continue to label the rest of the dots, using a combination of these methods. To emphasize that the picture could go on and on, you might ask—after the last dot is labeled—whether the class thinks you could continue adding two as long as you wish.

Exercise 2

Display an ~~overhead calculato~~r or a class calculator.

T: ***Do you remember how we taught the calculator to count, and then it could follow a counting (by ones) snake?***

Encourage students to recall the process of teaching the calculator to count by ones:

1. Put on the starting number.
2. Press $\boxed{+}$ $\boxed{1}$.
3. Press $\boxed{=}$ $\boxed{=}$ $\boxed{=}$ and so on.

T: ***This +2 arrow picture is also a counting snake, but instead of counting by ones it shows counting by twos (or skip-counting). Do you think we could teach the calculator to count by twos and follow our +2 arrow picture?***

Allow a few minutes for students to discuss the question and observe that the difference is +2 rather than +1. That is, counting by twos requires adding 2 each time to get the next number rather than adding 1. They should decide to teach the calculator to count by twos in the following way:

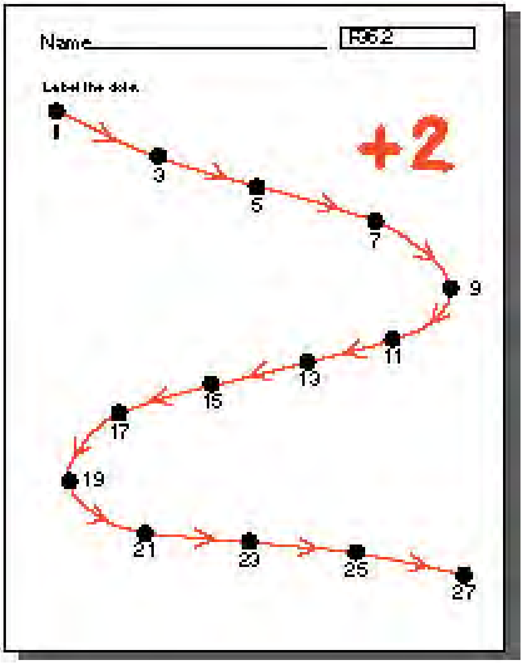
1. Put on the starting number.
2. Press $\boxed{+}$ $\boxed{2}$.
3. Press $\boxed{=}$ $\boxed{=}$ $\boxed{=}$ and so on.

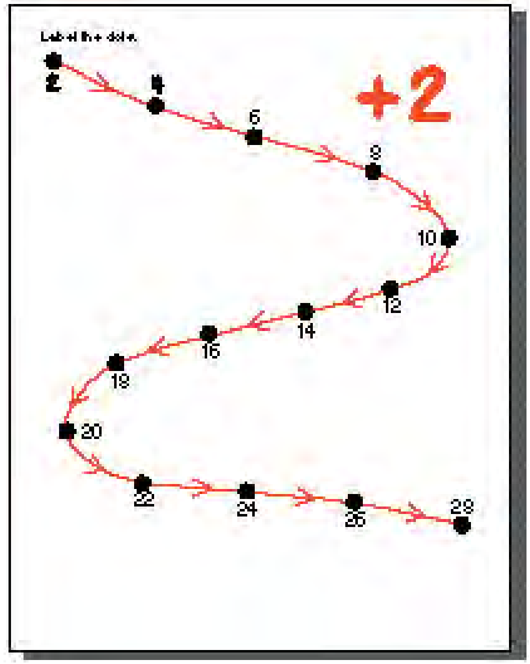
Do this on the overhead or class calculator and observe the calculator following the arrow picture.

T: ***Could we count by twos starting at a number other than 1?***

Students may suggest starting at 0. In this case, erase the numbers in your arrow picture and put 0 at the first dot. Then let one student teach the calculator to count by twos starting at 0. Instruct the student (or students) to press $\boxed{=}$ on the calculator very slowly, while other students label the dots in the arrow picture. If students suggest starting at another number, such as 10, repeat the labeling and counting process.

Erase the board and direct students to complete the back side of Worksheet F36.2. Make calculators available to all students, individually or in pairs. Students who finish quickly can continue the +2 picture on another piece of paper.


Name
Label the dots.
+2


Label the dots.
+2

F37 MINICOMPUTER INTRODUCTION #2

Capsule Lesson Summary

Use the Minicomputer to represent numbers from 1 through 10. Introduce some trades on the Minicomputer and relate these to addition facts.

Materials

Teacher
- Minicomputer set
- Base-10 blocks or other place value manipulatives

Student
- Base-10 blocks or other place value manipulatives

Description of Lesson

Display two Minicomputer boards. You may like to ask students to show the numbers put on the Minicomputer with base-10 blocks at their places.

Exercise 1

T: ***Who remembers how to put 2 on the Minicomputer?***

Ask a volunteer to put 2 on the Minicomputer. Praise any correct response. If the answer is incorrect, tell the class which number has been put on the Minicomputer and ask for another volunteer.

Repeat this question for the numbers 4, 1, and 8. Review the configurations for 1, 2, 4, 8 and then remove all checkers from the Minicomputer.

Hold up three fingers.

T: ***Who can put 3 on the Minicomputer?***

If a student puts three checkers on the white square of the ones board, lift the checkers one by one and say, "One plus one plus one is three." Remove the checkers and ask if someone can put 3 on the Minicomputer in another way.

When a student puts on the standard configuration for 3, lift each checker as you mention it and then replace it on the Minicomputer.

T: ***Two plus one is three.***
One plus two is three.

Demonstrate this fact with your fingers. Remove the checkers from the board and repeat this activity for 5, 6, 9, 7, and 10. Accept all correct answers but continue to ask for another way until a student suggests the standard configuration.

If you did not introduce your students to the standard configuration for 10 in Lesson F34, do so now.

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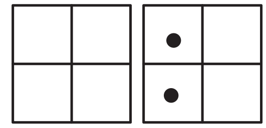
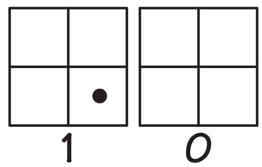


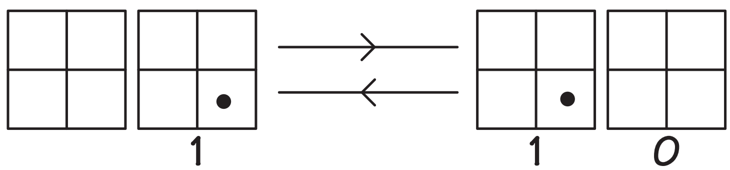
T: ***Can anyone put 10 on the Minicomputer?***

T: ***Yes; eight plus two is ten.***
There is another way to show 10, using only one checker.

Remove the checkers from the ones board and place one checker on the white square of the tens board. Be sure to verbalize the trade *eight plus two is ten*. Write 1 below (or above) the tens board, and 0 below (or above) the ones board.

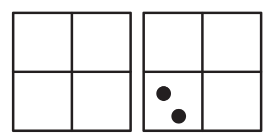


Move the checker quickly back and forth from the white square on the ones board to the white square on the tens board. As you do this, lead the class in saying "one-ten-one-ten."



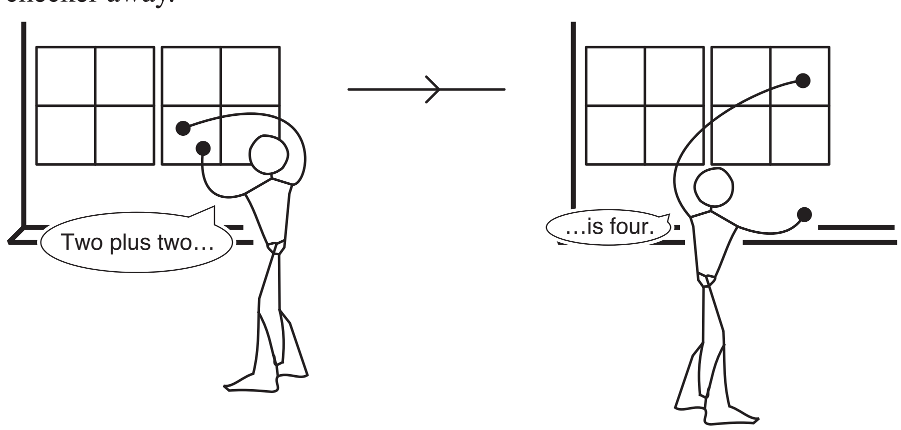
Exercise 2

Put two checkers on the Minicomputer as shown.

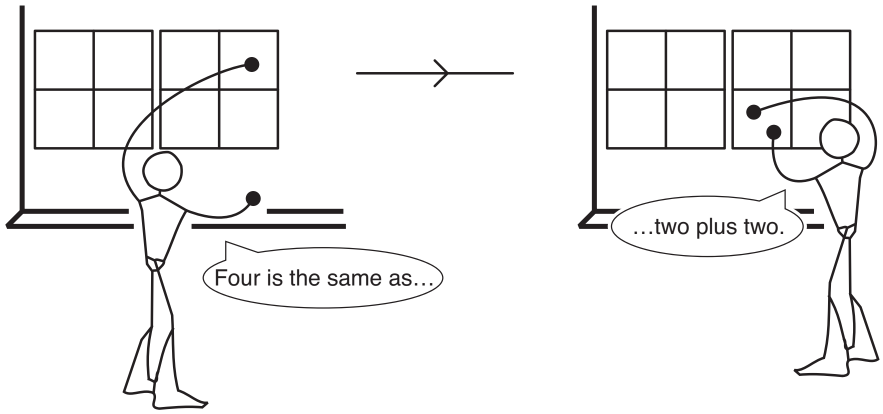


T: ***What number is this?*** (4)
How do you know? (2 + 2 = 4)
This is 4 with two checkers. Can someone show us how to put 4 on the Minicomputer with only one checker?

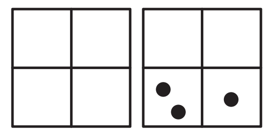
When a student suggests putting a checker on the purple square, emphasize the trade *two plus two is four*. Repeat the trade yourself in a very dramatic way making it as obvious as possible. First, pick up the two checkers on the red square. Be sure to use both hands with one checker in each hand. As you pick them up say, "Two plus two is four." Then put one of the checkers on the purple square and put the other checker away.



Pause, then pick up the checker on the purple square and say, "Four is the same as two plus two." While you are speaking pick up another checker and place both checkers on the red square.



Put three checkers on the Minicomputer as shown.



T: ***What number is this?*** (5)
How do you know? (4 + 1 = 5 or 2 + 2 + 1 = 5)
Can someone show us how to put 5 on the Minicomputer with only two checkers?

When someone puts the standard configuration for 5 on the Minicomputer, you should demonstrate the 2 + 2 = 4 trade again.

T: ***This is another way to show 5 because 4 = 2 + 2…***

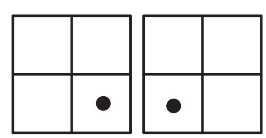
Demonstrate the 4 = 2 + 2 trade.

T: ***…and 2 + 2 = 4.***

Demonstrate the 2 + 2 = 4 trade.

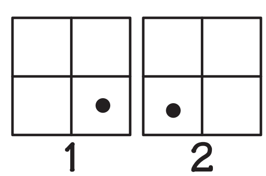
Exercise 3

Put this configuration on the Minicomputer.



T: ***What number is this?*** (12) ***Ten plus two is twelve.***

Point to the appropriate checkers as you say this. Write 12 below (or above) the Minicomputer. Use base-10 blocks or other place value manipulatives to model 12 as one ten and two ones.



Capsule Lesson Summary

Discuss an arrow picture in which the dots are for children and the arrows are for "sent a card to." Pose several comparing and/or counting questions.

Materials

Teacher		Student	
	• Colored chalk		• Colored pencils • Paper

Advance Preparation: You may want to draw the dots from the picture in this lesson on the chalkboard or on a sheet of chart paper before the lesson begins.

Description of Lesson

You may like to introduce the relation in this lesson as one about an upcoming event; for example, use Halloween or Thanksgiving cards.

T: ***Today we are going to look at some children sending cards. Here are the children.***

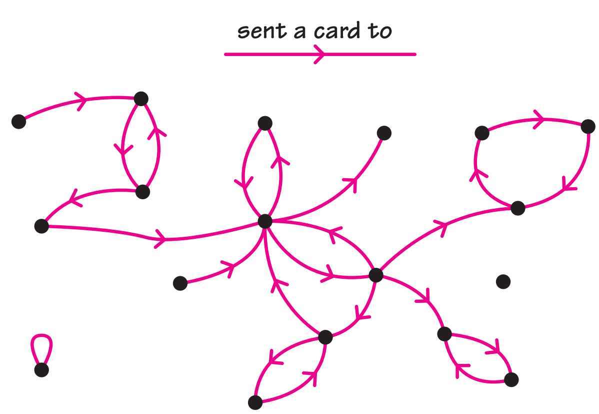
Draw 18 dots as in the next illustration, but without arrows yet.

Invite several students to count the dots but keep the pace brisk. If students have trouble keeping track of which dots they have counted already, assist by putting a mark next to each dot as it is counted. Erase the marks before continuing.

Draw one of the arrows from the picture below, while saying,

T: ***This child*** (point to the dot where the arrow starts) ***sent a card*** (draw the arrow) ***to this child*** (point to the dot where the arrow ends)**.**

Ask the students to close their eyes while you complete the arrow picture.



T: ***Open your eyes. Look at the picture silently and think carefully about it.***

After a minute or so, invite the students to discuss the drawing. Let them express their thoughts spontaneously, even if they are not directly related to the arrow picture.

S: ***It's a very complicated picture.***

S: ***It's pretty.***

S: ***There are many arrows.***

S: ***It looks strange!***

S: ***I see one child who received a lot of cards.***

In the case of a remark like this last one, ask the student to point to the child and to explain; for instance, trace all the arrows that end at the dot. Mention that each child who sends a card is at the beginning of an arrow, and each child who receives a card is at the end of an arrow.

S: ***I see one child who sent four cards.***

Ask the student to point to the dot and to trace the four arrows starting at that dot.

As the spontaneous discussion begins to fade, extend it with these questions for as long as the class remains interested. Be sure to ask students to explain their thinking by referring to the diagram.

T: ***Which child sent the most cards? How many?***
Find a child who sent only one card?
Which child received the most cards? How many?
Find a child who received no cards.
Find a child who sent exactly one card and received exactly one card.
What do you think about the child whose dot has a loop?
Find all the pairs of children who sent cards to each other?
How many cards were sent altogether? (23)
How many cards were received altogether? (23)
Which child would you like to be? Why?

Distribute unlined paper and ask your students to draw exactly eight dots; one for themselves (label it "me") and seven more dots for seven other children. The students can then draw a story of their own, using arrows of one color for "sent a card to." Many different pictures are possible. Invite some students to show and explain their finished drawings to the class.

Reading Activity

Read a story about sending cards or about the event you used in presenting this lesson.

Writing Activity

You may like to ask students to write a story about the way they sent cards.

F39.1 TWO SETS #1

Capsule Lesson Summary

Use a string picture to classify the family cars of class members. Have students analyze the diagram and justify their answers.

Materials

Teacher	• Colored chalk	**Student**	• None

Advance Preparation: The day before this lesson, ask students to find out the make and color of their family cars. Adjust the lesson, if necessary, so that there are dots in all the regions of the string pictures.

Description of Lesson

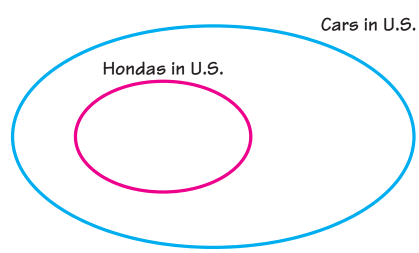
Draw a large string on the chalkboard and label it "Cars in U.S."

T: ***This string is for all the cars in the United States. Who would like to draw a dot for their family car?***

Let two or three students place dots for their family cars.

Also ask several students to draw dots for things that belong outside of the string; for example, a dot for a car in Europe, or a bicycle, or a horse, or a number, none of which are cars in the United States.

Erase all the dots and draw a string for all the Hondas in the United States. This string should be entirely within the first string as shown.



Once again, ask several students to draw dots for their family car. If it is a Honda it must be inside the red string. If the car is not a Honda, it must be outside the red string but inside the blue string.

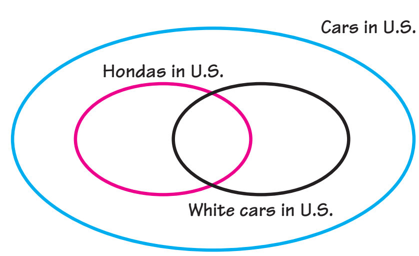
Ask again about dots for some things that belong outside the blue string.

Erase the dots but let the strings remain.

T: ***Who can trace a string for all the white cars in the United States?***

When a student has traced the string properly, use a third color of chalk to draw the string.

The correct placement of this third string is illustrated here.



(See **Comment** at the end of this lesson for ways to handle incorrect placements of the third string.) Once the correct placement has been found, draw the string yourself and proceed.

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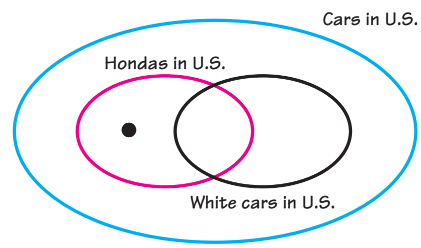
Ask several student to come to the front of the class, tell the kind and color of their family cars, and draw dots for them. Try to include dots in all regions of the picture.

Again, erase all dots but let the strings remain. Draw a dot as shown.



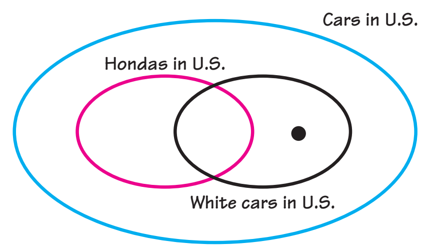
T: ***What could this dot be for?***

S: ***A Honda.***

T: ***A white one?***

S: ***No.***

Erase the dot and draw a new one.

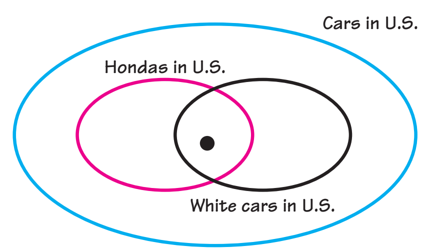


T: ***What could this dot be for?***

S: ***A white car.***

S: ***But not a Honda.***

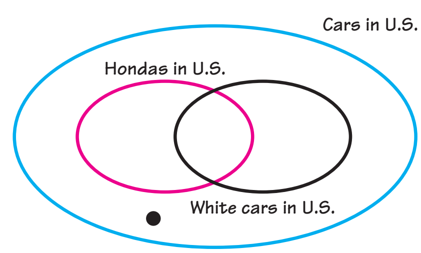
Erase the dot and draw this one.



T: ***How about this dot?***

S: ***A white Honda!***

Erase the dot and draw one in a different region.

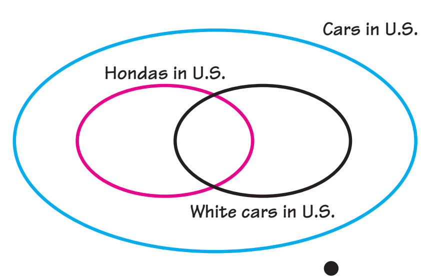


S: ***A yellow Ford.***

S: ***A blue Plymouth.***

T: ***Could the car be white?*** (No)
Could it be a Honda? (No)

Erase the dot and draw a dot in the outside region (outside the blue string).



S: ***A car outside the U.S.***

S: ***A horse.***

S: ***My desk.***

Erase the dot but let the strings remain.

T: ***I am thinking of a car and you must decide where to draw the dot for it in this picture. You may ask me questions but I can only answer either "yes" or "no."***

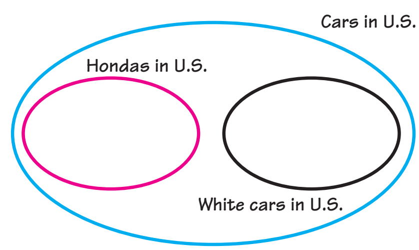
There are three useful questions:

- Is the car in the U.S.?
- Is it white?
- Is it a Honda?

When one of these questions is asked, give the answer and mention that this should help to locate the car in our picture. Answer other questions without comment. When the students have enough information to locate the car, let one of them draw the dot for it.

Comment: **Dealing with incorrect placement of the black† string.** Below are several possible incorrect placements and ways to respond to them. Keep in mind that sometimes one incorrect placement will be simply replaced by another one and you should have ready responses for both.

The incorrect placement most often suggested is shown here.



Ask if anyone disagrees with this placement and if so, why? If someone explains that there is no place to put a white Honda, ask the student to trace a new black string. If no one suggests this explanation, suggest it yourself in the following way.

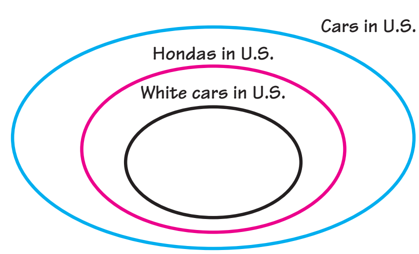
T: ***Who can draw a dot for a Honda in the U.S.?*** (In the red string)
Who can draw a dot for a white Chevrolet in the U.S.? (In the black string)
Who can draw a dot for a white Honda in the U.S.?

S: ***There's no place for it!***

Ask the students to suggest another placement of the black string.

Someone may suggest putting a dot (for a white Honda in the U.S.) in the red string and also in the black string. Remind them that in your picture, each single thing may be shown with only one dot.

Another incorrect placement sometimes suggested is this:



If no one disagrees with this, ask a student to draw a dot for each of the following:

- a red Honda (inside the red but outside the black)
- a white Honda (inside the black)
- a white Ford (impossible)

Ask the students to suggest another placement for the black string.

†In this description, we refer to the string shown here, which is printed in black; on your chalkboard, of course, you have used white or some other color.

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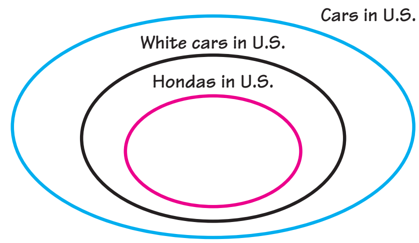


This would be another incorrect placement.

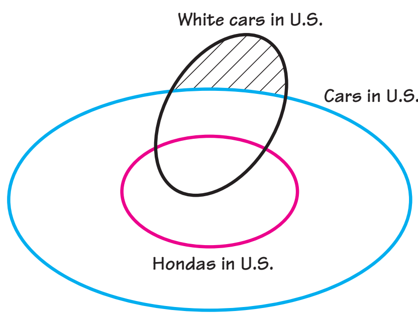
If no one disagrees with this, ask a student to draw a dot for each of the following:

- a white Chrysler (inside the black but outside the red)
- a white Honda (inside the red)
- a black Honda (impossible)

Ask the students to suggest another placement for the black string.

A solution like the following one is not really incorrect, but may not be completely understood.

T: ***This placement could be correct, but perhaps we should hatch this part of the picture to remind us that no dots may be drawn here; there are no white cars in the U.S. which are not cars in the U.S.***



F39.2 GRAPHING GEOMETRIC SOLIDS

Capsule Lesson Summary

Construct a real (concrete) graph of geometric solids brought from home. Discuss and interpret the graph.

Materials

Teacher
- Graphing mat
- Geometric solids

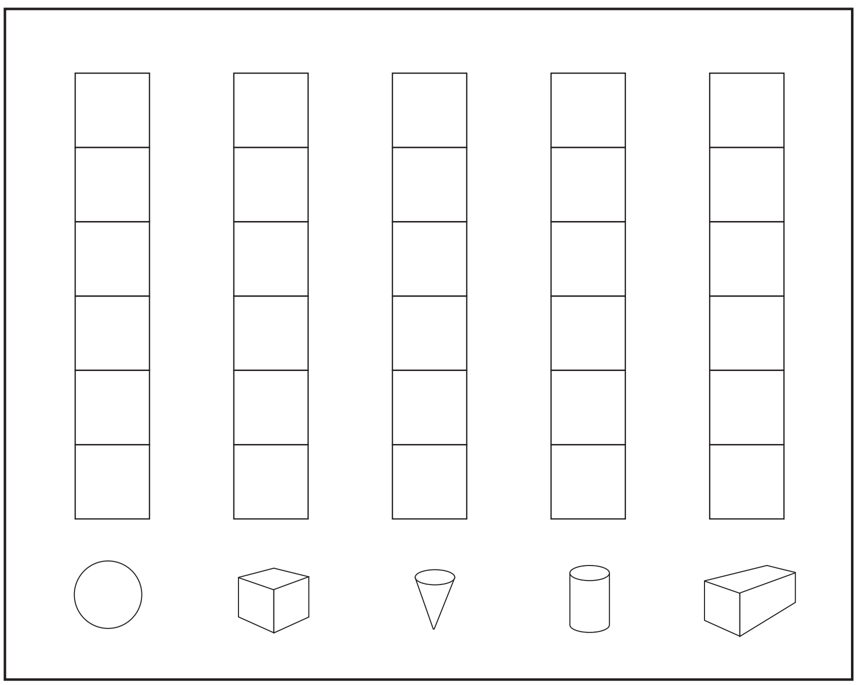
Student
- "Solids" brought from home

Advance Preparation: Prepare a graphing mat (see illustration in the lesson) using chart paper, robot walk grid sheets, or other large grids.

Description of Lesson

In this lesson the class will make a real graph of the solids students brought from home (see Lesson F36.1). In case students did not bring solids from home, provide a few yourself or help them find something in the classroom. Every student should have at least one thing to put into the graph, but you may want to limit the graph to include a maximum of two articles per student.

Prepare a mat similar to the following that the class will use to construct the graph.



Make the squares in the columns large enough to fit the items students brought from home, and make the columns sufficiently high to accommodate the items. Use your geometric solids to label the columns.

F39

With the graphing mat ready on a table or the floor, invite students to place their articles in the graph one at a time. After each placement, question the student and class to check the placement. Use the students' names for solids as well as the mathematical terms (if you wish). For example, suppose a student places a marble in the sphere column.

T: ***Does it look like a ball (sphere)? Does it roll like our ball? Does it look the same from all directions?***

After everyone has placed their articles in the graph and the class agrees with the placements, direct the class in interpreting the graph. For example, ask some of the following questions or ask student to suggest things we learn from the graph.

- Which geometric solids do we have most (least) of?
- Why do you think we found so many balls (spheres) or cans (cylinders) or boxes (rectangular prisms)?
- How many more balls did we find than cubes?
- Why do you think we didn't find many cones?

F40 ADJUSTMENT/ASSESSMENT DAY #4

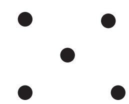
Note: See Section One, page 1-9, for a full explanation of the purpose of scheduled adjustment days. Worksheet F40 provides for a short, written assessment.

Today you may wish to repeat an earlier lesson either for a group of students or for the entire class. Many of the lessons can be made to appear completely different by changing the story and/or the numbers in the lesson. If you omitted any exercises or worksheets from an earlier lesson, you may like to include these. This is also a good time to allow students to work in centers or on a project of your choice.

The following game activities may be appropriate for students whose numerical readiness is weak.

How Many ?

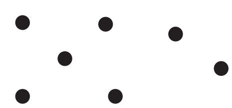
Draw these dots on the chalkboard, use magnetic checkers on a magnet-sensitive board, or use counters on a mat.



T: ***These are children playing in a park. How many are there?***

S: ***Five.***

Draw two more dots (or put out more checkers or counters).

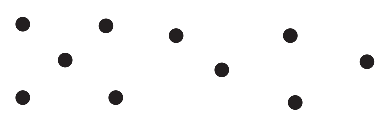


T: ***Now how many children are there?***

Encourage the students to answer without starting to count from one again. If they cannot answer immediately, you can demonstrate counting-on: Put your hand over the first five dots, then point to the other two as you count "six," "seven."

T: ***Here come some more children.***

Add three more dots (checkers or counters).



S: ***Three more.***

T: ***Correct, how many children altogether?***

S: ***Ten.***

Follow the same counting technique as before. Afterwards, if you feel your group is unsure about the method you have used, ask a student to count by ones as a check.

T: ***It is getting dark and , one by one, the children are going home. Remember there are ten of them. One goes home*** (erase one dot or remove one counter)***. How many are left?***

Continue to erase one dot (remove one counter) at a time, each time asking how many children are left. Afterwards, ask a student to point to *10* on the numeral chart or the number line and to count backward by ones.

F40

Tell a Story

Choose a number, for example 8, and invite students to tell a story using the number.

S: ***8 is my favorite number.***

S: ***My friend's dog had 8 puppies, 6 females and 2 males.***

S: ***Each person at our table has two hands, so there are 8 hands at our table.***

S: ***There are 8 more days until my birthday.***

Sometimes ask questions that encourage students to use properties of 8 in their stories.

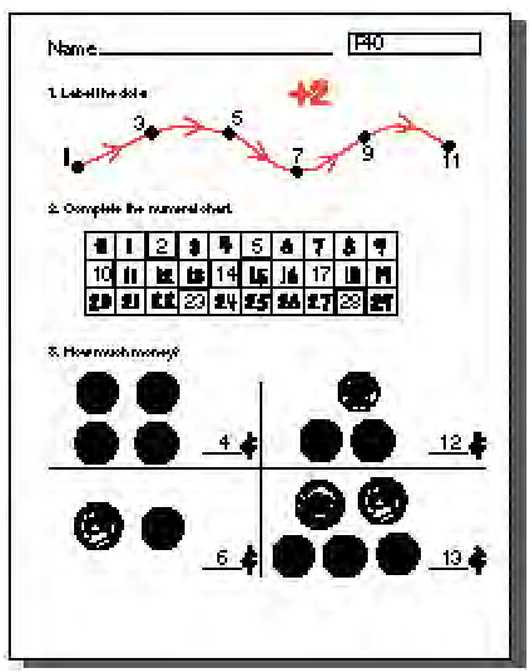
Repeat this storytelling activity using other numbers or two different numbers. For example, tell a story using the numbers 6 and 10.

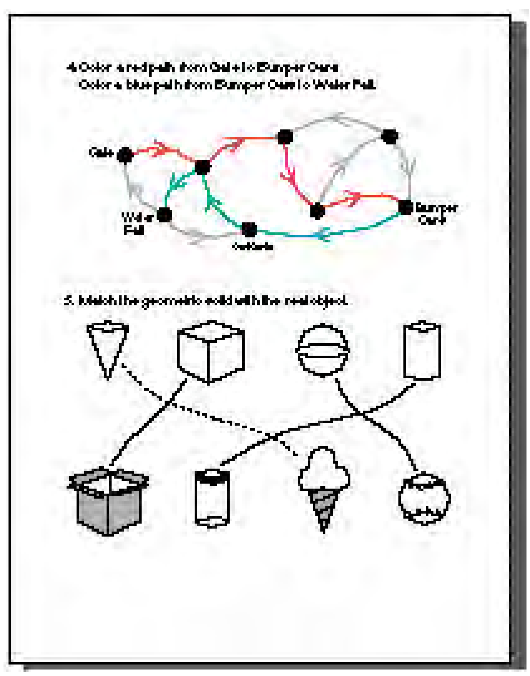
If your class is experiencing little difficulty with the *CSMP* curriculum, you may wish to omit this adjustment day and continue immediately with F41.1 *Minicomputer Introduction #3*.

Early Warning

Among the next nine classroom lessons are some that require extra preparation or involve materials not included with the *CSMP* Classroom Set. The lessons are listed here for your convenience in preparing for them. A more detailed description of the needed materials can be found on the first page of each lesson. (Special materials are listed here only once, even if they are used more often during the nine-day period.)

F44 *Calculator Addition and Subtraction*: Calculators; counters
F45.2 *Addition Story #3*: Coins
F46 *Measurement #1*: Measuring tools; collection of fruits; chart paper; scissors; tape
F48.2*Candies to Share*: Candies or objects to represent candies





F41.1 MINICOMPUTER INTRODUCTION #3

Capsule Lesson Summary

On the Minicomputer, review representing numbers from 1 to 10 and continue by showing some other numbers less than 20. Introduce some new trades on the Minicomputer.

Materials

Teacher
- Demonstration numeral cards
- Minicomputer set
- Base-10 blocks or other place value manipulative (optional)

Student
- Minicomputer set (optional)
- Base-10 blocks or other place value manipulative (optional)

Description of Lesson

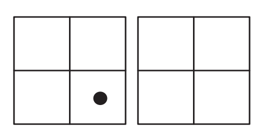
Exercise 1

Display two Minicomputer boards. Tell the students that you are going to put some numbers on the Minicomputer and that they are to tell you, with their fingers, which numbers these are. Briskly, review 2, 4, 1, 8, 3, 6, 5, 9, 7, and 10 on the Minicomputer. For each number, call on a student to answer aloud after the students have had an opportunity to show you the number with their fingers.

Place one board and some checkers at four separate locations around the room. Divide the class into four groups. Tell your students that you are going to hold up a numeral card (from *0* to *10*) and that a student in each group should put that number on the Minicomputer. Accept non-standard configurations as correct, but try to get at least one display of the standard configuration. If someone puts the wrong number on the Minicomputer, other group members should help the student put on the number. You may prefer to conduct this activity with pairs of students working on individual Minicomputers.

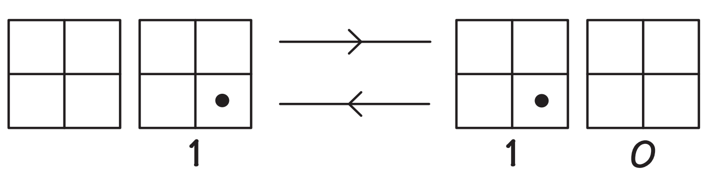
Exercise 2

Put this one checker on the Minicomputer.

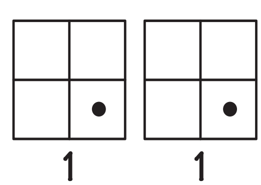


T: ***What number is this ?*** (10)

Move the checker quickly back and forth from the white square of the tens board to the white square of the ones board. As you do this, lead the class in saying "ten–one–ten–one–ten." End with the checker on the tens board.



T: ***If I give you one more checker, can you put 11 on the Minicomputer? Who would like to write 11 below (above) the Minicomputer boards?***



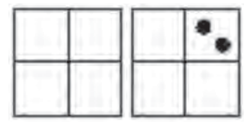
F41

If the numerals are not written clearly below the boards, rewrite 11 yourself with a 1 below both boards. You may also like to ask students to model 11 with base-10 blocks or other place value manipulatives. Remove the checker from the ones board and repeat this activity with 12, 14, and 18. Try to make the relationship between the Minicomputer boards and the written numeral obvious.

If your class is interested and is enjoying the lesson, continue with Exercise 3.

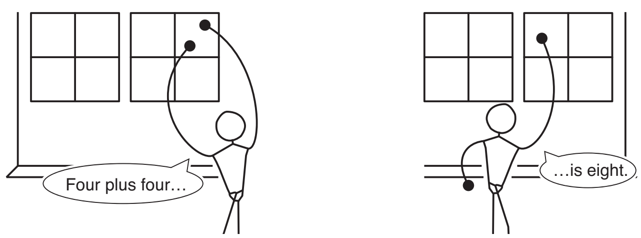
Exercise 3

Put two checkers on the Minicomputer.

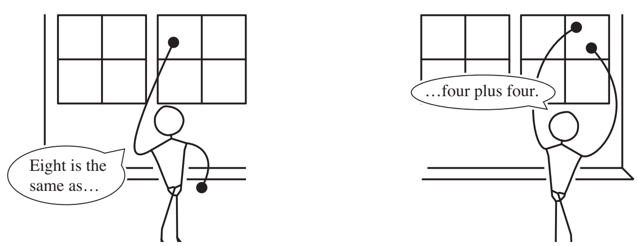


T: ***What is this number?*** (8) ***This is 8 with two checkers.***
Who can show 8 with just one checker?

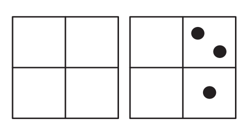
After 8 has been put on the Minicomputer with one checker, repeat the trade yourself as dramatically and obviously as possible. First, pick up the two checkers on the 4-square. Be sure to use both hands with one checker in each hand. As you pick them up say, “Four plus four is eight.” Then put one checker on the 8-square and put the other checker away.



Pause and then pick up the checker on the 8-square and say, “Eight is the same as four plus four.” While you are speaking, pick up another checker with your empty hand and put both checkers on the 4-square.



Put this configuration on the Minicomputer.



T: ***What number is this?*** (9)
How do you know? (8 + 1 = 9 or 4 + 4 + 1 = 9)
Could someone show us how to put on 9 with only two checkers?

After a student has put the standard configuration for 9 on the Minicomputer, demonstrate the 8 = 4 + 4 and 4 + 4 = 8 trades again.

Center Activity

Put two Minicomputer boards and some checkers in a center for practice.

Capsule Lesson Summary

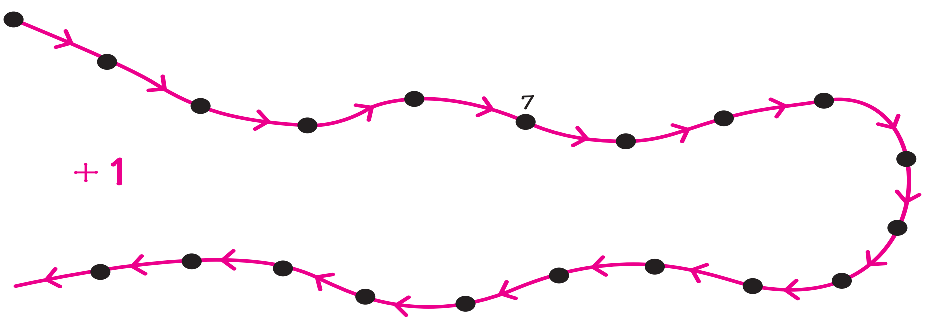
Use a spiral arrow picture with arrows for +1 to associate counting by ones and adding one.

Materials

Teacher	• Colored chalk • Calculator (optional)	**Student**	• Worksheets F41.2* and ** • Calculator (optional)

Description of Lesson

On the chalkboard, draw a long +1 arrow road.



T: ***The dots are for numbers and the red arrows are for +1. Here is the number 7*** (point to the dot labeled 7)**.**

Trace the arrow starting from 7 to the next dot.

T: ***Seven plus one. Which number is this?***

S: ***8.***

T: ***Right. Seven plus one*** (trace the arrow) ***is eight.***

Label the next dot 8 and write the fact 7 + 1 = 8 on the board.

T: ***Eight plus one is…?***

S: ***9.***

Label the next dot 9. Continue "forward" several more steps writing the corresponding facts on the board. Then point to the dot that precedes 7 on the road.

T: ***What number is this?***

S: ***6.***

T: ***Right. Six plus one*** (trace the arrow) ***is seven.***

F41

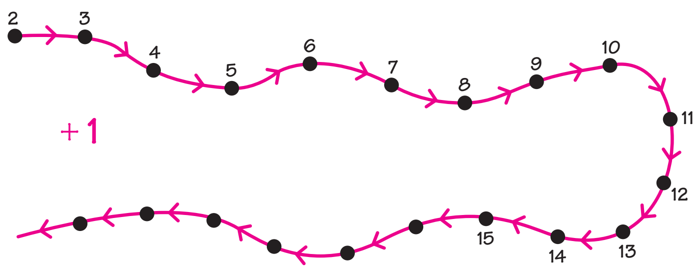
If the students suggest an answer other than 6, such as 5 or 8 say:

T: ***Does five (or eight) plus one*** (trace the arrow) ***equal seven?***

S: ***No.***

T: ***Then this dot cannot be 5 (or 8).***

Continue "backward" labeling the dots for 5, 4, 3, and 2.

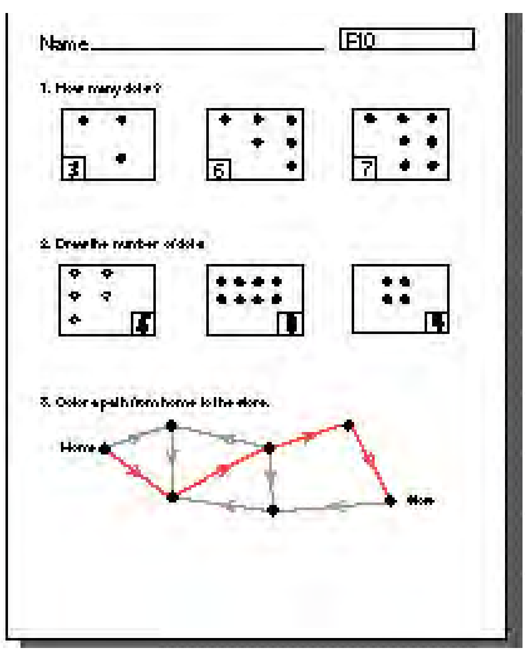


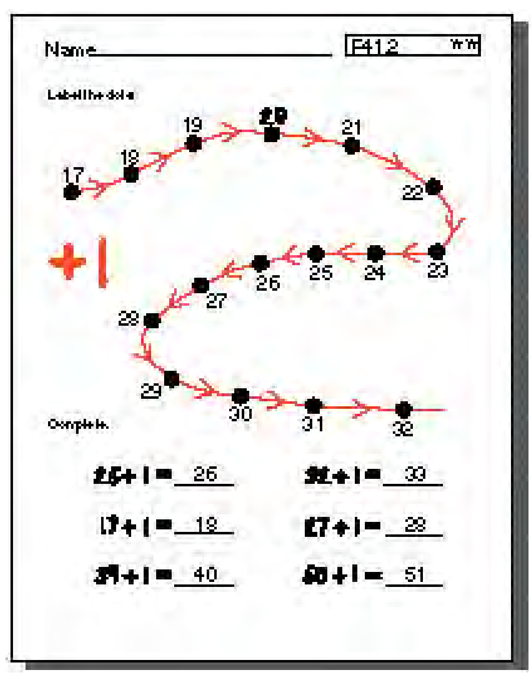
You may like to use a counting calculator (starting at 2) to check the labels for dots on the road.

Worksheets F41.2* and ** are available for individual practice.

Home Activity

Suggest to parents/guardians that they practice adding 1 to a number between 0 and 50 with their child. Recommend they do this by completing addition problems like those on the worksheets or by asking questions (mental arithmetic) such as, "Which number is 1 more than 37?"





F42 THE NUMBERS SPEAK #2

Capsule Lesson Summary

Review the relations *more than* and *less than*. Label the dots in an arrow picture where the arrows are for *is less than*; explore various extensions of this arrow picture.

Materials

Teacher
- Colored chalk

Student
- Colored pencils
- Unlined paper
- Worksheets F42* and **

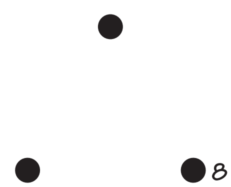
Description of Lesson

Exercise 1

Play the mental game as described in Exercise 1 of Lesson F29 for a few minutes. This game involves students giving numbers less than or more than the previously mentioned number.

Exercise 2

Draw three dots on the chalkboard.



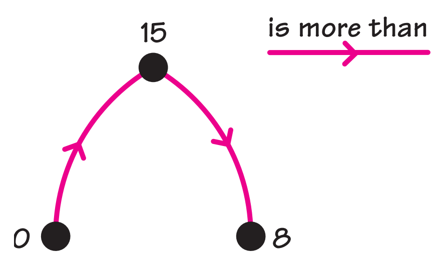
T: ***These dots are for numbers. One of the numbers is 8. We don't know which numbers the other dots are for. These numbers are playing a game. They are saying, "I am more than you."***

Add arrows to your drawing (see next illustration).

T: ***Which number is the least?*** (8)
Which number is the greatest? (The dot on the left)
If this number is 8 (point to 8)***, what could these other numbers be?***

Call on two volunteers each to label a dot. If the students label them incorrectly, ask the class to correct their mistakes.

Here are some labels which might be suggested.



T: ***What does 15 say to 8? What does 20 say to 15?***

S: ***"I am more than you."***

T: ***Is 15 more than 8?*** (Yes) ***Is 20 more than 15?*** (Yes) ***Then this number*** (point to the middle dot) ***could be 15 and this number*** (point to the left dot) ***could be 20.***

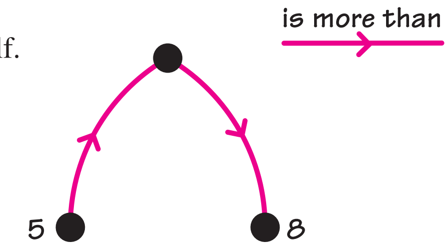
T: ***What does this arrow picture show us?***

S: ***20 is more than 15, and 15 is more than 8.***

F42

Assist the students with this explanation, if necessary. Erase the labels except for *8* and repeat this activity two or three times.

If no student suggests this type of situation, propose it yourself. Point to the dot on the left and label it 5.

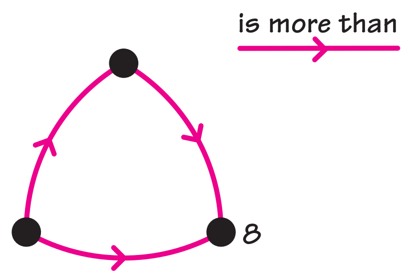


T: ***Could this dot be for 5?*** (No)
How do you know?

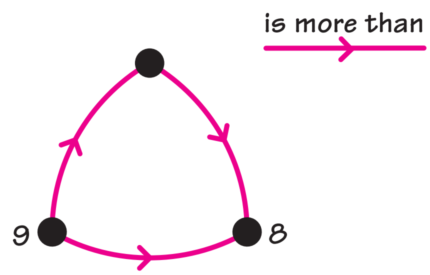
Do not expect a student to verbalize the explanation for this clearly. Accept any answer that implies the following: Since the first number is more than the second one, and the second one is more than 8, the first number must also be more than 8. Erase the 5.

T: ***Could we draw another red arrow?*** (Yes)

Ask students to again suggest labels for the unlabeled dots in this arrow picture.



Note: It is possible for situations to develop which would require the use of numbers other than the whole numbers; for example,

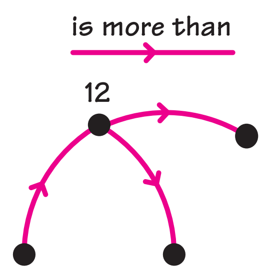


Most first graders will not be aware of any numbers both less than 9 and more than 8, and may conclude that there is no number between 9 and 8. In this case, you should say, “You do not yet know any number which is between 9 and 8.” If a student suggests a number which is between 9 and 8, such as $8\frac{1}{2}$, accept this answer as correct but do not emphasize it. Simply erase the suggested labels and begin again.

Exercise 3

This exercise could be presented as a cooperative group activity.

Erase the previous arrow picture, distribute Worksheet F42*, and draw the picture from this worksheet on the chalkboard.



T: ***What are these arrows for?***

S: ***Is more than.***

T: ***Who would like to read this arrow picture for us?***

When a student volunteers, assist in tracing the arrows on the left and say,

T: ***This number is more than 12.***

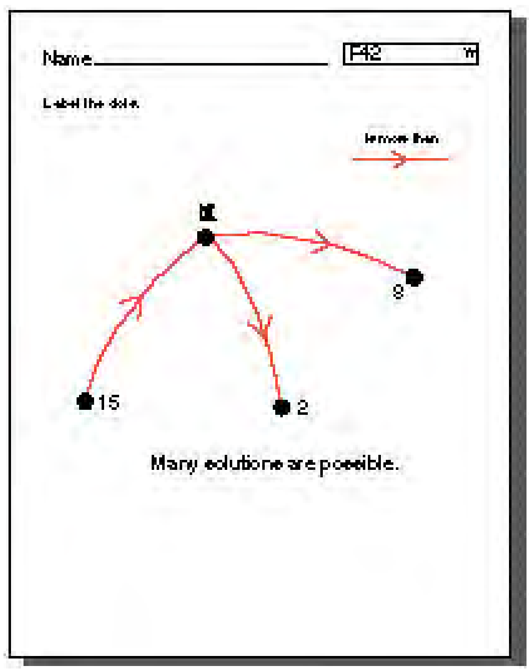
Continue until all three arrows have been read.

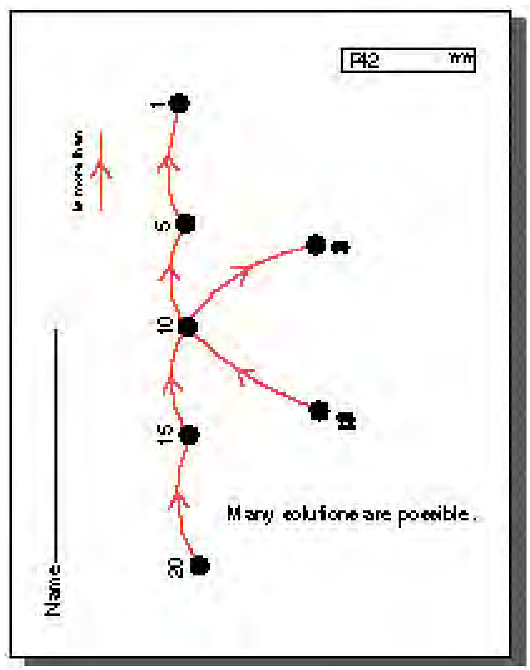
Instruct students to label all the dots on their worksheet.

When some of the students (or groups) begin to finish Worksheet F42*, draw the arrow picture from Worksheet F42** on another board. Instruct students to label the dots.

You may wish to encourage students (or groups) who finish quickly to add some missing red arrows to their arrow pictures, or to continue adding arrows to the picture on either worksheet.

If students are working in groups, you may like to end the lesson by inviting groups to share and compare their labelings.





F43 TANGRAM PUZZLES

Capsule Lesson Summary

Introduce the Tangram and investigate the pieces in various ways (sort, assemble, and so on). Use all seven Tangram pieces to make specified designs.

Materials

Teacher	• Tangram • Overhead projector (optional)	**Student**	• Tangram • Tangram booklet

Note: Cardboard Tangrams are included in the *CSMP* classroom set. More durable Tangrams made of plastic or wood are available from several other sources.

Description of Lesson

You may choose to allow students to work with a partner during this lesson.

Exercise 1

Provide each student or pair of students with a Tangram (set of seven Tangram pieces). Allow several minutes for free exploration and then conduct a short discussion of the pieces:

T: ***How many pieces are there?*** (Seven)
What shapes are the pieces?
What sizes are the pieces?

The seven Tangram pieces are triangles (two big, one medium, and two small), one square, and one parallelogram. Let students give their own names for the parallelogram.

Instruct students to sort the pieces or put them in groups as they like. Then ask some students to share their methods of sorting.

S: ***I put the triangles together and then the square and diamond (parallelogram) together.***

S: ***I did the same; I put the triangles in one pile and those that are not triangles in another.***

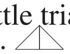
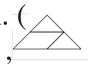
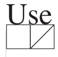
S: ***I made three groups: big, medium, and small.***

Exercise 2

You may like to use an overhead projector for demonstration in this exercise. Place the Tangram pieces on the projector and demonstrate putting two or three pieces together to form another shape.

T: ***Put some pieces together to make another shape.***

Allow a few minutes of free exploration and then give more explicit assembly instructions, such as:

- Use two pieces to make another square. (Two little triangles to make a square like the Tangram square or two big triangles to make a big square: )
- Use two pieces to make another triangle. (Two little triangles to make a medium triangle, or two big triangles to make an even bigger triangle: )
- Use two pieces to make another parallelogram. ()
- Use three pieces to make (1) a triangle (, ); (2) a square (), (3) a rectangle ( , )

Allow students to demonstrate at the overhead. Do not expect or try to get all of the above examples.

Exercise 3

Distribute Tangram booklets and tell the students that the Tangram puzzle is thought to be an ancient Chinese puzzle. Legend says that a favorite square tile was dropped and broke into seven pieces. Scholars spent years trying to put it back together. Show the students the square on the cover of the booklet. Instruct them to use their Tangram pieces to cover the square. Then ask them to make the same square next to the booklet.

Tell the students that in the Tangram booklet there are many different designs they can make with all the Tangram pieces. The instructions for each page of the booklet are the same: Use all seven Tangram pieces to cover the picture on that page. When they have done it, raise their hands and you will check it. Each time you check a page indicate that the student (or pair of students) has successfully made the design with Tangram pieces.

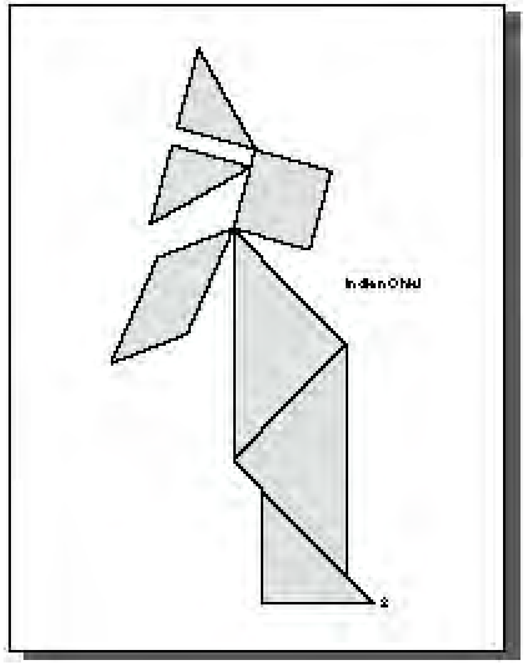
The puzzles vary in difficulty; encourage students to be patient but persistent. Be prepared to give occasional clues (place one or two key pieces or draw some lines to show how some of the pieces fit in a puzzle). If students become frustrated, instruct them to go on to another page and come back to that page later. If some students think Tangram pieces are missing from their sets, suggest they check by putting all their pieces on the cover square.

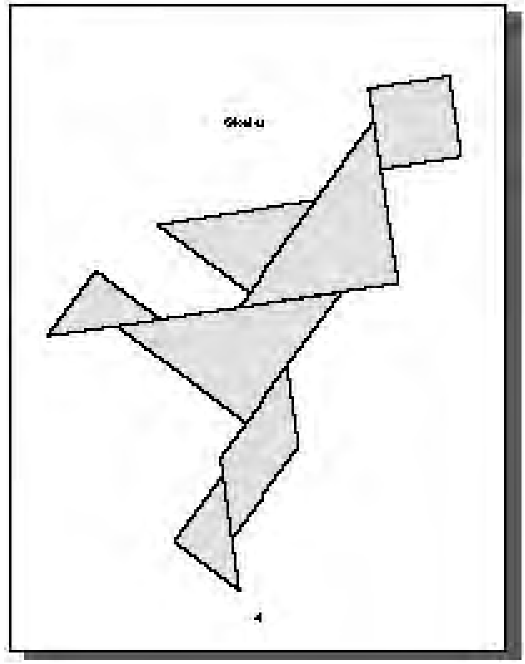
Center Activity

Tangram booklets and Tangram sets can be put in a center for free exploration. Later you can make task cards with other shapes and puzzles.

Home Activity

Copy the Tangram blackline master (Blackline F43) on heavy stock and send it home with a puzzle for students to complete with a family member.


Indian Child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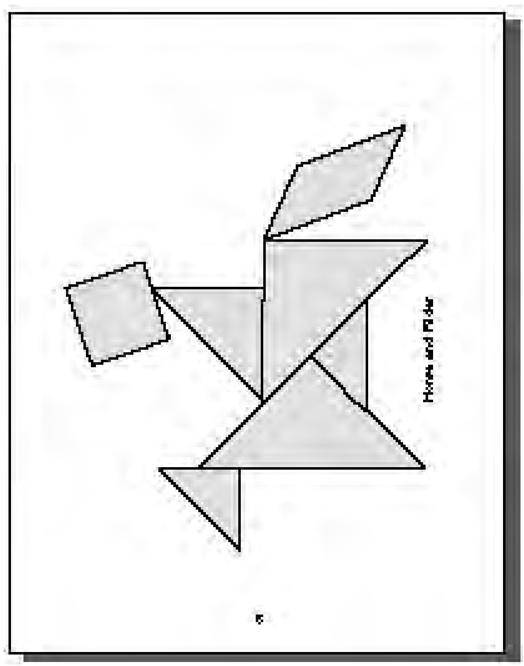
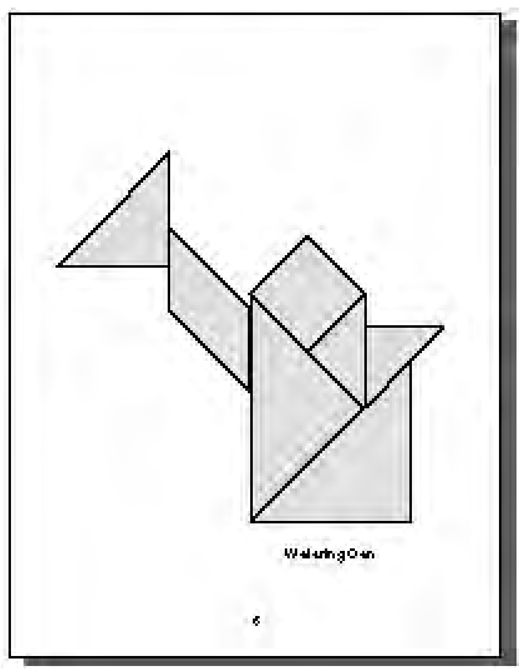

Horse and Rider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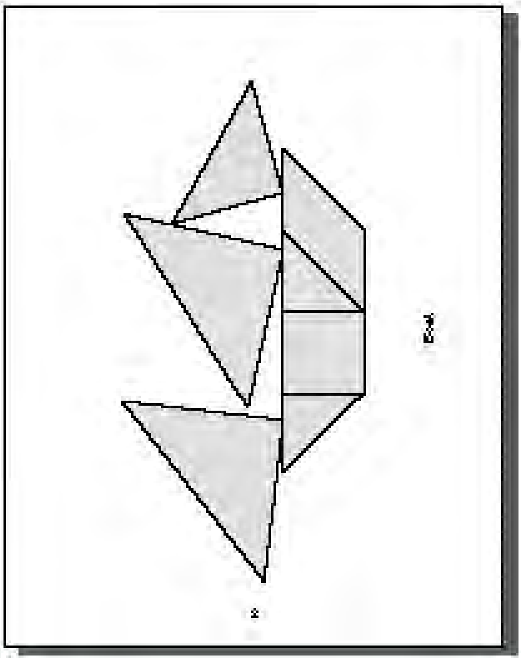

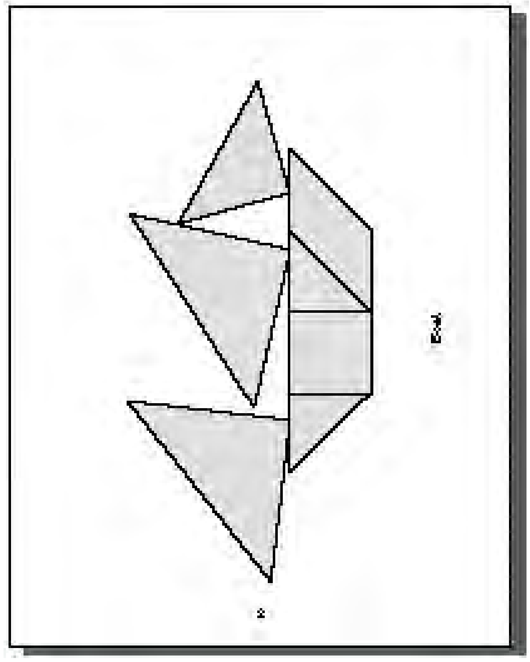

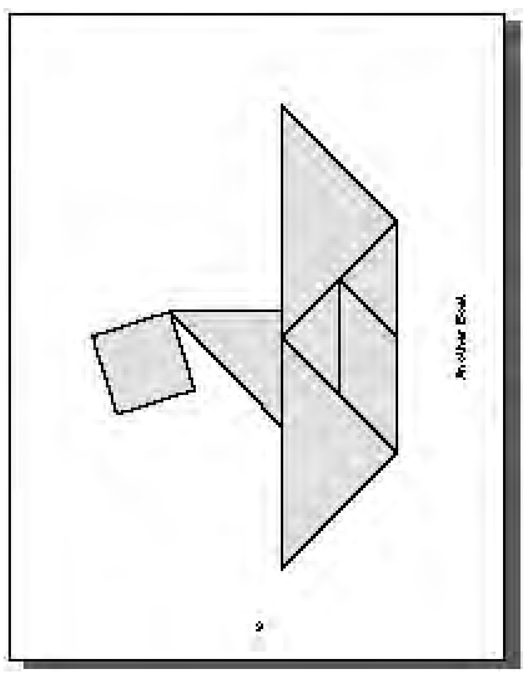

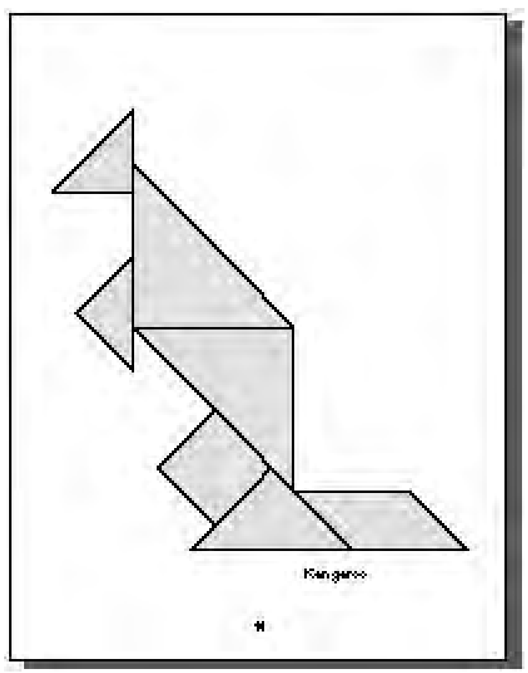

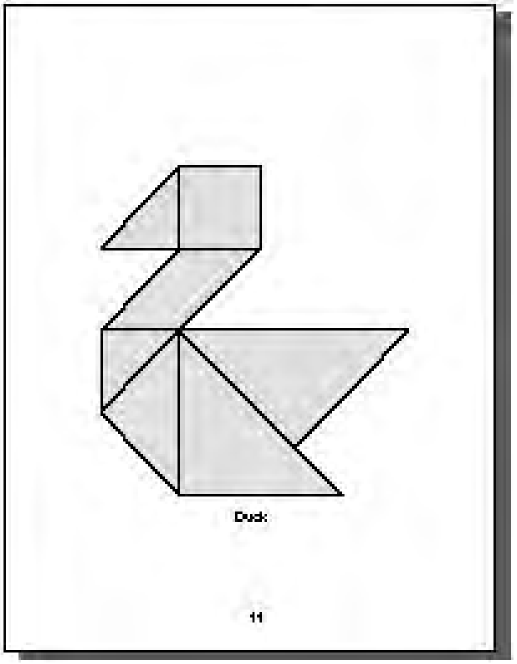
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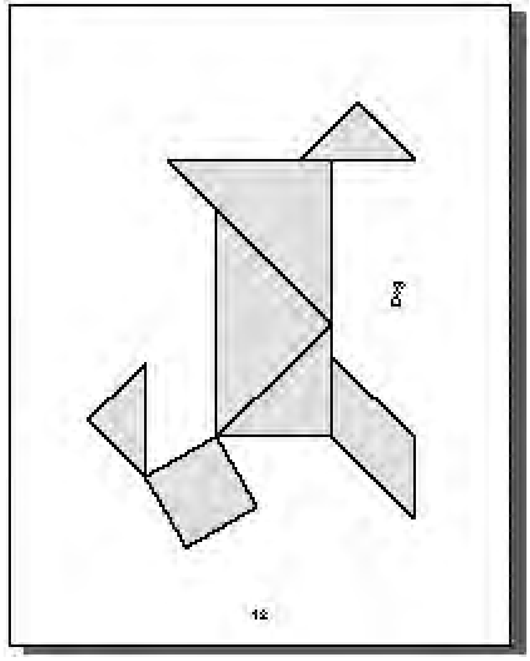
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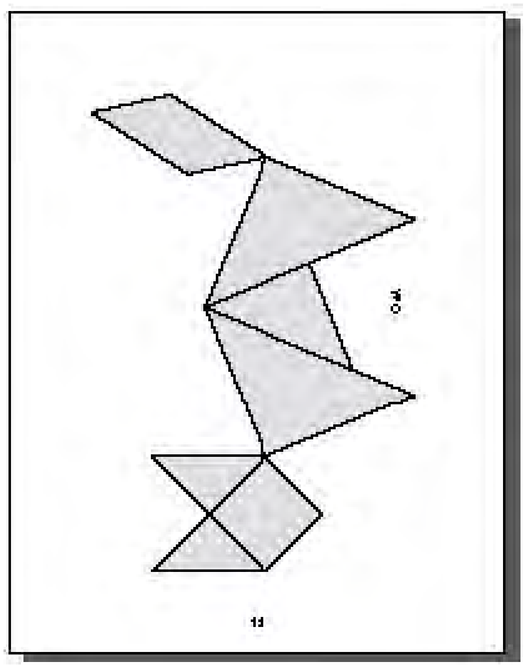
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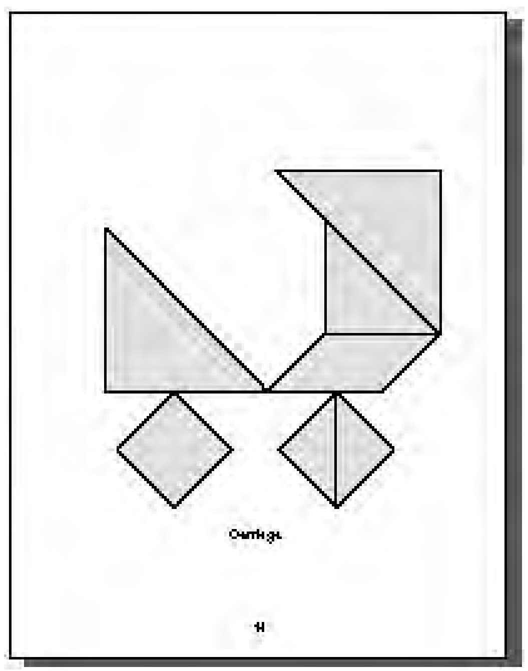
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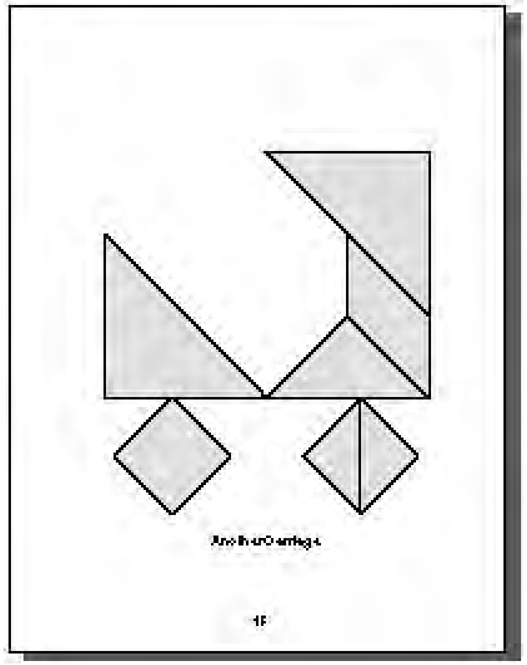

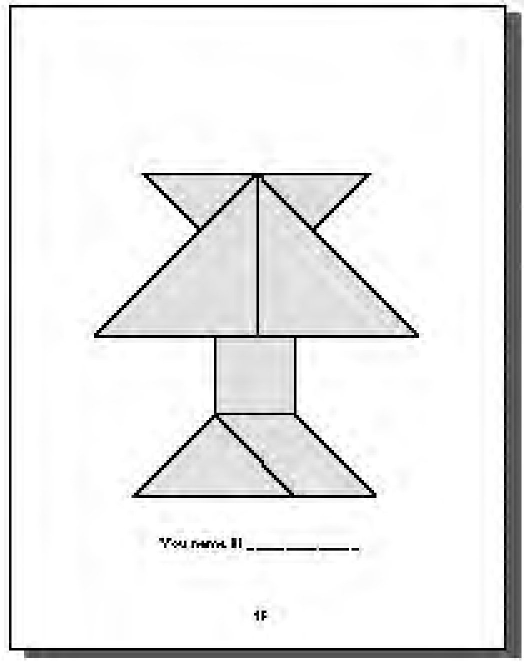

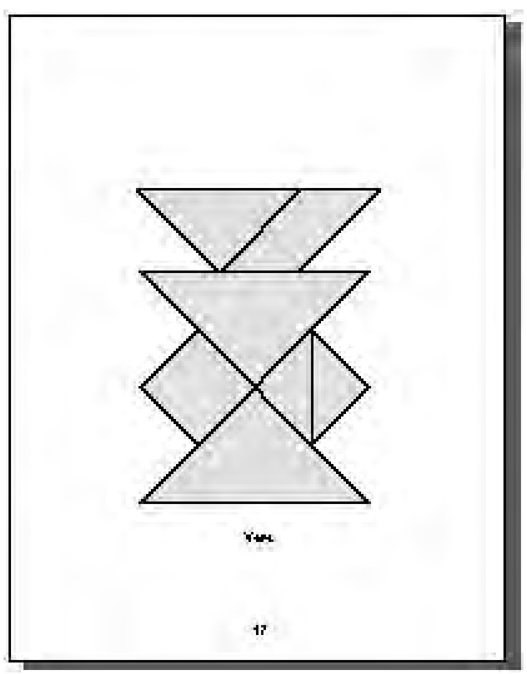

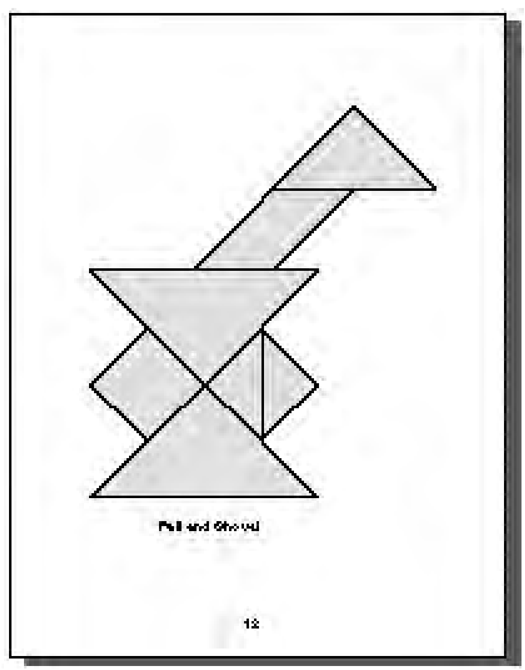

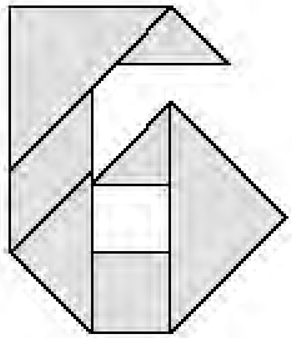

Six

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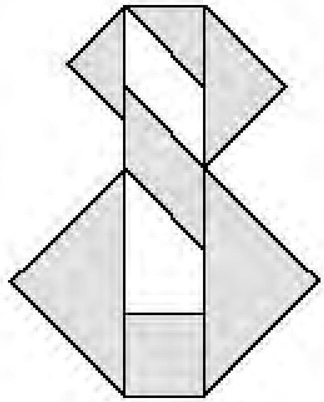

Eight

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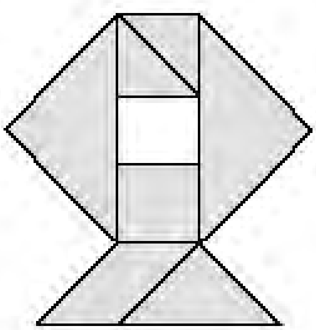
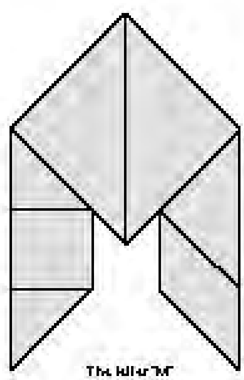


Knight's Helmet

21



The letter "M"

22

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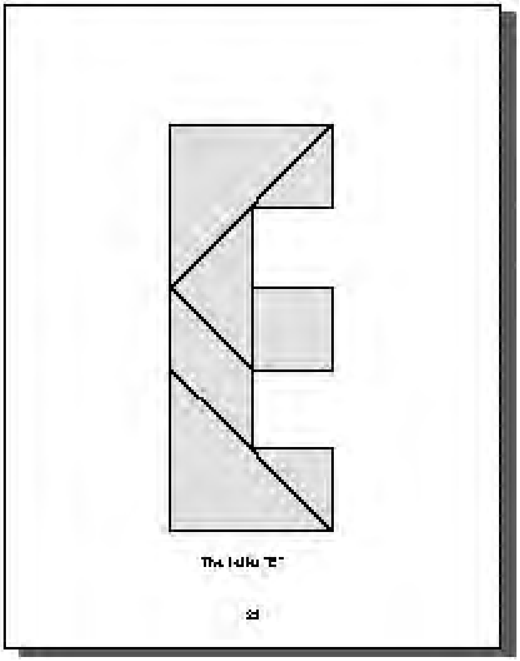

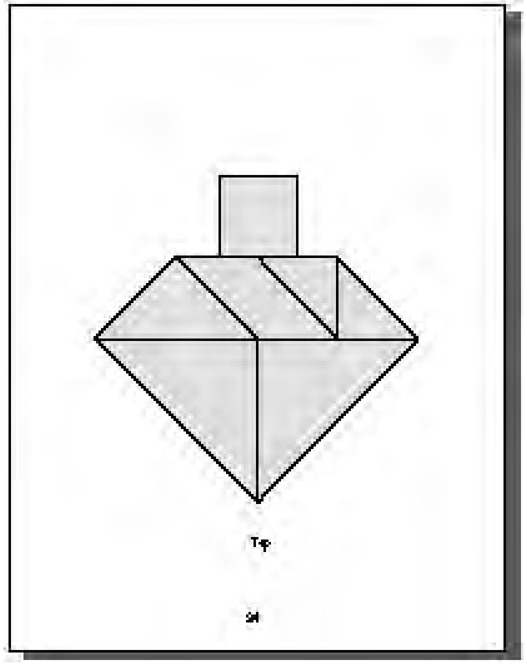

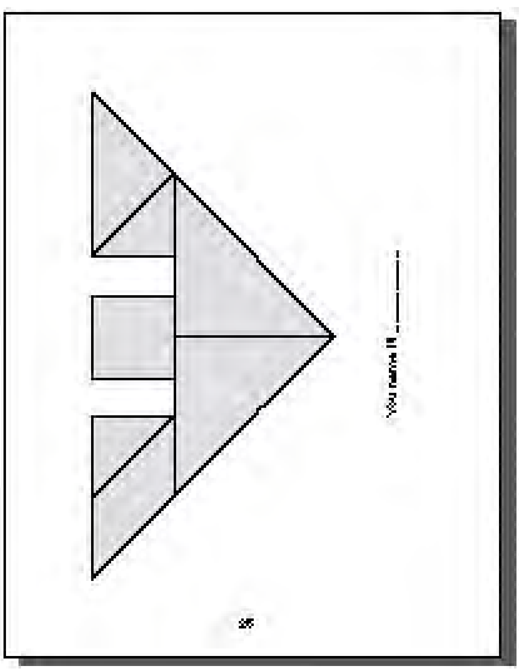

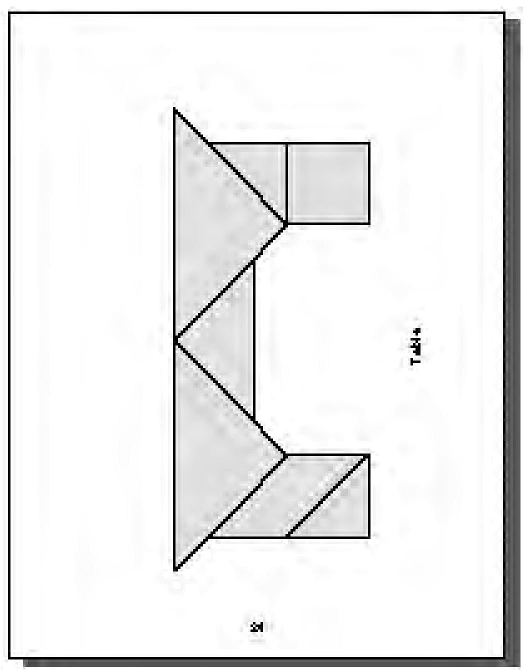

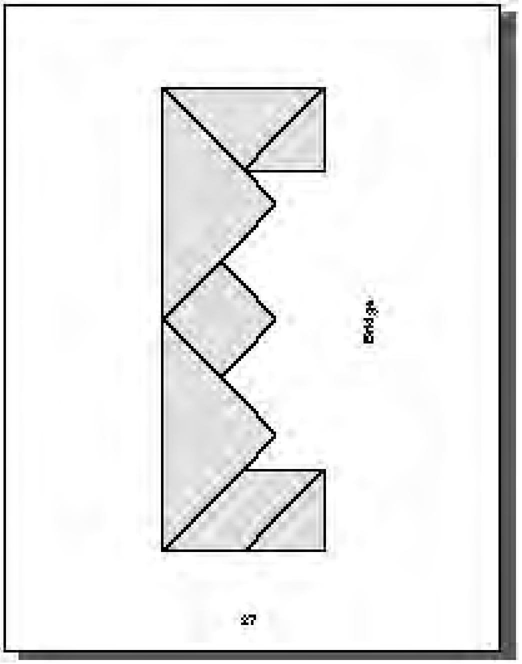
Bridge
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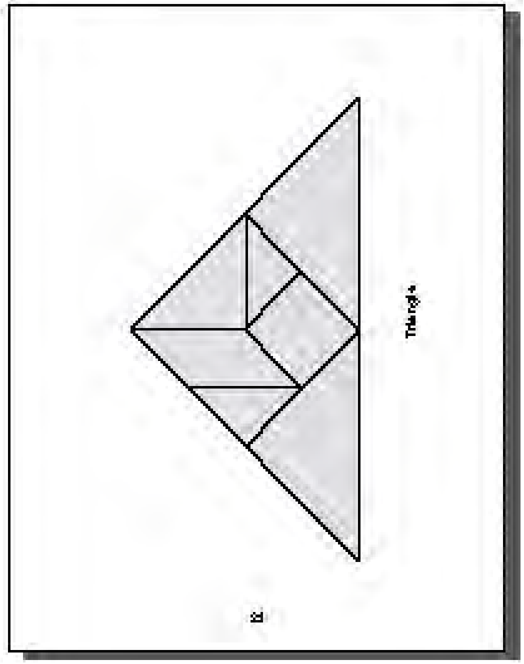
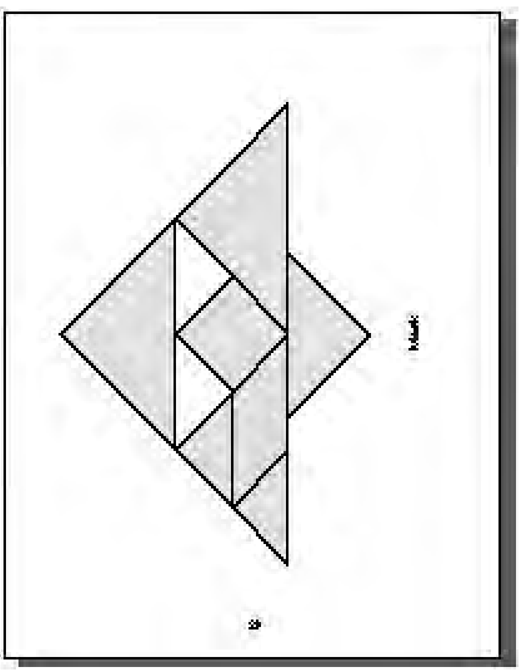
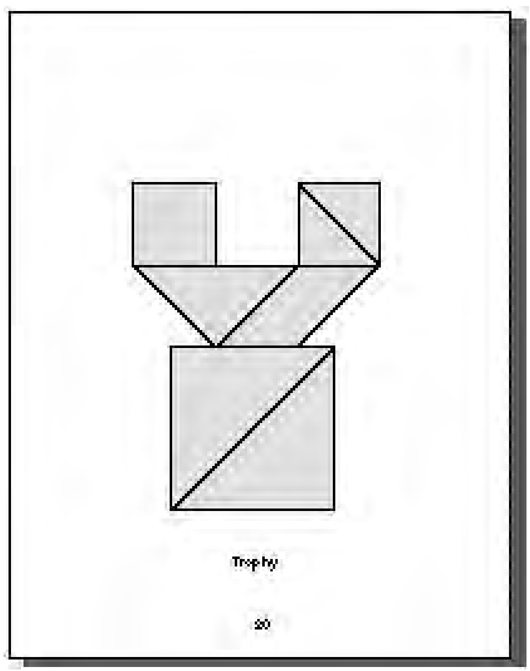
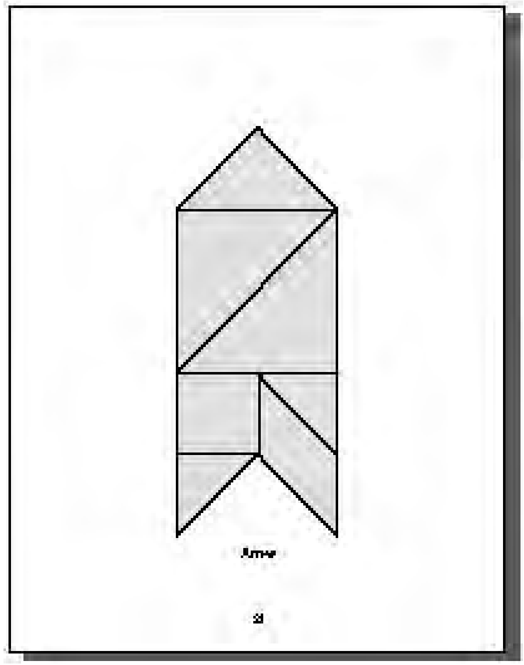
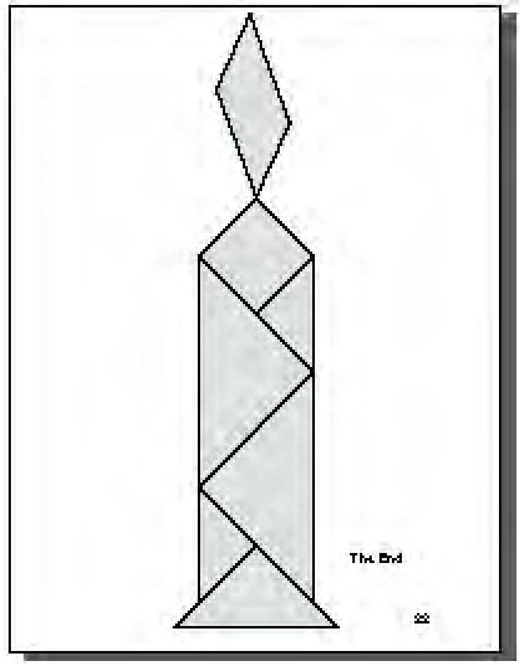

Triangle


Mask


Trophy
30




The End
22

F44 CALCULATOR ADDITION AND SUBTRACTION

Capsule Lesson Summary

Locate and name the operation keys of a calculator. Learn how to use the $\boxed{+}$ and $\boxed{-}$ keys in solving problems.

Materials

Teacher
- Overhead calculator
- Counters (between 80 and 100) in a container

Student
- Calculator
- Paper
- Phone number (optional)

Note: For Exercise 3, students will need to know their phone numbers.

Description of Lesson

Display the overhead or class calculator. Conduct a quick review of the calculator: location of keys, how to turn on the calculator, how to clear the display, and so on.

T: ***Today we are going to use the calculator to help us solve problems.***

Exercise 1

Show the class your container with counters.

T: ***This container has quite a lot of counters in it. Do you have an idea about how many?***

Invite students to make some estimates.

T: ***How could we find out exactly how many?***

S: ***Count them.***

S: ***Teach the calculator to count. Each time we take a counter out of the container press*** $\boxed{=}$.

T: ***Let's try to share the job of counting so that no one has to count all of the counters.***

Divide the class into five to eight groups of students (possibly four students per group). Give each group a handful of counters (less than 20) and ask them to count just their counters. Each group should count together and check each other.

T: ***Each group will tell us how many counters they have. As they put their counters back into the container, we will put the number on the calculator. What key should we press to tell the calculator to add that number of counters to what's in the box?***

S: $\boxed{+}$.

Carry out the process. Start with nothing in the container and 0 on the display of the calculator. As each group puts its counters into the container and says how many (for example, 17), press the appropriate keys ($\boxed{+}$ $\boxed{1}$ $\boxed{7}$). After the last group puts in its counters, be sure to press $\boxed{=}$ and say what the total count is. Compare the total with previous estimates.

F44

Put the container with counters aside for a few minutes.

T: ***Let's have the calculator help us solve another problem. Suppose I have 27 pennies in one pocket and 18 pennies in another pocket. How many pennies do I have altogether?***

Write 27 + 18 on the chalkboard and invite students to explain how to use the calculator to find 27 + 18 = 45.

Exercise 2

Bring back the container with counters. Adjust the following problem to your situation.

T: ***Here is another problem. There are 93 counters in our container. I am going to take out 25*** (model with the container of counters)***. Now how many counters are there in the container? Can we use the calculator to help us solve this problem?***

Let the students tell you to put 93 on the display of the calculator. Then press $\boxed{-}$ $\boxed{2}$ $\boxed{5}$ $\boxed{=}$. You may need to discuss that "–" is the sign you use to subtract or "take out." Write the appropriate number sentence on the board; for example, 93 - 25 = 68.

At this point you may like to invite students to pose some addition or subtraction problems. Then ask the class to explain how to use the calculator to solve the problem. Each time write the problem on the board.

Distribute calculators to groups of two or three students. In the groups, let one student pose an addition or subtraction problem and another student use the calculator to solve the problem. Encourage students to write the problems on their papers.

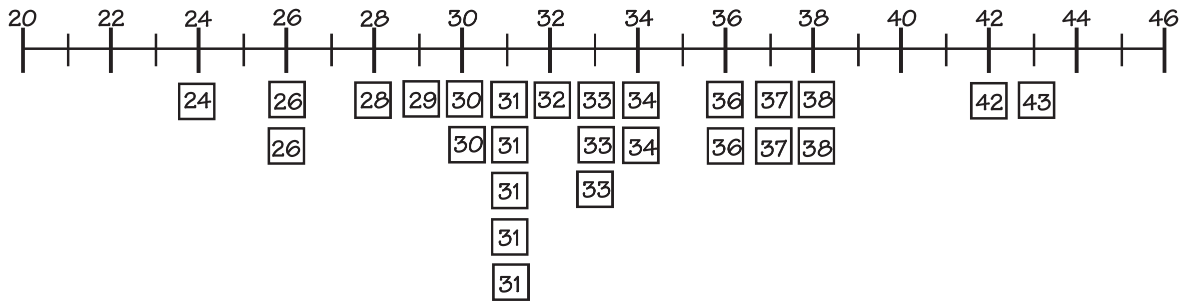
Exercise 3 (optional)

Instruct students to write their phone numbers on their papers and use the calculator to add the digits. You may want to model at the board using your phone number or the school's. That is, instruct students to just write the digits of their phone numbers, separated a bit, and then to insert "+" between the digits. Tell students to write the results next to the phone numbers. For example,

Phone Number		Sum of Digits
696-8940	6 + 9 + 6 + 8 + 9 + 4 + 0	42

Students working in groups could check each other's work.

Collect and discuss the results. You may like to let students write their sum on a Post-it™ note and place it on a number line drawn on the board. For example,



Some possible questions or observations to make include the following:

- What is the least (greatest) sum?
- Most of the sums are in the 30’s.
- How can several students have a sum of 31? Do they have the same phone number?
- No one has a sum of 40. Could we make up a phone number for 40?

F45.1 MINICOMPUTER INTRODUCTION #4

Capsule Lesson Summary

Review representation of the numbers from 0 to 10 on the Minicomputer and introduce the 1 + 1 = 2 and 2 = 1 + 1 trades on the Minicomputer.

Materials

Teacher
- Minicomputer set
- Demonstration numeral cards

Student
- Minicomputer set (optional)

Description of Lesson

Exercise 1

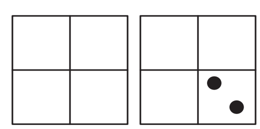
Display two Minicomputer boards. Tell the students that you are going to put some numbers on the Minicomputer and that they are to tell you, with their fingers, which numbers they are. Briskly review 2, 4, 1, 8, 3, 5, 7, 6, 9, and 10 on the Minicomputer.

Place two boards and some checkers at two separate locations in the room. Divide the class into two groups. Tell the students that you are going to hold up a numeral card (from 0 to 10), and that a student in each group should put that number on the Minicomputer. Accept non-standard configurations as correct, but try to get at least one display of the standard configuration. If someone puts the wrong number on the Minicomputer, ask students in that group to help the student put on the number. You may prefer to conduct this activity with pairs of students working on individual Minicomputers.

Try to include all the students in this activity. Always remove all checkers from the Minicomputer before proceeding to another number. Show each of the numbers from *0* to *10* once, in random order. Include a couple of numbers greater than 10, such as 14 and 18.

Exercise 2

Put two checkers on the Minicomputer.



T: ***What number is this?*** (2)
How do you know?

The best response to this question is “because 1 + 1 = 2.” If necessary, hold up one finger on each hand and say, “One plus one is two.” Then return to the Minicomputer and repeat, “One plus one equals two,” lifting each checker briefly as you speak.

T: ***Can anyone show us another way to put 2 on the Minicomputer?***

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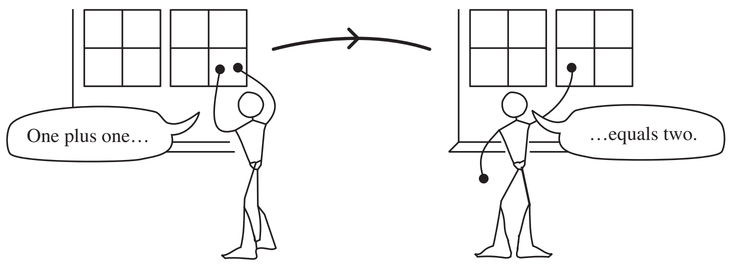
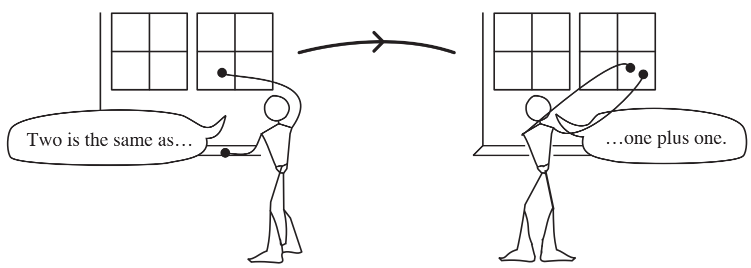
Be prepared to make the trade yourself if no student volunteers. In any case, you should demonstrate this trade very dramatically and obviously, using both hands as illustrated below. First, pick up the two checkers from the white square and say, “One plus one equals two.” Then, put one checker on the red square of the ones board and put the other checker away.



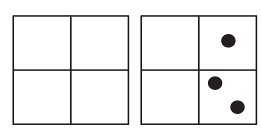
Pause briefly; then pick up the checker from the red square and say, “Two is the same as one plus one.” While speaking, put this checker and another one onto the white square of the ones board.



Demonstrate the 1 + 1 = 2 and 2 = 1 + 1 trades again.

Exercise 3

Remove all checkers from the Minicomputer. This time, put the checkers on the Minicomputer more slowly so that the students can mentally calculate the number. First, put one checker on the purple (4-) square of the ones board—pause; put one checker on the white (1-) square—pause; and then put a second checker on the white (1-) square.



T: ***What number did I put on the Minicomputer?*** (6)
How do you know? (4 + 1 + 1 = 6)

Demonstrate this fact with your fingers.

T: ***Who knows a way to put 6 on the Minicomputer with only two checkers?***

If a student attempts to make the trade, assist by saying, “One plus one is two.” If a student does not make the trade, do not insist on it. In any case, after 6 has been shown with two checkers, you should demonstrate the 2 = 1 + 1 and 1 + 1 = 2 trades again very dramatically.

Center Activity

Put two Minicomputer boards and some checkers in a center for practice.

F45.2 ADDITION STORY #3

Capsule Lesson Summary

Tell a story with string pictures about three boys putting pennies in their piggy banks. Use the story and the string pictures to pose and solve some addition problems. Introduce equivalent coin values.

Materials

Teacher
- Colored chalk
- Coins (about 30 pennies, a nickel, a dime, and a quarter)
- Calculator

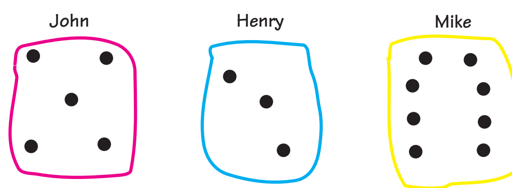
Student
- Paper
- Calculator

Description of Lesson

Choose three students to play the brothers in the story.

T: ***This is a story about three brothers: John, Henry, and Mike. Each of them has a piggy bank which they are trying to fill with pennies. Here is how many pennies each has in his piggy bank right now.***

Draw these three pictures on the chalkboard. Give the three students pennies and ask them to stand near the pictures.



T: ***Who has the most pennies?*** (Mike)
Who has the fewest pennies? (Henry)
How many pennies does Mike have? (Eight)
Suppose John and Henry put their pennies together. (Invite the students to do this.) ***How many would they have together?*** (Eight)

If necessary, ask a student to count these pennies.

T: ***Who has more pennies, Mike… or John and Henry (together)?***

S: ***They have the same number of pennies.***

T: ***Now, here is the rest of the story. Yesterday the three boys were very helpful at home, so their mother gave them each four more pennies. Immediately, the brothers put the coins into their piggy banks. Now who has the most pennies?*** (Mike) ***Who has the fewest pennies?*** (Henry)

Add the information to your drawing (see next illustration) and give more pennies to the students.

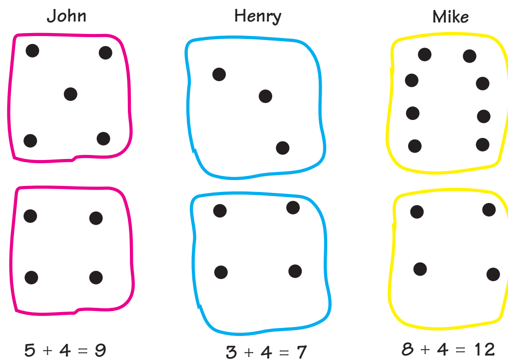
F45

T: ***How many pennies does John have now?*** (Nine)
How many does Henry have? (Seven)
How many does Mike have? (Twelve)

If there is disagreement over an answer, ask a student to count the pennies.

T: ***What number sentences could we write by the pictures?***

It may be necessary for you to suggest the first number sentence yourself. As the students respond, write the sentences on the board, and ask students to write them on their papers.



Invite students to tell other stories about the picture.

T: ***Could the boys trade some of their pennies for other coins?***

S: ***John could trade five pennies for a nickel.***

S: ***Mike could trade ten pennies for a dime (or two nickels).***

T: ***How many pennies would there be if the boys put all their pennies together?***

Encourage students first to estimate the answer. Then write a number sentence for this combination on the board and do the calculation on a calculator.

$$9 + 7 + 12 = 28$$

T: ***Could we use different coins for the total amount?***

Allow students to make several suggestions.

Center Activity

Provide more practice with coins in a center (see Lesson F35).

Home Activity

Repeat the home activity from Lesson F35.

F46 MEASUREMENT #1

Capsule Lesson Summary

Explore and compare the sizes of fruit according to weight, circumference, and length. Predict an order relationship for each aspect of size. Make graphs of the actual relationships and compare to the predictions.

Materials

Teacher
- Fruits
- Measuring tools (balance or scale, string, adding machine tape)
- Chart paper
- Tape

Student
- Scissors

Advance Preparation: Find five or six fruits of various sizes (e.g., grape, plum, banana, apple, melon, and pumpkin). If several of each are available, students can work in groups to compare the fruits for different aspects of size.

Description of Lesson

Display a collection of five or six different fruits.

T: ***Let's put these fruits in a row in order of their size.***

Let the class discuss the problem for a few minutes. Try to get the students to agree on an order. There may be some discussion of what you mean by size. Do not force a notion of size, but let the students find their own understanding. When the class has come to an agreement and has the fruits ordered in a row, continue with some questions about different aspects of size.

T: ***Do you think the fruits are in order from heaviest to lightest?… from longest to shortest?… fattest to skinniest?***

Each time, let the class discuss the question and how they might have to rearrange the order to accommodate that aspect of size. Record on the board the predicted order for these various aspects of fruit size.

Display some measuring tools: a balance or scale, string, and adding machine tape.

T: ***Now we are going to do some comparing and measuring to see how close our predictions are.***

You may prefer to work with the whole class on each aspect of size, or to divide the class into three groups having each group deal with a different aspect of size. If you choose to have three groups, first discuss with the class which tool could be used to compare the fruits for each of the different size considerations. For example,

T: ***Can we just look at these fruits and know for sure that the banana is bigger around than the plum? How could we tell for sure?***

S: ***Measure around each fruit with a ruler.***

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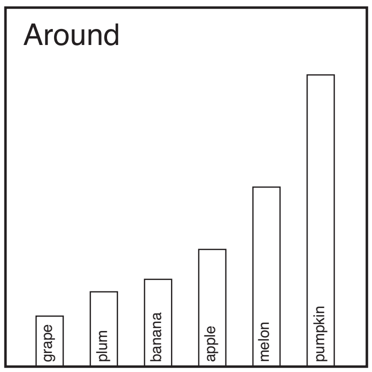
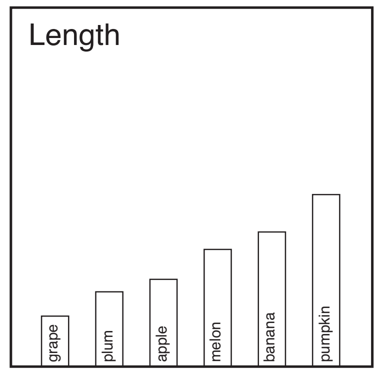
T: ***It will be hard to go around with a ruler.***

S: ***We could use a tape measure like my aunt has for sewing.***

T: ***Yes. But today we will use strips of paper (or pieces of string) and cut them the size that goes around each piece of fruit.***

With the class or in groups, instruct the students to compare all the fruits for each aspect of size. Using adding machine tape, let students cut a strip of paper the size around or the length of each piece of fruit. On each strip of paper, write the name of the fruit. Then direct the students to order the strips of paper in a graph on chart paper. For example,





Weight can be compared with a balance or scale. In this case, the graph can be the actual fruit in order by weight.

After the three graphs have been made, compare the orders of the fruit in the graphs with earlier predictions.

Reading Activity

This lesson can be followed with a book considering size and order such as *The Very Hungry Caterpillar* by Eric Carle.

F47.1 MINICOMPUTER INTRODUCTION #5

Capsule Lesson Summary

On the Minicomputer, review representation of numbers between 0 and 19 and introduce the standard configurations for 20, 40, and 80. Put numbers between 10 and 30 on the Minicomputer.

Materials

Teacher
- Minicomputer set
- Base-10 blocks or other place value manipulative (optional)

Student
- Base-10 blocks (optional)
- Minicomputer set

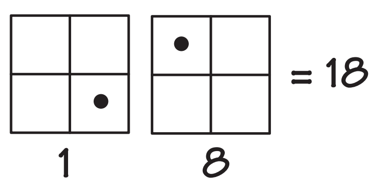
Description of Lesson

This is a good lesson to let students work in pairs.

Exercise 1

Display two Minicomputer boards. Tell the students that you are going to put some numbers on the Minicomputer and they should whisper to their partners which number it is. Accept four or five whispers yourself and then ask a student to answer aloud. If you wish, you might use some non-standard configurations to challenge the students. Feel free to put on any number up to 19 during this activity but try to vary the numbers enough to involve all of your students. When the number is more than 9 and is shown in standard configuration, ask a volunteer to write the appropriate numeral below (above) the Minicomputer.

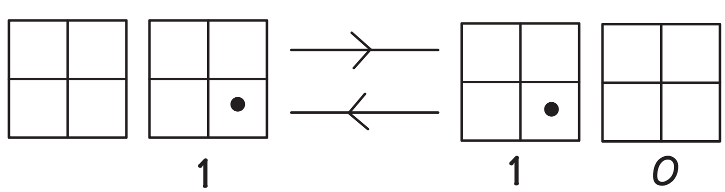
Occasionally, when the number is more than 9, write the numeral to one side of the Minicomputer with "=" between the Minicomputer and the numeral. For example,



You may also want to read 18 as "one ten and eight ones" and to model the number with base-10 blocks (or another place value manipulative).

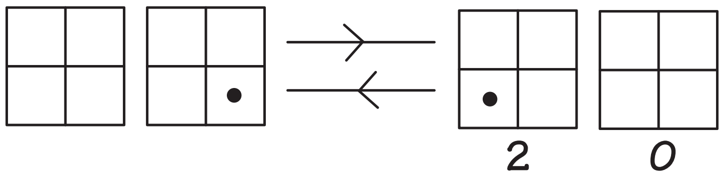
Exercise 2

Move a checker quickly back and forth from the 1-square to the 10-square while the class says "one—ten—one—ten."



F47

Put a checker on the 2-square and say, "Two." Now move the checker to the 20-square and ask what number is on the board now. Write 2 under the tens board and 0 under the ones board as you say "two tens—twenty." Move the checker briskly back and forth from the 2-square to the 20-square while the class says "two—twenty—two—twenty."

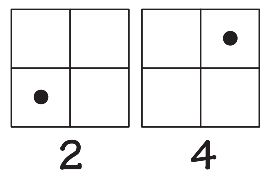


Repeat this activity with 4 and 40, and with 8 and 80.

Exercise 3

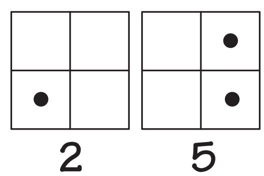
Put 20 on the Minicomputer.

T: ***If I give you one more checker, who can put 24 on the Minicomputer? Who would like to write 24 below (above) the Minicomputer?***



You may also like to ask students to model 24 with base-10 blocks and read 24 as "two tens and four ones."

T: ***Who can put 25 on the Minicomputer? Who can write 25 below the Minicomputer?***



If the class is interested and is enjoying the lesson, continue with Exercise 4.

Exercise 4

Provide pairs of students with one Minicomputer sheet (two boards) and three or four checkers. Announce a number between 10 and 30 and write it under the demonstration Minicomputer boards. Instruct students to put the number on their desk Minicomputers. Then invite a student to put the number on the demonstration Minicomputer. Repeat several times.

F47.2 TELLING STORIES FOR AN ARROW PICTURE #1

Capsule Lesson Summary

Tell stories that could be the interpretation of a picture with dots, strings, and arrows.

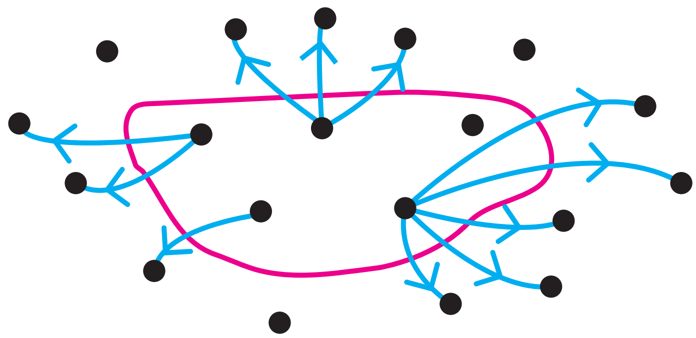
Materials

Teacher
- Colored chalk

Student
- Paper
- Colored pencils

Description of Lesson

Draw this picture on the board.



T: ***Usually, I tell you the story to go with our picture. Today, it is your turn to make up the story. Try to think of one that could go with this picture.***

You may need to help the students during their stories to ensure that they are explicit about the following points:

T: ***What do the dots inside the string stand for?***
What do the dots outside the string stand for?
What are the arrows for? (The arrows should all have the same meaning within a story.)

Here is a sample story, with the teacher's commentary.

S: ***My story is about pets.***

T: ***Where are they in the picture?***

S: ***Outside the string.***

T: ***What are the dots inside of the string for?***

S: ***Children.***

T: ***What do the arrows tell us?***

S: ***The children are saying, "You are my pet."***

Some additional questions about the story can now be posed; for example,

T: ***Which child has the most pets?***
How many pets does that child have? (Five)
Point to a child with two pets.
Does every child have a pet? (No)

Ask for other interpretations of the picture. The students may begin to suggest only variations of the first story. In this case, ask who has a story that is not about pets. Some stories may need altering before they fit the picture. For example, suppose a story has the following main characters:

Inside the string:	Children
Outside the string:	Mothers
Meaning of the arrows:	"You are my mother"

Let the students discuss the story, guiding them to discover that in this story, several children seem to have more than one mother, an impossibility! The class may eventually suggest that mothers could be inside the string and children could be outside the string. The arrows could then mean "you are my child."

If you cannot see a way to modify a story so that it fits the picture, say,

T: ***That is a very nice story, but it does not seem to fit our picture.***

You may want to draw a second picture which illustrates the student's story, if this is possible.

Writing Activity

Students can write stories about the picture in the lesson, or they can draw their own pictures and write stories to go along.

F48.1 COUNTING ACTIVITY #2

Capsule Lesson Summary

As a group count forward, backward, and by twos.

Materials

Teacher	• None	Student	• None

Description of Lesson

Use one or all of the exercises of this lesson as appropriate for your class.

Exercise 1

Remind the students of the counting activity they did about a month ago in Lesson F25.1.

T: ***Today, you can probably count much better than you could a month ago. We are going to count by ones today; I will point to each of you in turn. The first person to whom I point will say "one"; the second person will say "two"; and so on. Let's see if we can do it without any mistakes.***

Walk up and down each row, or around each table, pointing to the students in order until each has participated. The last number counted should be the total number of students in class.

T: ***How many students are there in class today?***
We are going to count by ones again, but this time I will begin with a different student.
Like before, say the number that comes next when I point to you.
Which number will the last student say this time?

The students will probably agree that this number will be the same as the last number counted earlier.

Beginning with a different student, walk up and down the rows, or around each table, pointing to the students in order until each has participated. Acknowledge those students who correctly predicted the last number to be counted.

Exercise 2

If the previous exercise was successful, conduct this activity with the entire class. However, if the students begin to have difficulty paying attention, conduct the activity with just one row or table of students at a time.

T: ***We are going to count forward by ones and then we will count backward by ones. As we count forward and you say a number, try to remember which number it is.***

Start with a different student and ask the class to count by ones as in Exercise 1. Continue until each student has participated. This sample dialogue is for a class of 26 students.

T: ***Now we are going to count backward by ones.***

Point to the student who counted last.

T: ***What was your number?***

S: ***26.***

Point to the student who was next to last.

T: ***What was your number?***

S: ***25.***

Continue in this manner, pointing to each student in exactly reverse order of the forward counting. You may also wish to point to the appropriate place on the number line as a number is said.

Exercise 3

Repeat Exercise 2, but this time have the class count by twos starting at 0. Ask students to remember the number they say so you can call on their memory to count backward by twos. Recall how many students are in class today and predict what the last student will say before you start the counting.

Center Activity

Place dot-to-dot puzzles in centers for practice counting backward and counting by twos. Blacklines F48.1 (a)-(f) are available for this purpose.

Home Activity

Suggest to parents/guardians that they practice counting by ones, counting backward, and counting by twos with their child. You may like to send home some dot-to-dot pictures for this purpose.

F48.2 CANDIES TO SHARE

Capsule Lesson Summary

Share 12 candies equally among some children. Draw string pictures and write number sentences for the different ways of sharing.

Materials

Teachers		Student	
	• Colored chalk • Candies or objects to represent candies		• Colored pencils • Unlined paper • Candies or objects to represent candies

Description of Lesson

Draw 12 dots on the chalkboard and put out 12 candies (or objects to represent candies). Ask the students to count silently as you draw.

T: ***The dots are for these candies. How many are there?***

S: ***12.***

T: ***We are going to share all of these candies among some children. Try to give the same number of candies to each child. How many should we give to each?***

S: ***How many children are there?***

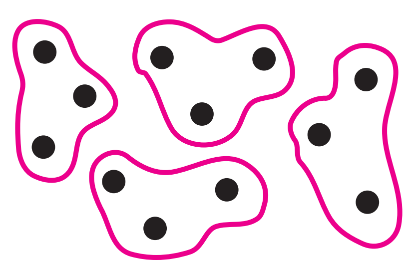
T: ***That's a good question. You can decide how many children to give candies to, but remember, we would like to give the same number to each child.***

Joani wants to give each child three candies. Someone show us the three candies one child will receive.

Invite a student to point to three candies. With colored chalk, draw a string around the dots for the candies chosen.

T: ***We give these three candies to one child. Who can show the candies we give to a second child?***

Continue until all of the candies have been distributed. If a student suggests giving a child a number of candies other than three, you should remind the class that each child is to receive the same number.



T: ***Who would like to explain this picture to us?***

S: ***There are twelve candies and each child gets three.***

T: ***Let's write a number sentence for this on the board.***

Write 12 on the board. Point to each string individually and record the number of candies in each string.

T: ***How many children received candies?*** (Four)
How many times did I write 3 in this number sentence? (Four)
Four times three is twelve. Here is a short way to write this.

$$12 = 3 \times 3 \times 3 \times 3$$
$$12 = 4 \times 3$$

Read this number sentence for your class.

T: ***Twelve is equal to three, plus three, plus three, plus three .***
Twelve is equal to four times three.

In the preceding dialogue, the class decided to give each child three of the twelve candies; your class, however, may decide to give each child a different number and may arrive at a different outcome.

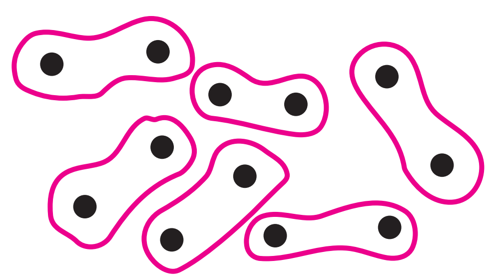
For example, a student may suggest giving each child five candies with two candies left over. Accept this suggestion, but mention that you will not be able to share all of the candies this way. Record the addition number sentence (12 = 5 + 5 + 2) on the chalkboard as before, but do not introduce a multiplication fact.

Erase your drawing, leaving the number sentences on the chalkboard.

If you like, allow students to work in pairs to find other ways to share the candies. Distribute unlined paper and explain to the students that they should draw exactly 12 dots on their papers. They may share the 12 candies in any way they wish, but every child should receive the same number of candies. Some students may benefit from having candies or objects to represent the candies while doing this sharing. Encourage them to draw pictures of the sharing. Students who finish quickly can try to find other ways of sharing 12 candies equally.

As the students work, circulate among them to find neatly drawn pictures showing different number sentences. When many students have finished at least one sharing, ask a student whose drawing is clear and correct to hold up the picture for the class to see. Ask a second student (or the partner) to describe this picture, as you record the appropriate number sentence on the board.

A picture like this one, for example, could lead to the following dialogue.



S: ***In this drawing, each child gets two candies.***

T: ***How many candies are there in all?***

S: ***12.***

T: ***How many children received candies?***

S: ***6.***

T: ***Let's write a number sentence for this on the board.***

$$12 = 2 + 2 + 2 + 2 + 2 + 2$$

T: ***How many times did we add 2?*** (Six times)
Could we write this sentence another way?

Encourage the class to think about a multiplication fact. You may have to explain that another way to write 2 + 2 + 2 + 2 + 2 + 2 is 6 x 2. Read the number sentences to the class.

$$12 = 2 + 2 + 2 + 2 + 2 + 2$$

$$12 = 6 \times 2$$

Examine and discuss students' drawings until several number sentences are on the board.

Optional: Extract the multiplication facts from the number sentences on the board and organize them in a list. As you do this, look for patterns and encourage students to find any facts not represented. Also make observations like "more children get fewer candies each."

12 = 12 x 1
12 = 6 x 2
12 = 4 x 3
12 = 3 x 4
12 = 2 x 6
12 = 1 x 12

Writing Activity

Students can write stories about their pictures of sharing 12 candies equally.

Reading Activity

This would be a good time to read a story such as *The Doorbell Rang* by Pat Hutchins. This story involves sharing 12 cookies—first two ways, then four ways, then six ways, and finally twelve ways.

F49.1 MINICOMPUTER INTRODUCTION #6

Capsule Lesson Summary

Put numbers less than 100 on the Minicomputer and read them. Write number stories about various configurations of numbers on the Minicomputer.

Materials

Teacher	• Minicomputer set	Student	• Paper • Counters (optional)

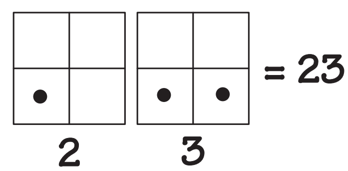
Description of Lesson

This is a good lesson to let students work in pairs.

Exercise 1

Display two Minicomputer boards. Tell the students that you are going to put a number on the Minicomputer and they should whisper the number to their partner. Feel free to use any number up to 99, but alternate easier numbers with more difficult ones and occasionally represent a number less than 20 with a non-standard configuration. Each time, accept four or five whispered answers and then ask a student to answer aloud.

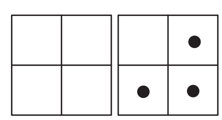
Occasionally, when the number has two digits and is in standard configuration, ask a student to write it below (above) the Minicomputer while you write it to one side.



Exercise 2

T: ***Who can put 7 on the Minicomputer ?***

Accept any correct answer.



4 + 2 + 1 = 7
5 + 2 = 7
4 + 3 = 7
6 + 1 = 7

T: ***How do we know this is 7?***

As a student explains, write appropriate number sentences on the chalkboard. Note that if the standard configuration for 7 is given, there are several possible number sentences. You may want to ask students to copy the number sentences on their papers or to write down number sentences that they see on the Minicomputer.

It is sufficient to write a single number sentence, but if more are volunteered, record them also. You may wish to ask students to demonstrate a number sentence with counters or their fingers.

T: ***Who can put 9 on the Minicomputer?***

Accept any correct answer.

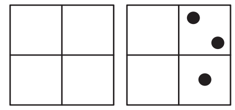
T: ***How do we know this is 9?***

If necessary, help the students verbalize the explanation.

F49

T: ***Who can write a number sentence on the board?***

For example, if this non-standard configuration for 9 is offered, there are several possible number sentences. Again, students can copy the number sentences on their papers.

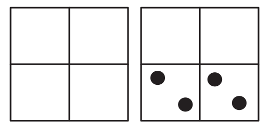


$8 + 1 = 9$
$4 + 4 + 1 = 9$
$4 + 5 = 9$

Again, it is sufficient to write just one number sentence, but if more are volunteered, record them also. You may wish to ask students to demonstrate a number sentence with counters or their fingers.

Exercise 3

Put this configuration on the Minicomputer.

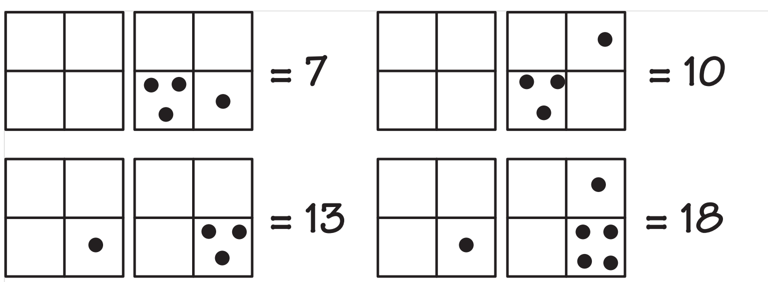


T: ***What number is this?*** (6)
How do you know?

If necessary, help the students verbalize their explanation.

T: ***Who can write a number sentence on the chalkboard?***
Who can show us another way to put 6 on the Minicomputer?

Follow a similar sequence for some of the following configurations. Stop when the students begin to lose interest in this exercise.



F49.2 +2 ARROW ROAD

Capsule Lesson Summary

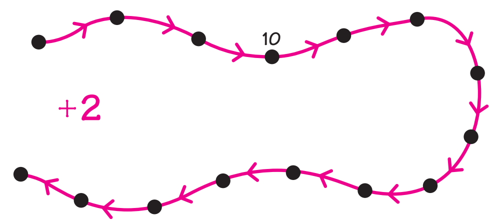
Draw and label the dots in a +2 arrow picture. Associate counting by twos with adding two.

Materials

Teacher
- Colored chalk
- Calculator (optional)

Student
- Worksheets F49.2* and **
- Calculator (optional)

Description of Lesson



Draw this long +2 arrow road on the chalkboard.

T: ***The dots are for numbers and the red arrows are for +2. Here is 10.***

Trace the arrow starting at 10 to the next dot on the road.

T: ***Which number is here?***

S: ***12.***

T (tracing the arrow again)**:** ***Ten… plus two… is twelve. Yes, that is correct.***

Also demonstrate adding two on the number line by starting at 10 and moving two spaces (in the positive direction) as you say, "Ten plus two is twelve." You can demonstrate adding two another way by holding up two fingers as you say, "Ten plus two is…," and then count the fingers, "… eleven, twelve."

After these checks have been made, label the dot 12, write the fact 10 + 2 = 12, and continue.

T: ***Who can label another dot?***

Students should feel free to suggest labels for any dot in the picture.

Let a student point to a dot, say which number is there, and then, if correct, label it. Since this activity is open, there are many kinds of student responses. Here we suggest a few possibilities.

A student may wish to label the dot following one that has already been labeled. Check such a response by adding two on the number line and with counters. A student may wish to label the dot immediately preceding one that has already been labeled. For example, a student might point to the dot preceding 10 on the road.

S: ***8.***

T (tracing the red arrow from the dot to 10)**:** ***Eight… plus two… is ten. Is that correct?***

S: ***Yes.***

F49

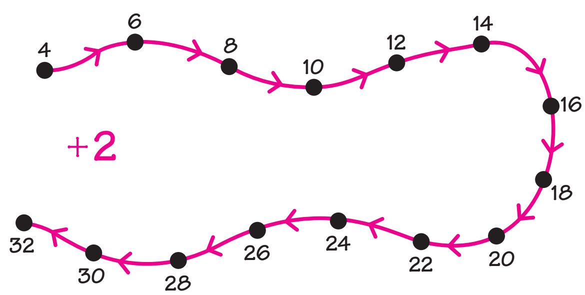
Check this addition problem on the number line and with counters as before.

A student may wish to label a dot which does not immediately precede or follow a labeled dot. In this case, accept the response with this comment:

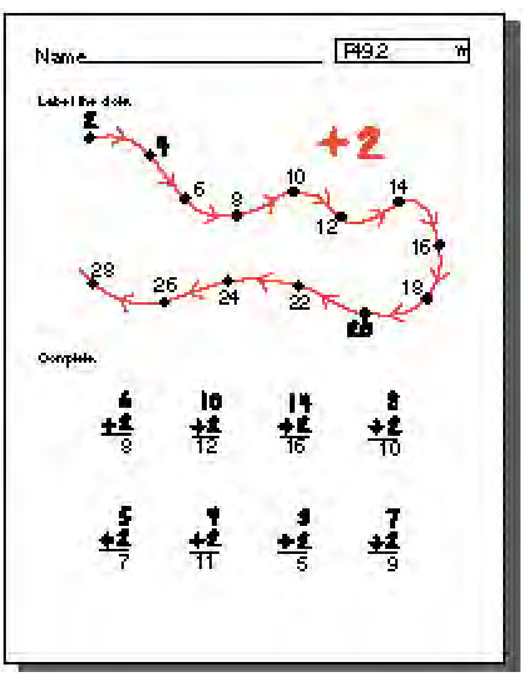
T: ***You may be correct. We will check your idea after we have labeled these other dots*** (point to unlabeled dots between the suggested one and a labeled one)**.**

Note: If the student in this case is correct, you might ask for an explanation. Do not, however, press for a very precise one.

Continue in this manner until all the dots in the picture have been labeled. You may want to let students use a counting calculator (to count by twos starting at 4) to check the picture.



Distribute Worksheets F49.2* and **. Students should begin with the * worksheet; those who complete it correctly should proceed to the ** worksheet.



F50 ADJUSTMENT/ASSESSMENT DAY #5

Note: See Section One, page 1-9, for a full explanation of the purpose of scheduled adjustment days. Worksheet F50 provides for a short, written assessment.

Today you may wish to repeat an earlier lesson, either for a group of student or for the entire class. Many of the lesson can be made to appear completely different by changing the story and/or the numbers in the lesson. If you omitted any exercises or worksheets from an earlier lesson, you may like to include these. This is also a good time to allow students to work in centers or on a project of your choice.

The following activities may be appropriate for students who need additional practice.

Guess My Rule

Tell the students you are going to teach the calculator a secret rule: plus some number. Then program the calculator for the secret rule without letting the students see what keys you press. For example, teach the calculator +2 by pressing $\boxed{-}$ $\boxed{2}$ $\boxed{+}$ $\boxed{2}$ $\boxed{=}$. Show the students that 0 is on the display.

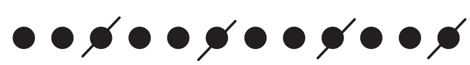
T: ***The calculator is ready to use my secret rule. Put a number on the calculator display and then press ≠. The calculator will use my secret rule and show you the result.***

Let students test several numbers on the calculator. They may guess the secret rule quickly, but ask that they keep it to themselves, using it to predict the results for other test numbers before pressing $\boxed{=}$.

After the secret rule (+2) is announced, invite students to act like a calculator and use the rule on several more numbers, each time checking the result on the calculator.

Special Dots

Draw some dots on the board, marking (for example) every third one. Then, point to each dot in turn and ask the student to count along silently until you reach one of the marked dots. These they say aloud; for example,



S: (Silently: one, two) ***three,*** (silently: four, five) ***six…***

Now, Before, After

Identify the date on the calendar; for example, November 20. Ask the following questions:

- Today is November ____?
- Yesterday was November ____?
- Tomorrow will be November ____?

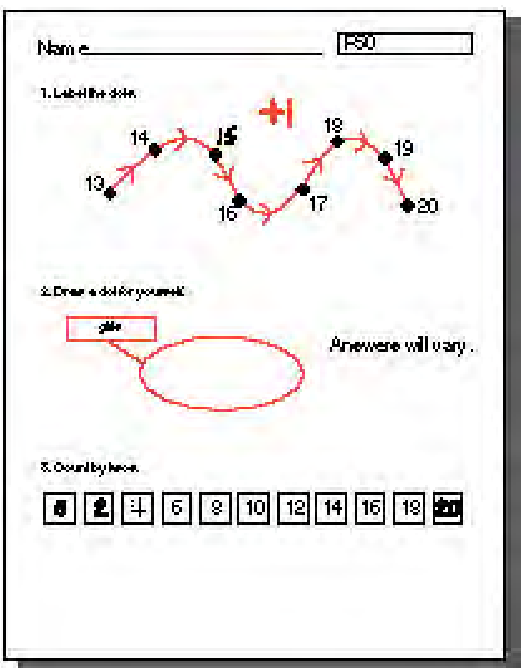
Choose a student who has recently had a birthday. Ask the following:

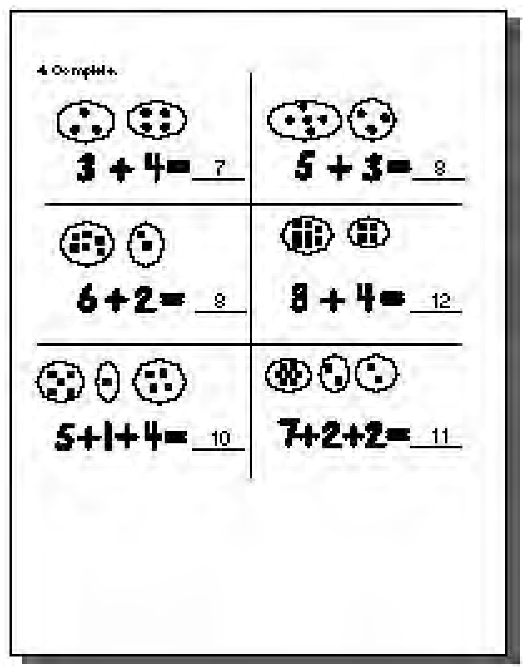
- How old is Juan now? ____
- How old was Juan last year? ____
- How old will Juan be next year? ____
- How old will Juan be in two years? ____

Early Warning

Among the next nine classroom lessons are some that require extra preparation time or involve materials not included with the *CSMP* Classroom Set. The lessons are listed here for your convenience in preparing for them. A more detailed description of the needed materials can be found on the first page of each lesson. (These special materials have been listed here only once, even if they are needed more than once during the nine-day period.)

F52 *Counting Calculator #3*: Calculators
F58.2 *Headband Patterns*: Headbands; adding machine tape; rubber stamps, templates, stickers, or blocks
F59 *Detective Story*: Nickels; clock





F51 THE NUMBERS SPEAK #3

Capsule Lesson Summary

Review the relations *less than* and *more than*. Determine where the least and the greatest numbers are in an *is less than* arrow picture. Explore various ways to label the dots in the arrow picture. Compare the *less than* relation among numbers with the *shorter than* relation among people.

Materials

Teacher	• Colored chalk	**Student**	• Colored pencils • Unlined paper

Description of Lesson

Exercise 1

Play the mental game as described in Exercise 1 of Lesson F29 for a few minutes. This game involves students giving a number that is less than or more than the previously mentioned number.

Exercise 2

Draw four dots on the chalkboard. Add arrows to the picture as you tell this story.

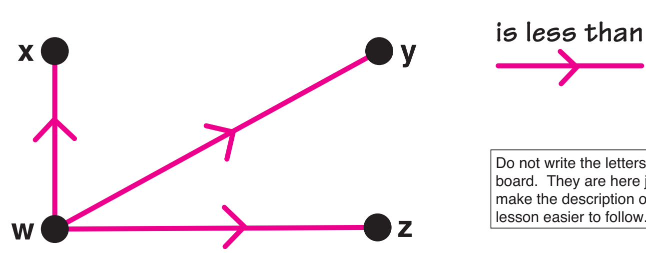
T: ***These are some numbers I met on the way to school this morning. How many numbers did I meet?***

S: ***Four.***

T: ***These numbers were arguing because each of them claimed to be the greatest. I told them you could help solve the problem after I give you several clues. The first clue is this*:**

This number (point to **w**) ***is less than this number*** (point to **x**) ***and less than this number*** (point to **y**) ***and less than this number*** (point to **z**)***.***

Draw arrows and the "key" in your picture on the board.



Do not write the letters on the board. They are here just to make the description of the lesson easier to follow.

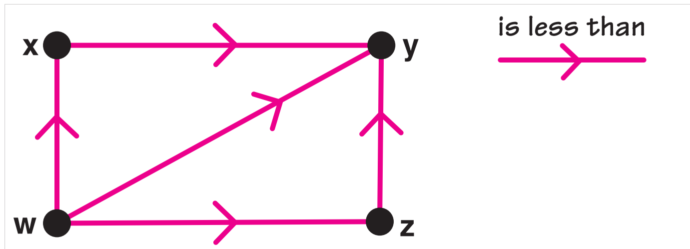
T: ***Now, what do we know?***

Allow the students to discuss the picture. They should agree that the only thing they know for sure is which number is the least (the number at **w**).

F51

Add two new arrows (from **x** to **y** and from **z** to **y**) to your picture as you say,

T: ***This number*** (point to **x**) ***is less than this one*** (point to **y**).
This number (point to **z**) ***is less than this one*** (point to **y**).



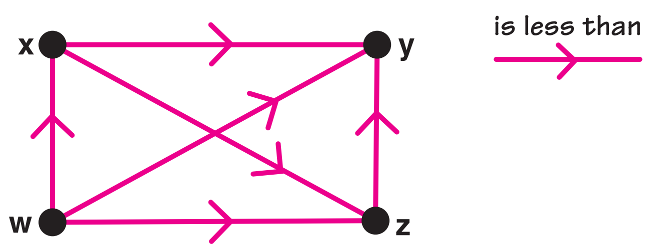
Allow the students to discuss this new information. Eventually, they should discover that the number at **y** is the greatest number in the picture.

T: ***Which of these numbers*** (point to **x** and **z**) ***is greater?***

S: ***It's impossible to tell!***

T: ***You are right. I must give you another clue.***

Draw an arrow from **x** to **z**.



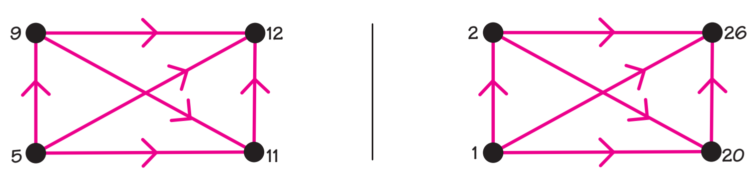
T: ***Now, where is the least number in this picture?*** (At **w**) ***How can you tell?***
Where is the greatest number in this picture? (At **y**) ***How can you tell?***
What about the other two numbers?

S: ***They are in between.***

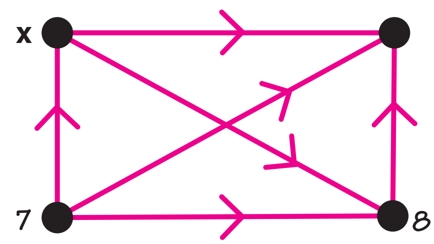
S: ***This one*** (**x**) ***is less than the other*** (**z**).

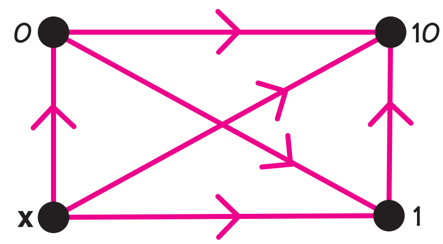
T: ***I knew you would be able to help the numbers solve their problem!***
***Which numbers could these be? Remember, the red arrows are for* is less than.**

Instruct students to copy the picture and label the dots with some numbers that fit. When many students have completed the problem, discuss two or three different solutions. For example,



In the course of exploring the problem, one of these situations could develop.





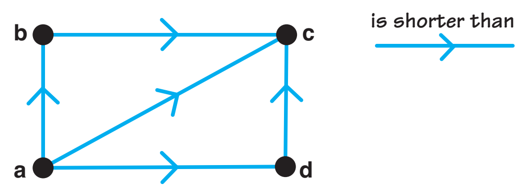
Only numbers both more than 7 and less than 8 can be at **x**. Most students will be unaware of such numbers. Guide the class in a discussion of this apparent conflict by saying, "You do not yet know numbers between 7 and 8." If a student suggests a number such as $7\frac{1}{2}$, accept this as correct but do not emphasize it.

A number less than 0 must be at **x**. Most students will be unaware of such numbers. Guide the class in a discussion of the problem, by saying, "You do not yet know numbers less than 0." If a student suggests a negative number, accept this as correct but do not emphasize it.

Erase all labels but leave the picture on the board for Exercise 3.

Exercise 3

Draw this new arrow picture beside the earlier one.



T: ***These new dots are for people and the blue arrows are for* is shorter than.**
All the blue arrows have been drawn.
What do we know about the heights of these four people?

S: ***This person*** (pointing to **a**) ***is the shortest; and this one*** (pointing to **c**) ***is the tallest.***

T: ***What about the other two people?***

S: ***They are the same height.***

Invite the class to suggest people in the room to put at each dot. Check by comparing heights.

Exercise 4

Instruct the students to draw dots for four numbers, label the dots as they wish, and then use one color to draw arrows for *is more than*.

Center Activity

Place task cards with pictures similar to the ones in Exercise 2 of this lesson or Exercise 2 of Lesson F42 in a center. Ask students to label the dots.

F52 COUNTING CALCULATOR #3

Capsule Lesson Summary

Review how to teach a calculator to count forward and backward by ones and by twos. Count along with a calculator counting by twos. Predict some numbers you will see and check them. Teach the calculator to count backward by twos. Follow counting backward by twos in a –2 arrow picture.

Materials

Teacher
- Overhead or class calculator
- Colored chalk

Student
- Calculator
- Unlined paper
- Colored pencils

Description of Lesson

Display an overhead or class calculator. Review how to teach the calculator to count forward and backward by ones, and then how to count by twos starting at 0 or at some other number.

Exercise 1

Invite a student to teach the overhead or class calculator to count by twos starting at 0. Follow these steps:

1. Put on the starting number (0).
2. Press $\boxed{+}$ $\boxed{2}$.
3. Press $\boxed{=}$ $\boxed{=}$ $\boxed{=}$ and so on.

Invite the class to count along with the calculator until you reach 30 or so.

T: ***Do you think if we keep pressing ≠, we will ever see 35? How do you know?***

S: ***No; we will see 34 and 36 but we'll skip over 35.***

S: ***We never see a number that ends with 5 (has 5 in the ones place).***

Press $\boxed{=}$ a few more times to check the results. Ask several more "will we see" questions and encourage students to talk about patterns. You may want to introduce or mention the idea of even numbers, but do this casually.

Repeat this exercise with the calculator counting by twos starting at 1.

Exercise 2

Invite a student to teach the calculator to count by twos starting at 0; ask the student to stop at 24.

T: ***Can you guess how many times Sean pressed ≠ to go from 0 to 24 counting by twos?***

Allow several students to make guesses and write them on the chalkboard. Then ask the student to repeat the task; this time, ask the class to count how many times $\boxed{=}$ is pressed. (12)

Repeat this activity once or twice going from 0 to 18 or 0 to 30, counting by twos.

F52

Exercise 3

End Exercise 2 with 30 or put it on the calculator display.

T: ***Suppose we taught the calculator to count by twos and we made it stop at 30. Could we teach the calculator to count backward starting at 30 and see all the same numbers in reverse back to 0? Could we teach the calculator to count backward by twos?***

You may need to have a short discussion of counting backward by twos. If necessary, model the process with students doing the counting. That is, go around the class first counting by twos starting at 0; tell students to remember which number they say. Then, start with the last person and go in reverse order with each student saying his or her number.

T: ***Let's teach the calculator to count backward by twos. We'll start at 30*** (put 30 on the display)***. What do we tell the calculator to do next?***

S: ***Take away (subtract) 2.***

S: ***Press ß ≠.***

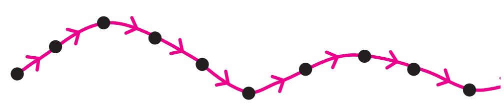
T: ***Now the calculator is ready to count backward by twos.***

Choose a student to press = repeatedly as the class reads the display in unison. Stop at 0.

T: ***So we teach a calculator to count backward by twos with the following steps:***

1. ***Put on the starting number.***
2. ***Press ß ™.***
3. ***Press ≠ ≠ ≠ and so on.***

Draw an arrow picture on the chalkboard.



T: ***Do you remember that a counting calculator can follow a counting snake? What kind of arrows would the snake have if it were counting backward by twos ?***

S: ***–2.***

Write –2 in red near the picture. Then let a student choose a starting number (greater than 20) to put at the beginning of the arrow picture. Call on students to label the other dots as the class watches the calculator count backward by twos, starting from the number at the beginning of the arrow picture.

Distribute calculators and invite students to teach their calculators to start at a fairly large number and count backward by twos. After a few minutes of free exploration, ask the students to draw their own –2 arrow picture. If you prefer, use the Blackline F22 to prepare pictures for students to color and use. Allow students to choose a starting number and label the rest of the dots in their picture.

Home Activity

Suggest to parents/guardians that they ask their child to show them how to teach a calculator to count forward and backward by twos and occasionally predict which number will come next.
With such a counting calculator, they can predict which number will come next or which number they will see after pressing = two more times.

F53.1 TRADES ON THE MINICOMPUTER #1

Capsule Lesson Summary

Put numbers from 0 to 20 on the Minicomputer. Review Minicomputer trades and introduce some new trades. Emphasize the movements involved in making trades for the entire class.

Materials

Teacher
- Minicomputer set
- Demonstration numeral cards

Student
- None

Description of Lesson

Display two Minicomputer boards and have the numeral cards from 0 to 20 at hand.

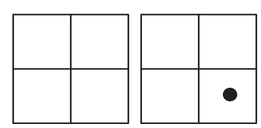
Exercise 1

Tell the students that you are going to hold up (or point to) a numeral card and that you will choose a volunteer to put that number on the Minicomputer. If someone puts the wrong number on the Minicomputer, the students should hold up both of their hands in silent protest. Ask a student who protests to put the correct number on the Minicomputer. Try to include all your students in this activity.

Always remove all checkers from the Minicomputer before proceeding to another number. If the number has two digits, you may wish to ask a student to write it below the Minicomputer. Have all the numbers 0 to 20 put on the Minicomputer once in any order.

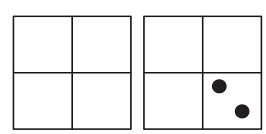
Exercise 2

Put one checker on the Minicomputer.



T: ***What number is this?*** (1)

Add another checker.



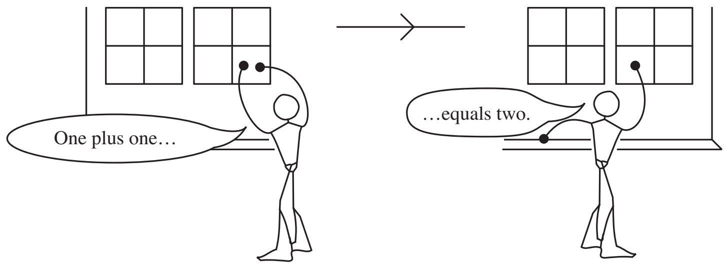
T: ***What number is on the Minicomputer now?*** (2) ***How do you know?***

The desired response is "1 + 1 = 2." If necessary, hold up one finger on each hand and say, "One plus one is two." Return to the Minicomputer and repeat, "One plus one equals two," lifting each checker briefly as you speak.

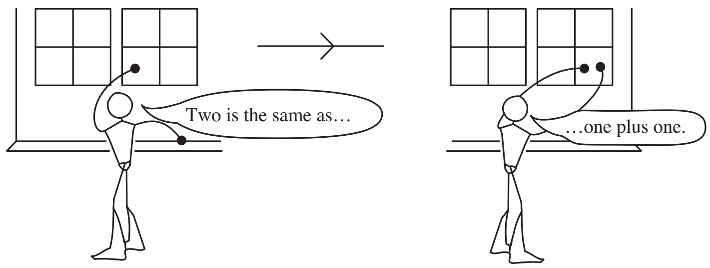
T: ***Can someone show us another way to put 2 on the Minicomputer?***

Encourage a student to use two hands and to explain the trade as it is made. Then, using both hands, demonstrate the trade very dramatically and obviously as illustrated on the following page. First, pick up the two checkers from the white square and say, "One plus one equals two." Then put one of the checkers on the red square and put the other checker away.

F53



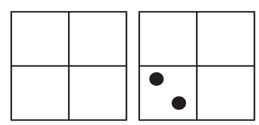
Pause briefly, and then pick up the checker from the red square saying, “Two is the same as one plus one.” As you speak, pick up another checker and put both checkers on the white square.



Demonstrate the 1 + 1 = 2 and 2 = 1 + 1 trades again. End with one checker on the red square.

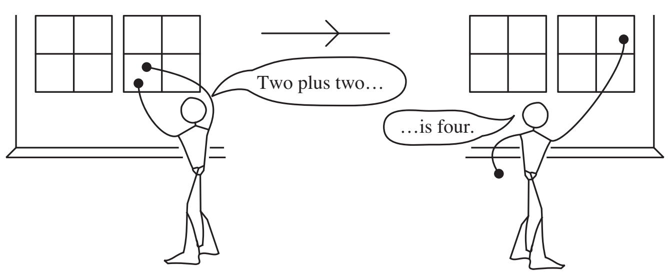
T: ***What number is on the Minicomputer?*** (2)

Put another checker on the red square of the ones board.



T: ***What number is on the Minicomputer now?*** (4)
Who can put 4 on the Minicomputer with only one checker?

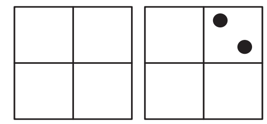
As a student makes the trade say, “Two plus two equals four.” If the student does not use both hands, suggest this and help the student to make the two hands movements. After the trade is made, repeat it in a very dramatic way, making it as obvious as possible.



Pause briefly, and then make the 4 = 2 + 2 trade. Stress the use of both hands as you make the 2 + 2 = 4 trade again. Be sure the students realize that the trade results in a checker being “leftover” (which should be put on the chalk tray or back in the box).

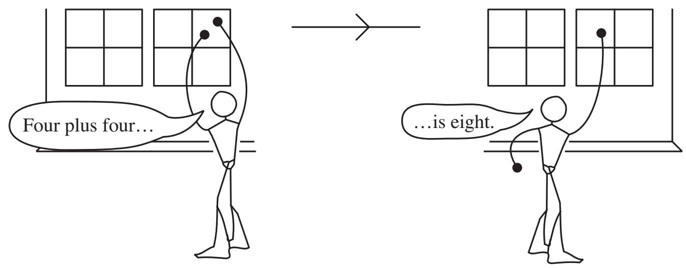
T: ***What number is on the Minicomputer?*** (4)

Put another checker on the purple square of the ones board.



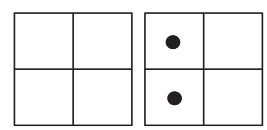
T: ***What number is on the Minicomputer now?*** (8)
Who can put on 8 on the Minicomputer with only one checker?

As a student makes the trade say, "Four plus four is eight." Encourage using two hands to make the trade. Then make the 8 = 4 + 4 and 4 + 4 = 8 trades yourself in a very dramatic way.



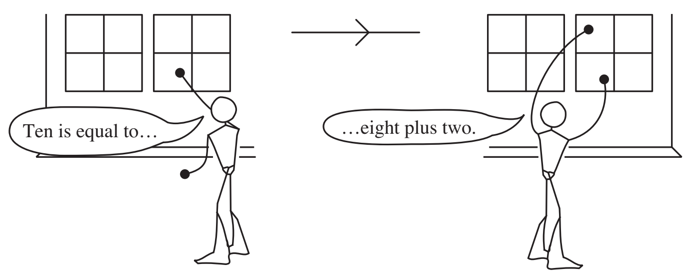
T: ***What number is on the Minicomputer?*** (8)

Add a checker to the red square of the ones board.



T: ***What number is on the Minicomputer now?*** (10)
Who can put 10 on the Minicomputer with only one checker?

As a student makes the trade say, "Eight plus two is ten." Again encourage the student to use two hands. After the trade has been made, make the 10 = 8 + 2 and 8 + 2 = 10 trades yourself, again as dramatically and obviously as possible.

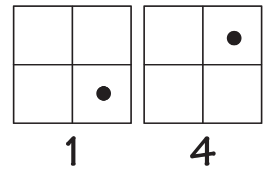


Repeat this several times. Using two hands, go back and forth between the ones board and the tens board. If the class is interested and is enjoying the lesson, continue with Exercise 3

F53

Exercise 3

T: ***Who can put 14 on the Minicomputer?***
Who would like to write 14 below (above) the Minicomputer?



Ask the class if they would like to put another number that is more than ten on the Minicomputer. Encourage the students to write the appropriate numeral below (or above) the Minicomputer. Be prepared to assist, if necessary. If a student has shown a number incorrectly on the Minicomputer, say, "No, this number is not _____; this number is _____." Explain why the number is _____, but do not insist that the student put the chosen number on the Minicomputer instead.

F53.2 GOLDY #3

Capsule Lesson Summary

Review the symbols < and >. Extend the use of these symbols in sentences involving addition.

Materials

Teacher
- Chalk

Student
- Worksheets F53.2*, **, ***, and ****

Description of Lesson

Ask someone to tell the class about Goldy the Goldfish. Be sure the student includes the fact that, faced with two schools of fish, Goldy compares them and always goes after the larger of the two.

Write these two numerals on the chalkboard.

$8 \qquad 5$

T: ***How many fish are in this school*** (point to 8)***?*** (Eight)

T: ***How many are in this one*** (point to 5)***?*** (Five)
Who can draw Goldy's mouth to show which school of fish Goldy would go after?

Choose a student to draw Goldy's mouth.

$8 \quad > \quad 5$

T: ***Yes; 8 is more than 5.***

Put this information on the board.

$5 \times 2 \qquad 6$

T: ***Who can draw Goldy's mouth?***

Ask a student to do so.

$5 \times 2 \quad > \quad 6$

T: ***Is this correct?***

S: ***Yes; 5 plus 2 is 7, and 7 is more than 6.***

Continue with this information on the board.

$5 \times 2 \qquad 4 \times 3$

T: ***Who can draw Goldy's mouth?***

S: ***They're the same; they're both 7.***

S: ***Goldy can't decide!***

Invite a student to show that Goldy cannot decide.

$5 \times 2 \quad = \quad 4 \times 3$

T: ***Yes; 5 plus 2 equals (or is the same as) 4 plus 3.***

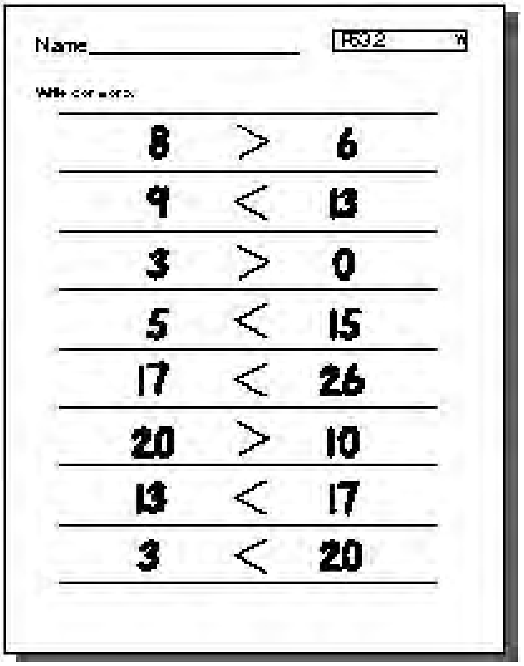
Distribute Worksheets F53.2* and ** and explain that students should draw Goldy's mouth to show which school of fish Goldy would go after, or use "=" to show that Goldy cannot decide. Students who successfully complete the * and ** worksheets can proceed to the *** and **** worksheets. The last two worksheets may be saved for a later time or be done in cooperative pairs.

F53

Note: You may want to ask some students to write the result of a calculation above it to help decide how to draw Goldy's mouth. For example,

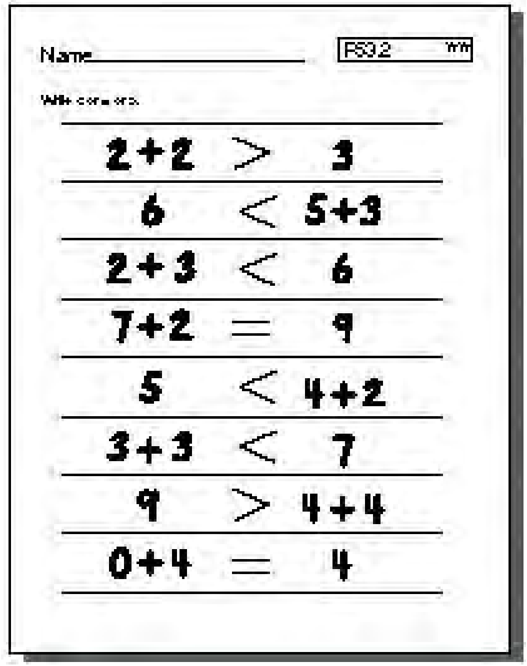
$$5 < \overbrace{4 + 2}^{6}$$

On the *** and **** worksheets, you may prefer to encourage students to decide how to draw Goldy's mouth by what makes sense, not necessarily by doing the calculations. For example, 6 + 5 < 6 + 6 because 5 < 6.


Name

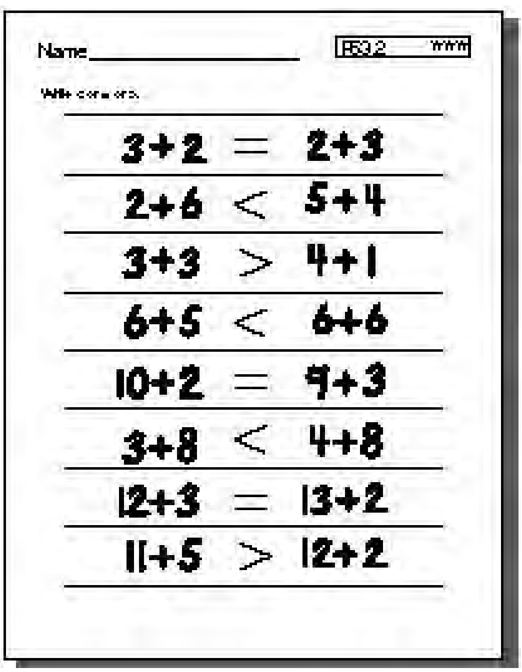
F53.2

8	>	6
9	<	13
3	>	0
5	<	15
17	<	26
20	>	10
13	<	17
3	<	20


Name

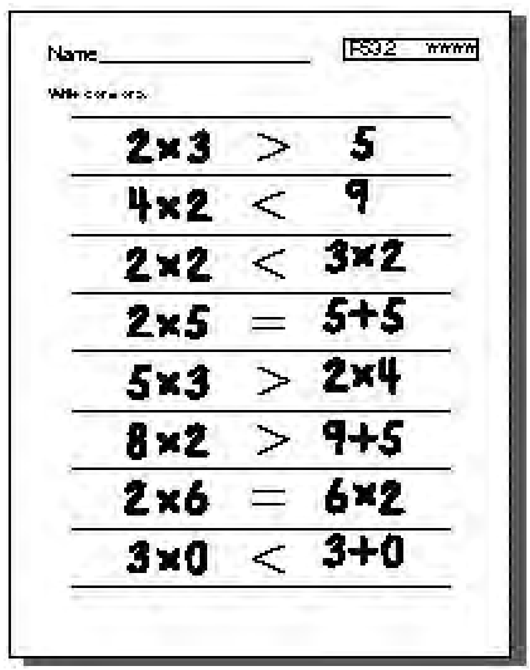
F53.2

2+2	>	3
6	<	5+3
2+3	<	6
7+2	=	9
5	<	4+2
3+3	<	7
9	>	4+4
0+4	=	4


Name

F53.2

3+2	=	2+3
2+6	<	5+4
3+3	>	4+1
6+5	<	6+6
10+2	=	9+3
3+8	<	4+8
12+3	=	13+2
11+5	>	12+2


Name

F53.2

2×3	>	5
4×2	<	9
2×2	<	3×2
2×5	=	5+5
5×3	>	2×4
8×2	>	9+5
2×6	=	6×2
3×0	<	3+0

F54 +1 AND +2 ARROW PICTURE #1

Capsule Lesson Summary

Label the dots in an arrow picture with both +1 and +2 arrows.

Materials

Teacher
- Colored chalk
- Numeral cards (optional)

Student
- Worksheets F54*, **, ***, and ****

Description of Lesson

Exercise 1

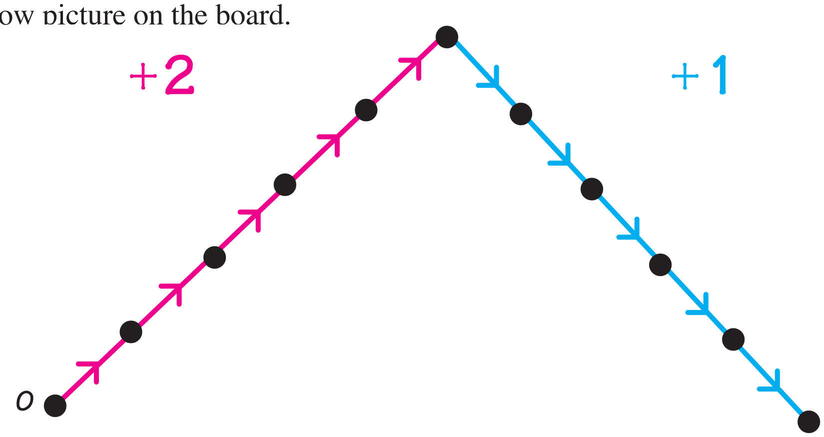
Conduct a group counting activity, counting forward and backward by ones and twos. For example, organize the class in a line or circle with an "A-B-A-B…" pattern of students standing and sitting. Tell the students that they are going to count by ones, but they must each remember their number. You may prefer to give students numeral cards. Start the count yourself saying "zero" and then point to each student in order as they count by ones. Then, starting with the last student, direct them to count backward to zero (say "zero" yourself).

Next, instruct only the standing students to count, saying the number they said before. That is, you start the count at 0 and the standing students continue counting by twos. Then, start with the last standing student and count backward by twos.

Next, instruct only the sitting students to count, saying the number they said before. That is, the student saying "one" starts and the rest continue counting by twos. Then the same group can count backward by twos.

Exercise 2

Draw this arrow picture on the board.



Allow the students to comment on the drawing. Emphasize that the red arrows are for +2 and the blue arrows are for +1.

After some discussion, point to the dot at the top of this arrow picture.

F54

T: ***What number is here?***

Do not reveal the correct number (10) at this time, but record several predictions on the board. Later, when this dot has been labeled, acknowledge correct predictions. If many students accurately predict the number, ask them to predict the number at the ending dot to the lower right in the picture (15).

Point to the dot at the end of the arrow starting at 0 and invite a student to label it. Ask the class to check that it is correct.

T: ***0 plus 2*** (trace the red arrow) ***is equal to…?***

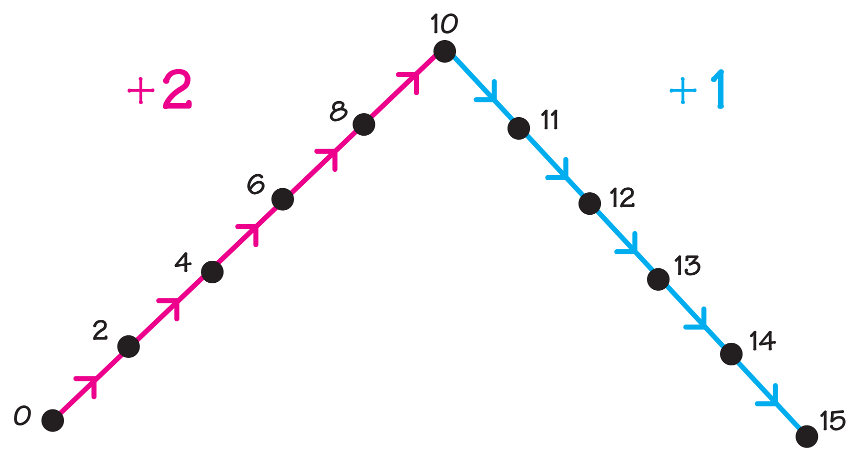
Continue in this manner until all the dots on the left side of the picture, including the dot for 10, have been labeled. Then, point to the blue arrow beginning at 10.

T: ***What is a blue arrow for?***

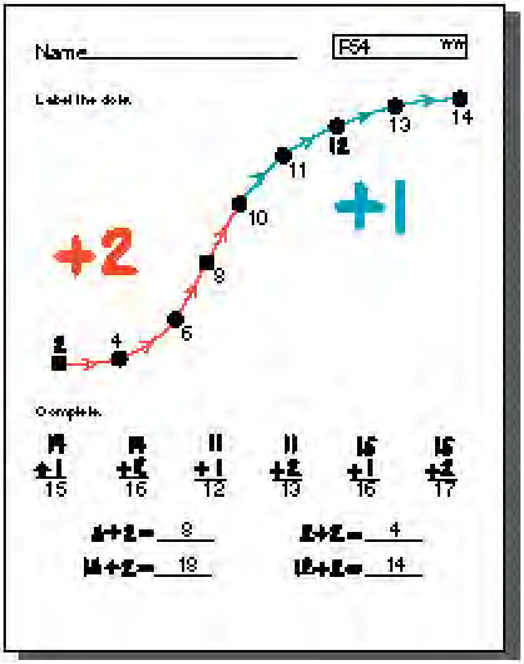
S: ***+1.***

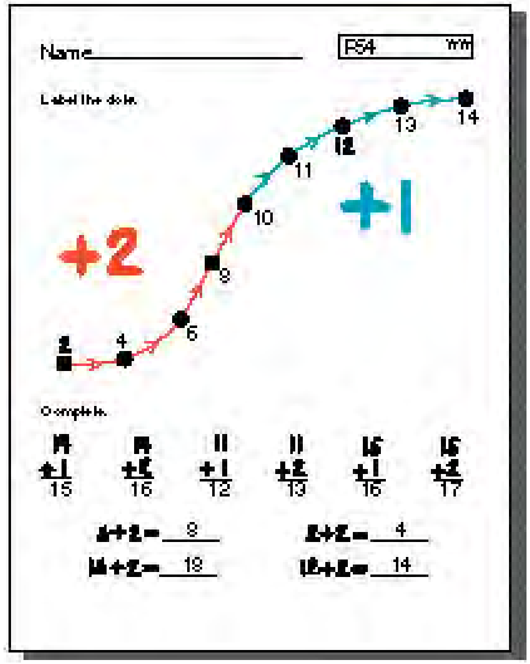
T: ***Who would like to label the next dot?***

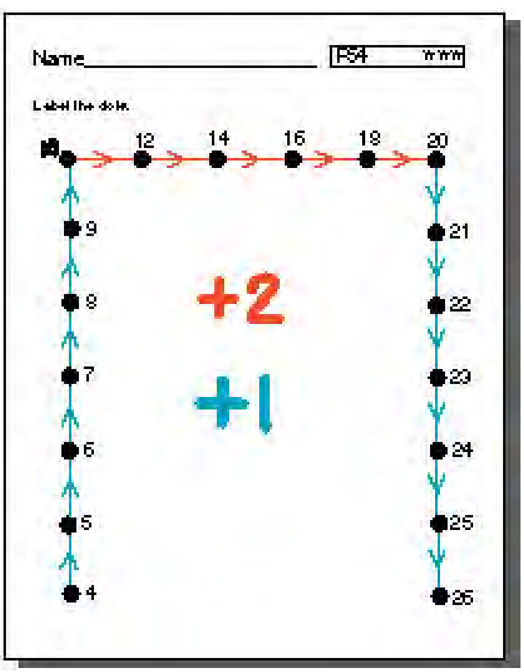
Proceed briskly until all of the dots in the arrow picture have been labeled.

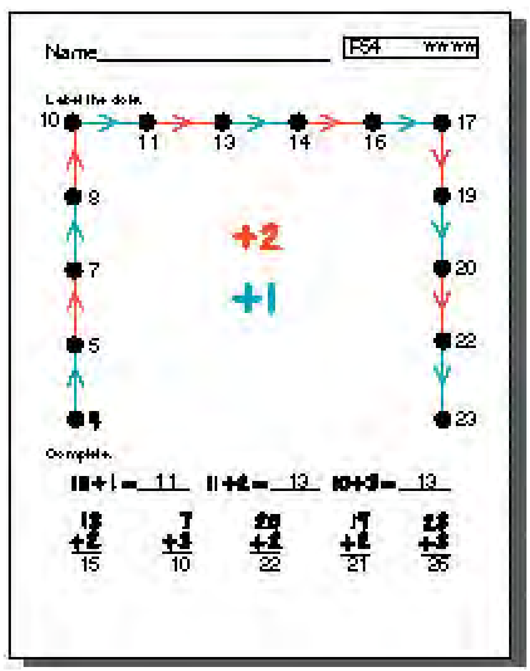


Worksheets F54*, **, ***, and **** are available for the remainder of the period.


Name
F54
Label the dots.
+2
+1
Complete.


Name
F54
Label the dots.
+2
+1
Complete.


Name
F54
Label the dots.
+2
+1


Name
F54
Label the dots.
+2
+1
Complete.

F55 TWO SETS #2

Capsule Lesson Summary

Use string pictures to classify the students in the classroom according to some well-defined characteristics. Interpret data gathered in a string picture.

Materials

Teacher	• Colored chalk	Student	• Colored pencils • Unlined paper

Description of Lesson

Exercise 1

Note: The string labels used in this lesson—“Wearing shoes with laces” and “Boys”—may not be appropriate for your class. Ideally there should be several children who are in the first category but not the second; several in the second but not the first; several in both; and several in neither. If this is not the case for your class, choose two other string labels so that the students will be distributed among the four categories. Be sure that the labels you choose are such that there will be no debate over whether a particular student fits into that category. “Children who are tall,” for example, could be a poor choice since a child may seem tall to some people but not to others.

Draw a red string labeled “Wearing shoes with laces” on the chalkboard.

T: ***This red string is for all children wearing shoes with laces. Can you draw a dot for yourself in this picture?***

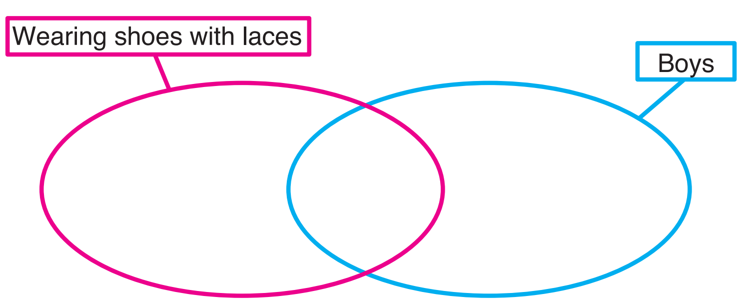
Let two or three students who are wearing shoes with laces draw dots for themselves inside the string; some who are not wearing shoes with laces can draw their dots outside the string. Ask students to explain why they put their dots where they did.

T: ***Who can draw a dot for my desk?***

Of course, this dot should be drawn outside the string. Erase the dots before continuing.

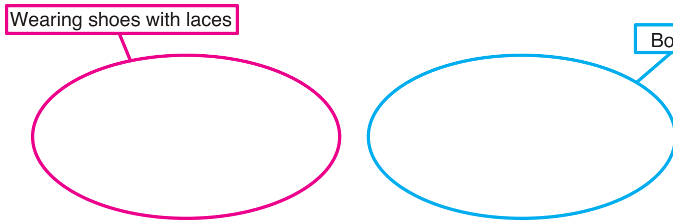
T: ***Who can draw a blue string for all the boys in the class?***

The blue string should be drawn so that the two strings overlap; most students will realize this.

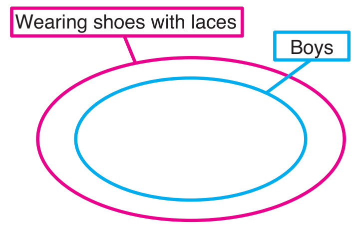


F55

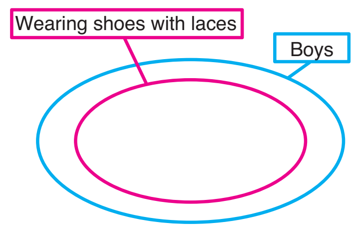
If, instead, a student draws a non-overlapping blue string, choose a boy wearing shoes with laces, and ask him to draw his dot. The class should observe that this is not possible and suggest that the blue string should be redrawn. Some students may suggest drawing two dots, one in each string; explain that there should be only one dot for the boy.



If a student draws the blue string inside the red string, ask a boy not wearing shoes with laces to draw his dot and discuss the difficulty.

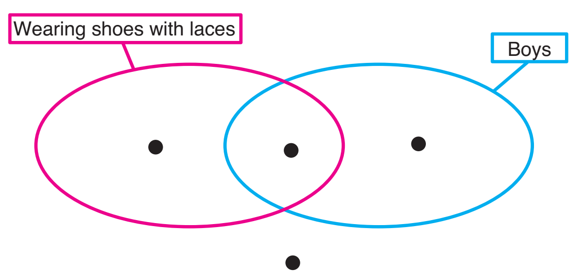


Similarly, if a student draws the blue string enclosing the red string, ask a girl wearing shoes with laces to draw her dot and discuss the difficulty.



When the blue string has been drawn correctly, label it “Boys” and ask students to draw dots for themselves. Continue in this manner until two or three dots have been drawn in each region. Do not forget the region outside of both strings. You can ask that dots be drawn for such things as a girl not wearing shoes with laces; a student’s pet dog; the classroom door; and so on.

Erase all but one of the dots in each region.



Point to the dots one at a time saying,

T: ***If this dot could be for you, raise your hand. Tell us why you raised your hand.***

After you have pointed to each of the dots, ask,

T: ***Who did not raise their hands? Why not?***

If some students believe that none of the dots could be for them, ask other students to help locate a dot for each of these students.

T: ***So, there is a dot that could be for each of you. Could anyone have more than one dot?***

If a student claims to have more than one dot, let the class discuss this and discover which dot is actually correct.

T: ***It appears that no one can have more than one dot.***

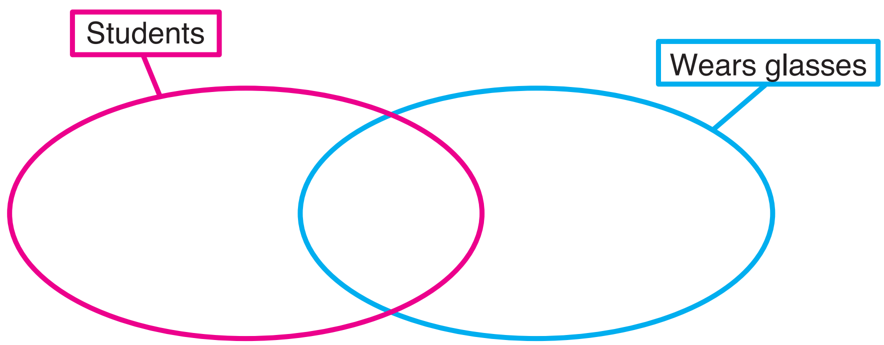
Invite all the students to draw dots and write their names next to them in the correct places in the picture.

T: ***What information do we get from our picture? How might this information be useful to a shoe store?***

Erase the string labels and names from the picture but leave the string picture.

Exercise 2

Organize the class into cooperative groups of three or four students each. Provide each group with unlined paper. Instruct the groups to copy the string picture and label the strings as shown below.



T: ***The red string is for all students and the blue string is for people who wear glasses. Draw dots for yourselves and for each person in your families.***

Students in a group should discuss among themselves where to put their family members in the picture. As you visit with the groups, encourage them to label dots and engage them in some discussion of their pictures. You may like to invite groups to tell the rest of the class about their pictures.

Another option for groups is to have them to choose labels for the strings and then collect data about where their classmates would be in their pictures.

Center Activity

Prepare task cards with string problems to place in a center. One example is provided on Blackline F55. Give the strings different colors and provide cut-outs to be placed in the string picture.

Home Activity

This would be a good time to send home a letter about the use of strings for classification. Such a letter can include several problems for parents/guardians to do with their children. See the sample letter in the blackline masters (Blackline F55).

F56 TRADES ON THE MINICOMPUTER #2

Capsule Lesson Summary

Progressively review the usual Minicomputer trades. Make trades so numbers on the Minicomputer are easier to read. Read numbers on the Minicomputer and write the numerals below (above) the boards to relate place value with the boards.

Materials

Teacher
- Minicomputer set
- Base-10 blocks (optional)

Student
- Minicomputer set
- Paper
- Worksheets F56* and **

Description of Lesson

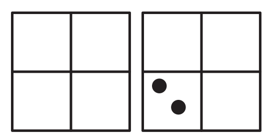
Exercise 1

Display two Minicomputer boards.

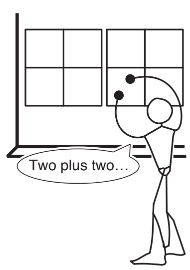
T: ***Who can put 2 on the Minicomputer?***

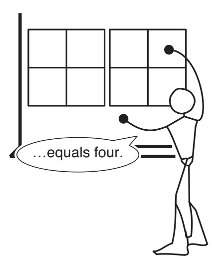
If a student puts two checkers on the 1-square, ask someone to make a trade and show 2 another way. Encourage the students to use both hands and say, "One plus one is two," as they make a trade.

T: ***I am going to add 2 to the number on the Minicomputer.***
What number is on the Minicomputer now? (4)
How do you know? (2 + 2 = 4)
Who can put 4 on the Minicomputer in another way?



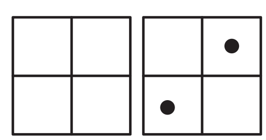
If necessary, help the students to use both hands and say, "Two plus two is four," as they make the trade.



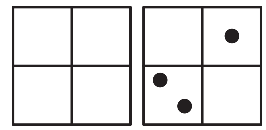


Briskly make the 4 = 2 + 2 and 2 + 2 = 4 trades again yourself, emphasizing the correct movements.

T: ***I am going to add 2 to the number on the Minicomputer.***
What number is on the Minicomputer now? (6)
How do you know? (4 + 2 = 6)



F56



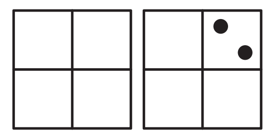
Put another checker on the red square of the ones board as you ask,

T: ***And two more than 6 is?***

S: ***8.***

T (pointing to the two checkers on the red square)**:** ***Who would like to make a trade with these two checkers?***

If necessary, remind the students that they should use both hands and say what trade it is. After a student has made the 2 + 2 = 4 trade, demonstrate the 4 = 2 + 2 and 2 + 2 = 4 trades yourself.

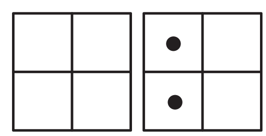


T: ***What number is on the Minicomputer? How do you know?***

S: ***8, because 4 + 4 = 8.***

T: ***I would like to put 8 on the Minicomputer with only one checker. Who can make a trade and do this?***

If necessary, help the students by saying, "Four plus four is eight," as they make the trade. When a student has made the 4 + 4 = 8 trade, demonstrate the 8 = 4 + 4 and 4 + 4 = 8 trades yourself.



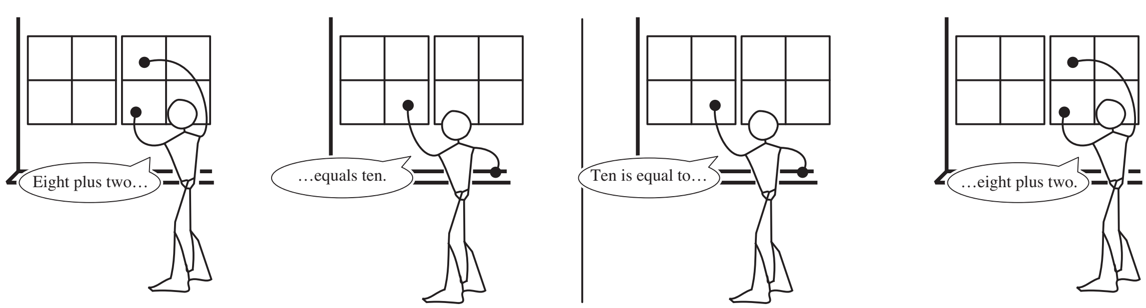
T: ***Now I am going to add 2 more to the number on the Minicomputer. What is the number? How do you know?***

S: ***10, because 8 + 2 = 10.***

T: ***Can someone make a trade and show 10 with only one checker?***

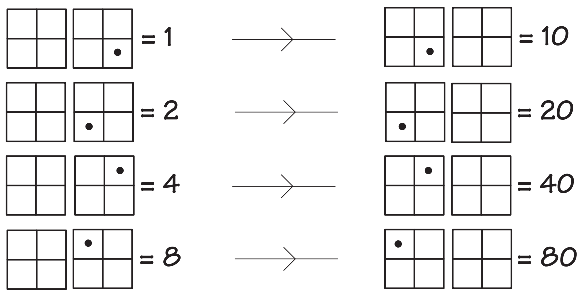
If no one remembers the 8 + 2 = 10 trade, point to the appropriate checkers and say, "Eight plus two is ten." If necessary, make the trade yourself.

Repeat this and the corresponding backward trade several times. Ask students to repeat "8 + 2 =10" and "10 = 8 + 2" as you move the checkers for the trades.



Exercise 2

Tell the students that you are going to move one checker to different squares on the Minicomputer and that they should tell you, after each move, what number is on the Minicomputer. First, move the checker in the following sequence.

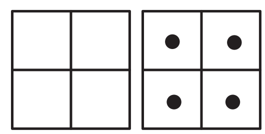


Next, move the checker randomly among the squares of the ones board and tens board.

Students can work in pairs for the next exercises.

Exercise 3

Put these checkers on the Minicomputer.



T: ***What number is this?*** (15) ***Write the number on your paper (or whisper it to your partner).***

Ask for an explanation of the correct answer, but if no one knows the answer, do not reveal it.

T: ***Who sees a trade we can make?***

Point to the checkers on the brown and the red squares as the 8 + 2 = 10 trade is suggested. If necessary, ask for a trade with these two checkers, and help a student to make the trade and say, “Eight plus two is ten.”

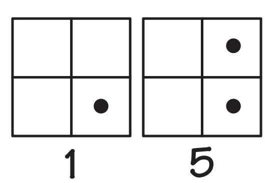
Standing to one side of the Minicomputer, point to the tens’ board.

T: ***What number is on this board?*** (10)

Write 1 below the tens board saying, “One ten.”

T: ***What number is on this board*** (point to the ones board)***?*** (5)

Write 5 below the ones board, saying, “Five.”



T: ***What number is on the Minicomputer?***

S: ***15.***

T: ***How many people would we need to show 15 fingers?***

S: ***Two.***

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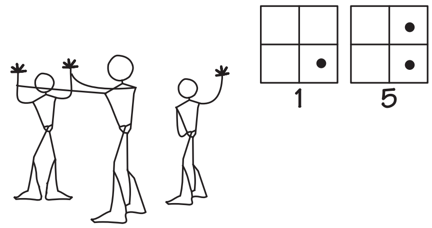
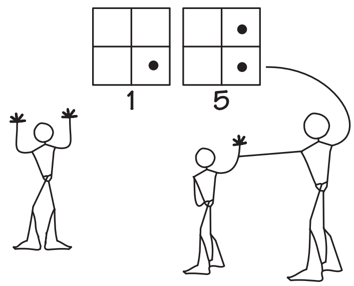
Instruct each pair of students to hold up 15 fingers. Then instruct two students to stand beside the Minicomputer with one of them holding up ten fingers and the other, five fingers.

Stand behind the student who is showing ten fingers, hold the student's hands high, and say, "Ten…" Then point to the tens board.



Stand behind the student who is showing five fingers, hold the student's hand high and continue, "…plus five is fifteen." Then point to the ones board.



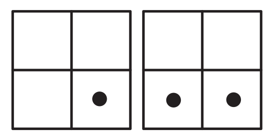
T: ***We have fifteen fingers and 15 on the Minicomputer.***

You may also like to model 15 with base-10 blocks.

If the lesson has moved quickly so far, continue with Exercise 4. Otherwise, go on to Exercise 5.

Exercise 4

Put this number on the Minicomputer.

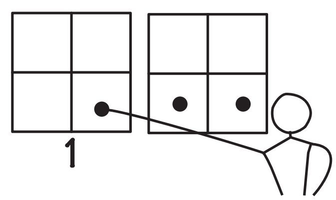


T: ***What number is on the Minicomputer? Write the number on your paper (or whisper the number to your partner).***

S: ***13.***

Point to the tens board.

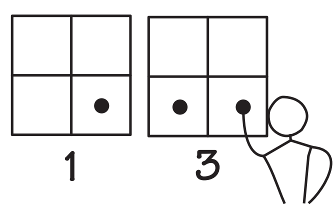
T: ***Which number is on this board?*** (10)



Write 1 below the tens board as you say, "Ten."
Then point to the ones board.

T: ***What number is on this board?*** (3)

Write 3 below the tens board as you say, "Three."



Point to the appropriate checkers as you say,

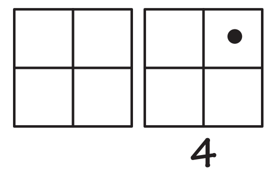
T: ***Ten plus three is thirteen.***

Repeat this activity for some of these numbers: 16, 19, 26, 43, 82, 54. You may wish to ask the students to write the numeral below the Minicomputer.

Exercise 5

Distribute individual Minicomputers (one sheet—two boards) and three or four checkers to pairs of students.

Distribute copies of Worksheet F56* and ask students to look at the front side. Observe that the pictures are Minicomputers without color. Instruct students to put checkers on their individual Minicomputers just like the first problem, while you do the same on the demonstration Minicomputer.



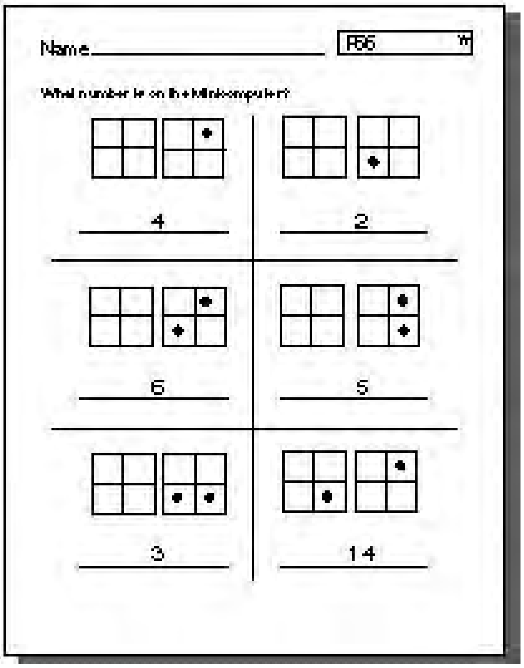
T: ***What number is on the Minicomputer?***

S: ***4.***

Instruct students to write the number on the blank below the Minicomputer.

Continue in this way to complete the front side of the worksheet. Then direct students to turn over the worksheet and do the problems with their partners.

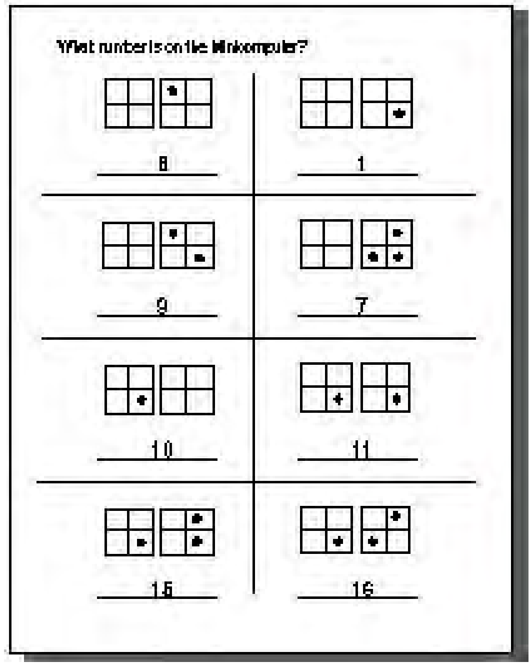
As students complete the * worksheet, check their work and direct them to do the ** worksheet.



Name________________ F56

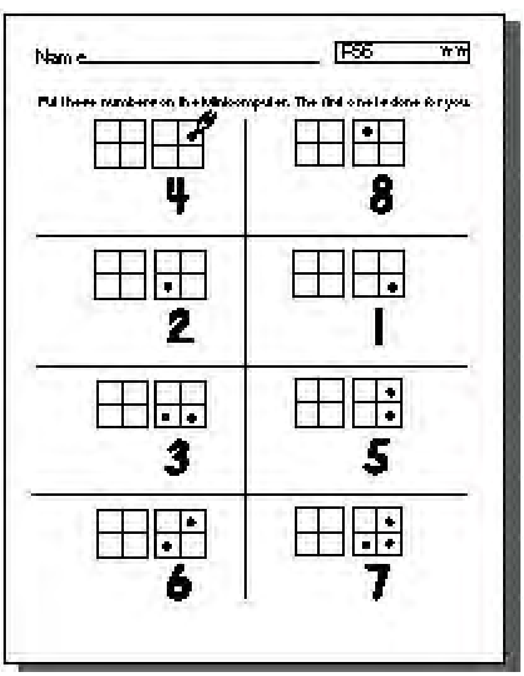
What number is on the Minicomputer?

4 | 2
6 | 5
3 | 14



What number is on the Minicomputer?

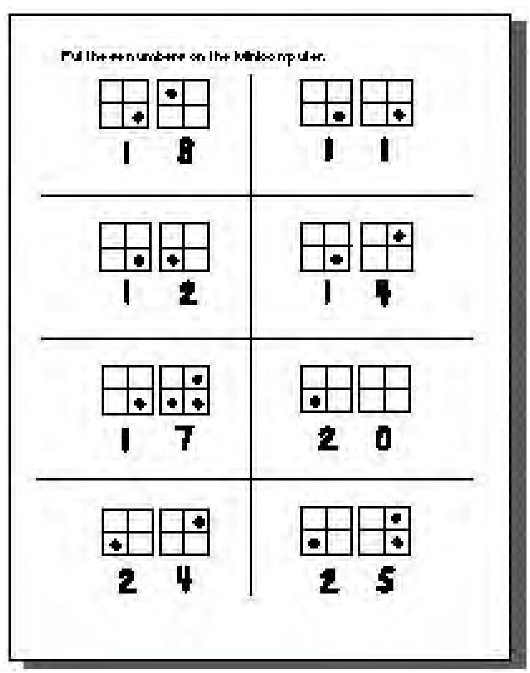
8 | 1
9 | 7
10 | 11
15 | 16



Name________________ F56

Put these numbers on the Minicomputer. The first one is done for you.

4 | 8
2 | 1
3 | 5
6 | 7



Put these numbers on the Minicomputer.

18 | 11
12 | 14
17 | 20
24 | 25

F57.1 TELLING STORIES FOR AN ARROW PICTURE #2

Capsule Lesson Summary

Tell stories that could be the interpretation of a picture with dots, strings, and arrows.

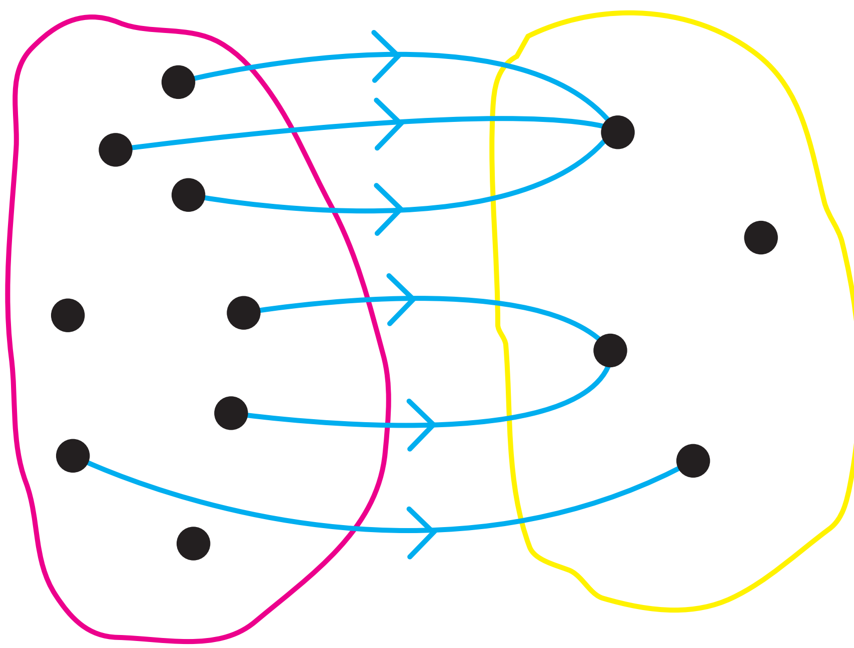
Materials

Teacher	• Colored chalk	Student	• Paper

Description of Lesson

T: ***Last week, I drew an arrow picture and you told stories to go with the picture. Today, I'll draw a different picture and you can invent new stories to go with it.***

Draw this picture on the chalkboard.



Once again, you may need to modify the stories as they are suggested, ensuring that they are explicit about the following points.

T: ***What are the dots inside the red string for?***
What are the dots inside the yellow string for?
What are the arrows for? (They should all be for the same thing within a story.)

Here is a sample story.

S: ***My story is about toys.***

T: ***Where are they?***

S: ***In the yellow string.***

T: ***What are the dots in the red string for?***

S: ***Children.***

T: ***What are the arrows for?***

S: ***A child is playing with a toy.***

Some additional questions about the story could also be posed; for example,

T: ***Which toy are most children playing with?***
Is every toy being played with?
Can you point to children who are playing with the same toy?

Ask for several other stories about this drawing. If students begin to suggest only variations on the first story, ask someone to tell a story which (in this example) is not about toys or children.

As in Lesson F47.2, some class discussion might be needed for stories that appear to conflict with the picture. For example, if a student suggests that the red string is for "Mothers," the yellow string is for "Children," and the arrows are for "You are my child," different mothers would have the same child (or a child would have more than one mother)—an impossibility! For such an example, the description of the strings could be reversed.

If a story cannot be salvaged through modification or discussion, say simply,

T: ***That is a very nice story but it does not seem to fit our picture.***

You may want to draw a picture which does fit the student's story, if this is possible.

Writing Activity

Ask students to copy the picture from the lesson and write a story which fits the picture. Alternatively, they can draw their own pictures to write stories about.

F57.2 A-BLOCK TABLE

Capsule Lesson Summary

Place A-block pieces in a table according to their color and shape characteristics. This lesson is a first experience for students to organize information in a matrix table.

Materials

Teacher
- One set of A-blocks
- Colored chalk

Student
- One set of A-blocks
- Worksheet F57.2

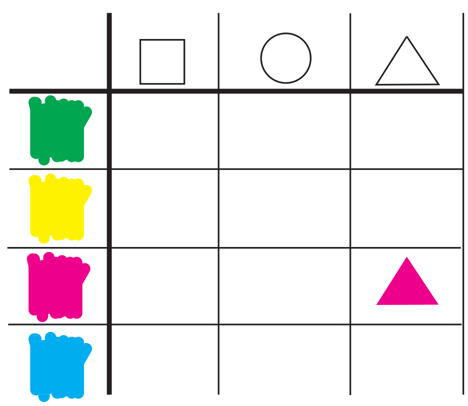
Description of Lesson

Distribute A-block sets and copies of Worksheet F57.2. Draw the table from the worksheet on the board (the colored patches should be drawn without any particular shape to them). The spaces in the table should be large enough for A-block pieces.

Hold up a red triangle and ask students to hold up the same piece.

T (pointing to the 12 spaces in the table)**:** ***In which of these spaces should we put this piece?***

Accept suggestions until someone indicates the position shown below and place the piece on the board.



Point to the red patch with your left index finger and the triangle column heading with your right index finger, as you say,

T: ***It's red and it's a triangle…***

Run your left finger horizontally to the right, and your right finger downward, until they meet at the red triangle.

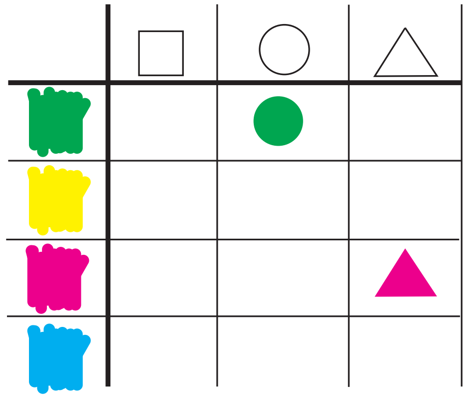
T: ***…so we put it here.***

Instruct students to place their red triangle in the table on their worksheet. Check student placement.

T: ***Who can find a piece to put here*** (point to the space for a green circle)***?***

F57

Ask a student to select one of the A-blocks; if the student is correct, put the piece in the table in its proper place. Instruct students to locate the piece in their A-block sets and place it similarly in the table on their worksheets.

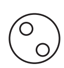


If an incorrect piece is selected, ask where it should be placed, place it there, and repeat the original question.

Alternate the two methods (selecting a piece and asking where it belongs, or pointing to a space and asking what could go there) until about six pieces have been placed in the table on the board. Then instruct students to place pieces in the remaining spaces of the table on their worksheets.

Center Activity

Place other attribute manipulatives in a center with similar tables on task cards for students to fill in. For example, use Attrilinks®, people pieces, colored beads, or even a collection of buttons.

	2 holes	4 holes	no holes on top	
Black				
White				
Red				
Blue				

F58.1 TRADES ON THE MINICOMPUTER #3

Capsule Lesson Summary

Make usual Minicomputer trades so that a number on the Minicomputer is easier to read.

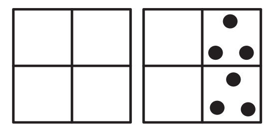
Materials

Teacher • Minicomputer set

Student • Paper

Description of Lesson

Display two Minicomputer boards with six checkers placed as shown.



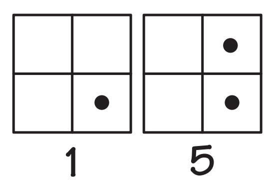
T: ***This is my secret number. Does anyone know what my secret number is?*** (15)

Encourage students to write the numbers on their papers, or allow several students to whisper the number to you.

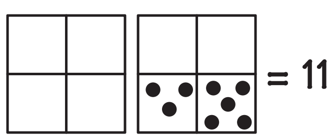
T: ***With all these checkers, it is hard to read my secret number. Does anyone see a trade we could make?***

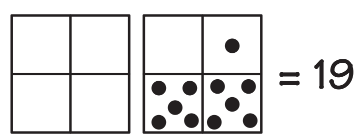
It may be necessary to make the first trade yourself. If so, make the 4 + 4 = 8 trade; otherwise, it does not matter which trade a student makes first. Emphasize the use of both hands and the removal of the "extra" checker from the Minicomputer. Ask students to say the appropriate addition fact as they make a trade. Continue until all trades have been made.

Ask a student to write the appropriate numeral below the Minicomputer. Commend those students who knew the secret number from the start.



Repeat this activity with one or two more secret numbers.





Capsule Lesson Summary

Observe and discuss similarities and differences in a variety of linear patterns. Make a variety of linear patterns and graph them according to "same pattern sequence."

Materials

Teacher
- Headbands (see below)

Student
- Rubber stamp, templates, stickers, or pattern blocks
- 2" by 25" strip of paper (adding machine tape)
- Colored pencils

Advance Preparation: Before teaching this lesson, prepare three or four headbands such as:

❍❍☆❍❍☆❍❍☆❍❍☆❍❍

✦✦✦■✦✦✦■✦✦✦■✦✦✦

♥✖♥✖♥✖♥✖♥✖♥✖♥✖♥✖♥

❖❖✓❖❖✓❖❖✓❖❖✓❖❖✓

Description of Lesson

Display your pre-made headbands and discuss with the class how they can be worn. Then ask the class to observe in what ways they are alike and in what ways different. Encourage varied observations, but include some about the pattern sequence. For example, the sequence in ❍❍☆❍❍☆❍❍☆❍❍☆❍❍ is the same as the sequence in ❖❖✓❖❖✓❖❖✓❖❖✓❖❖✓ even though the things making up the pattern are different.

Organize the class into groups of two to four students. Give each group several strips of paper and access to rubber stamps, stickers, templates, or pattern blocks. Instruct the groups to make headbands for each group member. You may want to encourage groups to give each member a job (e.g., choose things to use in the pattern, select a sequence, hold the paper, make the pattern, and so on).

At any one time, a group should use just one kind of material (rubber stamps, templates, and so on) and just two different pictures. Groups can change materials for another headband, but each headband should be made with two pictures in some pattern sequence.

When most groups have completed several headbands, plan for a collective discussion. Let each group describe some of the patterns they used to make headbands.

Make a headband graph putting together those with the same pattern sequence. For example,

❍❍☆❍❍☆❍❍☆❍❍☆❍❍	✧●✧●✧●✧●✧●✧●✧●✧	❀❀❀▼❀❀❀▼❀❀❀▼❀❀❀
❖❖✓❖❖✓❖❖✓❖❖✓❖❖✓	♥✖♥✖♥✖♥✖♥✖♥✖♥✖♥✖♥	✦✦✦■✦✦✦■✦✦✦■✦✦✦
●●✣●●✣●●✣●●✣●●✣	✺▲✺▲✺▲✺▲✺▲✺▲✺▲	
▲▲✇▲▲✇▲▲✇▲▲✇▲▲		
AABAABAABAABAABAA		

F58

Reading Activity

Following this lesson, you may like to read a story like *Little Red Hen* or *Gingerbread Man* and make special note of the language patterns. Patterns allow you to predict, for example, what the Gingerbread Man is going to say.

Home Activity

Send headband patterns home with students and instruct them to describe the pattern to their families. Suggest students and parents/guardians look for patterns together in, for example, wallpaper or clothing.

F59 DETECTIVE STORY #1

Capsule Lesson Summary

Investigate counting by fives with a calculator, and relate counting by fives to counting money and telling time. Discover a secret number from clues involving counting by fives, the *is less than* relation, and configurations on the Minicomputer.

Materials

Teacher		Student	
	• Overhead or class calculator • Nickels • Clock • Minicomputer set • 0-109 numeral chart • Colored chalk		• Paper

Advance Preparation: Use Blackline F59 (a) to make a clock face.

Description of Lesson

Exercise 1: Counting by Fives

Remind the class how they have counted by ones and by twos, both forward and backward. Ask whether anyone knows how to count by fives, and let some students demonstrate.

T: ***How can we teach the calculator to count by fives?***

Lead the class in a discussion of the following steps:

1. Put on the starting number (0 or 5).
2. Press $\boxed{+}$ $\boxed{5}$.
3. Press $\boxed{=}$ $\boxed{=}$ $\boxed{=}$ and so on.

Encourage the class to count by fives in unison with the calculator from 0 (or 5) to about 100.

T: ***When might we use counting by fives to count some things?***

S: ***Counting our fingers.***

S: ***Counting tally marks.***

S: ***Counting cents when you have nickels.***

S: ***Counting minutes on the clock.***

For each suggestion (you may need to make some of these suggestions yourself) demonstrate the use of counting by fives. Specifically, use counting by fives to calculate the amount (in cents) of money with between seven and ten nickels. Also, count the minutes in an hour on the clock. You may like to use Blackline F59(a) to make a clock face for this purpose.

Exercise 2: Detective Story

Before starting this exercise write a large 20 on a slip of paper, folding it so that the numeral is hidden.

T: ***I wrote the name of a secret number on this paper. You are all going to be detectives and try to discover what my secret number is. What does a detective do?***

Encourage class discussion, mentioning, among other things, that a detective searches for hidden things and uses clues rather than just guessing.

T: ***Listen carefully to my clues and you can discover what the secret number is.***

Clue 1

T: ***If you start at 0 and count by fives, you will say the secret number. Let's count by fives together.***

As the class counts by fives, point to the appropriate numerals on the 0–109 numeral chart. Count as far as you feel is appropriate.

T: ***Let's record some of these numbers on the chalkboard. What was the first number we said?***

S: ***0.***

Write 0 on the board. Ask the student which number came next, and continue recording the numbers on the board, up to at least 40.

T: ***Are these all the numbers we say when counting by fives?***

S: ***No, we can go on and on.***

Lead the discussion until many of the students realize that this list can go on and on. Draw three dots at the end of your list, and draw the students' attention to these dots.

T: ***These dots are for all the other numbers that we say if we are counting by fives.***

0, 5, 10, 15, 20, 25, 30, 35, 40,

T: ***The secret number is one of the numbers in our list.***
Could the secret number be 30?

S: ***Yes; 30 is in the list.***

T: ***Could the secret number be 13?***

S: ***No; 13 is not in the list.***

T: ***Could the secret number be 85?***

S: ***Yes.***

Point to the three dots.

T: ***We did not write 85 on the board but it is in our list. If we count by fives we would reach 85 right after 80. 85 could be the secret number.***

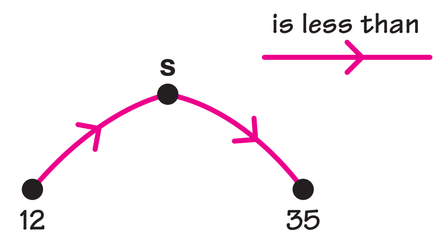
Do not expect all of your students to understand the three dots.

T: ***We know many numbers which could be the secret number. What do we need to help us decide which number it is.***

S: ***Another clue.***

Clue 2

Draw this picture on the chalkboard.



Point to the dot labeled **s**.

T: ***This is the secret number. What are the red arrows for?***

S: ***Is less than.***

T: ***What does the picture tell us about the secret number?***

S: ***12 is less than the secret number, and the secret number is less than 35.***

T: ***What numbers could be the secret number? Write them on your paper.***

Allow the class to discuss this situation. The following is a sample dialogue.

S: ***It could be 20.***

T (putting 20 at **s**)**:** ***Let's check whether the secret number could be 20.***
(Trace the arrow from 12 to 20) ***Is 12 less than 20?*** (Yes)
(Trace the arrow from 20 to 35) ***Is 20 less than 35?*** (Yes)
Was 20 one of the numbers we said when counting by fives? (Yes)
20 could be the secret number.

Circle 20 in your list of numbers and remove it from the arrow picture.

S: ***13; 12 is less than 13 and 13 is less than 35.***

T: ***Yes, but is 13 one of the numbers we said when we counted by fives?*** (No) ***Remember, our first clue was that we would say the secret number if we started at 0 and counted by fives. 13 cannot be the secret number because it is not in our list from the first clue.***

S: ***35 is in our list.***

Point to the dot for the secret number (labeled **s**) in the arrow picture.

T: ***Could 35 be the secret number?***
(Trace the red arrow starting at 12) ***Is 12 less than 35?*** (Yes)
(Trace the arrow from **s** to 35) ***Is 35 less than 35?*** (No)
So 35 cannot be the secret number.

Cross 35 off your list. Continue until all the numbers in your original list are either circled or eliminated. Point to the three dots at the end of the list.

T: ***Could any of the numbers which are in the list but not on the board be the secret number?***

S: ***No, those numbers are all more than 35.***

Cross off the three dots.

~~0~~, ~~5~~, ~~10~~, 15, 20, 25, 30, ~~35~~, ~~40~~,

T: ***Now we know that the secret number is either 15, 20, 25, or 30.***

Erase everything which has been crossed off. Display two Minicomputer boards.

Clue 3

T: ***I'll give you one more clue. When you know the secret number, write it on your paper (or whisper it to me.)***

The secret number can be put on the Minicomputer with only one checker. What is the secret number?

Look at (or listen to) answers from many students, but do not yet reveal the correct one (20).

T: ***Who can put the secret number on the Minicomputer with only one checker?***

After a volunteer has put 20 on the Minicomputer, ask if anyone can put 15, 25, or 30 on the Minicomputer using just one checker.

Finally, unfold the slip of paper on which you wrote the name of the secret number and reveal it to the class.

Center Activity

Put "counting by fives" dot-to-dot worksheets in a center. Blackline F59(b) has a sample worksheet. Make task cards with pictures of nickels and ask how many cents.

Home Activity

Provide "counting by fives" dot-to-dot worksheets as a home activity. Suggest parents/guardians find opportunities to count by fives such as calculating an amount of money with nickels.

F60 ADJUSTMENT/ASSESSMENT DAY #6

Note: See Section One, page 1-9, for a full explanation of the purpose of scheduled adjustment days. Worksheet F60 is available for a short, written assessment.

Today you may wish to repeat an earlier lesson either for a group of students or for the entire class. Many of the lessons can be made to appear completely different by changing the story and/or numbers in the lesson. If you omitted any exercises or worksheets from an earlier lesson, you may like to include these. This is also a good time to allow students to work in centers or on a project of your choice.

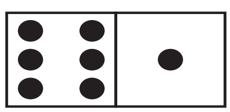
The following activities may be appropriate for students who need additional practice.

How Many Checkers?

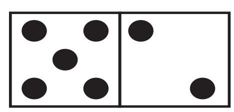
Place magnetic checkers on the board and let a student count them aloud. Remove the checkers one by one, each time asking how many checkers are left. A variation is to put checkers on the board and hide some of them. Ask the students to observe how many checkers are showing and discover how many are hidden.

Dominoes

Use dominoes with small groups of students. For example, ask everyone in the group to find a domino with seven dots. Then let each student describe the combination of dots on the domino. Write facts for 7 to correspond with the dominoes.

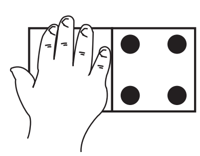


$6 + 1 = 7$



$5 + 2 = 7$

Ask students to display their dominoes with one side covered. Other students then predict how many dots are on the covered side.



Numeral Card Game

Students work in groups of three or four students. One student chooses a numeral card, from 0 to 10, and shows it to the others in the group. The other students must each tell something different about the number. For example, for the number 7 students might say the following:

S: ***5 + 2 = 7.***

S: ***I am showing 7 fingers.***

S: ***7 is less than 10.***

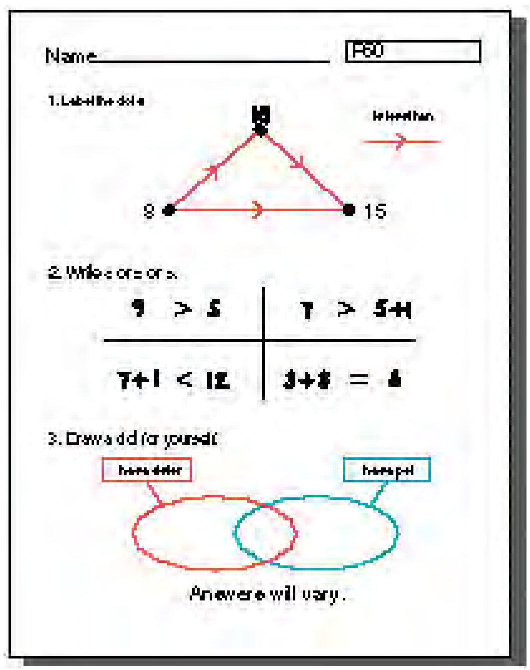
If your class is experiencing little difficulty with the *CSMP* curriculum, you may wish to omit this adjustment day and continue immediately with F61.1 *Trades on the Minicomputer #4*.

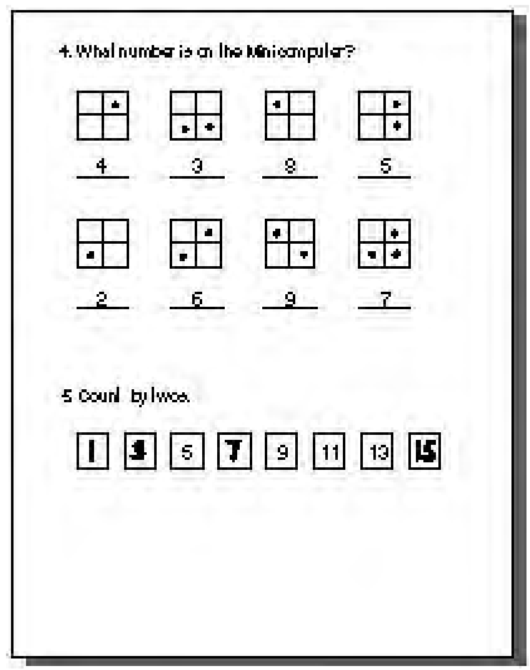
F60

Early Warning

Among the next nine classroom lessons are some that require extra preparation time, or that involve materials not included with the *CSMP* Classroom Set. The lessons have been listed here for your convenience in preparing for them. A more detailed description of the needed materials can be found on the first page of each lesson. (These special materials have been listed here only once, even if they are needed more than once during the nine-day period.)

F62 *Coin Cubes*: Coin cubes
F67.1 *Trades on the Minicomputer #5*: Base-10 blocks or other place value manipulatives
F68.1 *Coin Problem #1:* Coins; small container
F69.1 *Trades on the Minicomputer #6*: Base-10 blocks; dimes





F61.1 TRADES ON THE MINICOMPUTER #4

Capsule Lesson Summary

Begin with one checker on the 8-square and make backward trades until all checkers are on the 1-square.

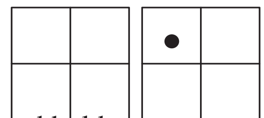
Materials

Teacher • Minicomputer set

Student • Paper

Description of Lesson

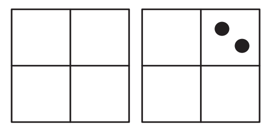
Display two Minicomputer boards and hold up one checker.



T: ***Who can put 8 on the Minicomputer with one checker?***

Write 8 below the ones board. Then, remove the checker from the 8-square and hold up two checkers.

T: ***Who can put 8 on the Minicomputer with two checkers?***



Demonstrate a backward trade yourself, stressing the use of both hands and saying, "Eight equals four plus four."

T: ***Show four plus four with your fingers. How many fingers altogether?***

S: ***Eight.***

T: ***Four plus four equals eight. Who can write this number fact on the chalkboard?***

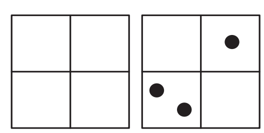
Instruct students to write the fact on their papers while one student writes it on the chalkboard. When this has been done, read the number fact aloud.

$$4 + 4 = 8$$

Leave 8 on the Minicomputer as 4 + 4 and hold up another checker.

T: ***Who can put 8 on the Minicomputer with three checkers?***

Demonstrate a backward trade yourself, stressing the use of both hands and saying, "Four equals two plus two."



T: ***Show four fingers, plus two fingers, plus two more fingers. How many fingers?*** (Eight) ***Four plus two plus two equals eight. Who can write this number fact on the board?***

Instruct students to write the fact on their papers while one student writes it on the chalkboard. When this has been done, read the number fact aloud.

$$4 + 2 + 2 = 8$$

You may stop at this point or continue making backward trades, each time getting 8 on the Minicomputer with one more checker.

F61.2 COMPOSITION OF FUNCTIONS #1

Capsule Lesson Summary

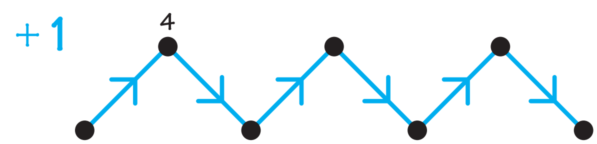
Find the greatest and least numbers in a +1 arrow picture and then label all the dots. Draw all the possible +2 arrows in the same picture.

Materials

Teacher	• Colored chalk	• Worksheet F61.2* and **
Student	• Paper	• Colored pencils

Description of Lesson

On the chalkboard, draw this arrow picture.



T: ***Point to the greatest number in this arrow picture. Write on your paper (or tell me with whispers) what the greatest number is.***

S: ***9.***

T: ***Point to the least number in this arrow picture. Write on your paper (or tell me with whispers) what the least number is.***

S: ***3.***

T: ***What are the blue arrows for?*** (+1)

Point to 4 and then trace the blue arrow that starts at 4.

T: ***4 plus 1 is… ?***

S: ***5.***

Write 5 near the appropriate dot. Point to the next dot.

T: ***What number is this? How do you know?***

S: ***6, because 5 + 1 = 6.***

Ask a volunteer to label this dot and continue in this manner until the dot for 9 has been labeled. Then, point to the left-most dot.

T: ***Who can tell us what number is here?***

When a correct answer is given, allow the student to label the dot. Ask the student to explain why this is correct. Guide the student to trace the arrow and to say, "Three plus one equals four."

Near the arrow picture, write +2 in red.

T: ***Where could we draw red +2 arrows in this picture?***

F61

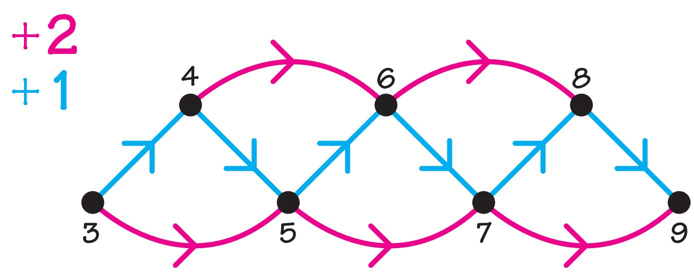
Let students make suggestions by tracing +2 arrows on the board, but do not allow more dots to be added to the drawing. If no one suggests a correct +2 arrow, point to 3 and ask,

T: ***What number is 3 + 2?***

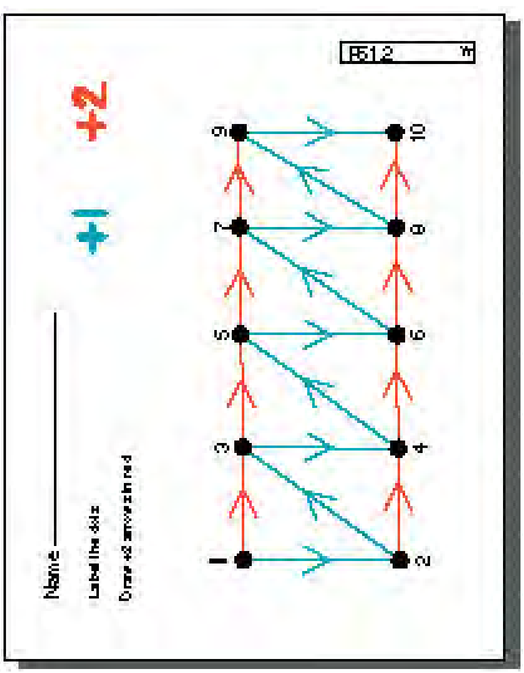
S: ***5.***

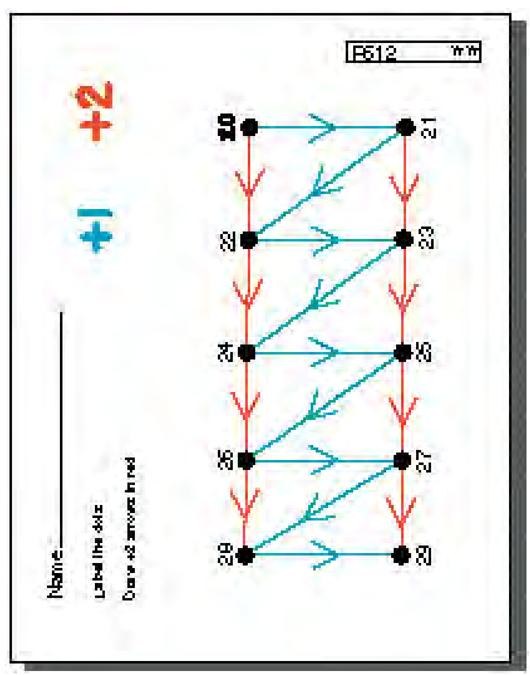
Draw a red arrow from 3 to 5 as you say, "Three plus two equals five."

Continue asking the students to trace +2 arrows on the board until the arrow picture is complete. When an arrow is correctly traced, draw it yourself in red. Occasionally, ask a student to explain why a +2 arrow may be drawn from one number to another.



Distribute Worksheets F61.2* and **. Explain to the students that they should label the dots first. Then, they should draw +2 arrows in red.





F62 COIN CUBES

Capsule Lesson Summary

Use coin cubes to generate combinations of coins. Determine the amount of money for different combinations of coins. Perform many cube-tossing trials, find possible outcomes, collect data, and make observations about the data.

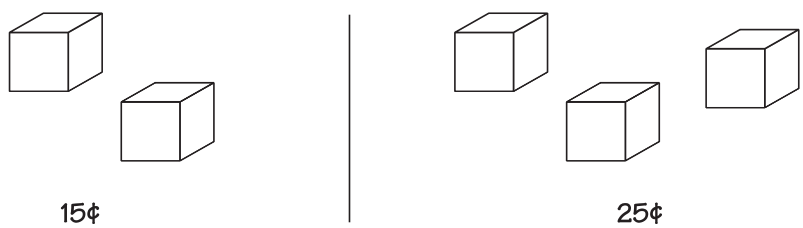
Materials

Teacher		Student	
	• Coin cubes		• Coin cube • Paper

Description of Lesson

Organize the class in groups of two or three students. Each group should have two or three coin cubes and paper. The activity is more difficult with three, so decide on using two or three coin cubes based on your class.

Instruct the groups by demonstrating how to use the coin cubes. Toss two (or three) cubes, observe what coins show on the top-most faces, and record the total amount of money. For example,



Then direct each group to perform ten cube-tossing trials. Each time, they should record the amount of money. Students can take turns tossing the cubes and recording within their groups. All members should agree on the amount of money each time. Encourage groups to keep an easy to read record of the ten trials; for example, they might record the result like this:

1. 10¢ + 1¢ = 11¢
2. 1¢ + 5¢ = 6¢
3. 5¢ + 5¢ = 10¢

⋮

After the groups have completed the ten trials, collect data from the whole class.

T: ***What different total amounts (sums) can we get when we toss two (three) cubes?***

Through a collective discussion, find all possible amounts of money. There are:

- six possibilities with two cubes: 2¢, 6¢, 10¢, 11¢, 15¢, and 20¢
- ten possibilities with three cubes: 3¢, 7¢, 11¢, 12¢, 15¢, 16¢, 20¢, 21¢, 25¢, and 30¢

Make a chart on the chalkboard with the possibilities.

F62

Determine how many times the different possibilities occurred among the groups. The following charts indicate one way the class data could be displayed.

Two cubes: (Assumes twelve groups of two students each)	2¢	6¢	10¢	11¢	15¢	20¢
	𝍸 𝍸	𝍸 𝍸 𝍸 𝍸 𝍸 |	𝍸 𝍸 𝍸	𝍸 𝍸 𝍸 𝍸 𝍸 ||	𝍸 𝍸 𝍸 𝍸 𝍸 ||||	𝍸 𝍸 |||

Three cubes: (Assumes eight groups of three students each)	3¢	7¢	11¢	12¢	15¢	16¢	20¢	21¢	25¢	30¢
	|	𝍸 ||||	𝍸 ||	𝍸 𝍸	||||	𝍸 𝍸 𝍸 ||||	𝍸 |||	𝍸 𝍸 |	𝍸 |||	|||

Make some observations about the data. For example,

T: ***Which amount of money came up the most (least) often?***
Why do you think we got _____¢ a lot less often than _____¢?
It looks like we got _____¢ about the same number of times as _____¢.
If we toss the cubes once, which amount of money would you predict we will get?

Center Activity

Put coin cubes in a center with task cards for additional practice.

F63.1 ADDITION ON THE MINICOMPUTER #1 ________ F63

Capsule Lesson Summary

Review standard configurations for 1to 9 on the Minicomputer and make a couple of trades. Present an addition problem in a story situation; let students solve the problem with a picture and on the Minicomputer. Write the corresponding number sentence.

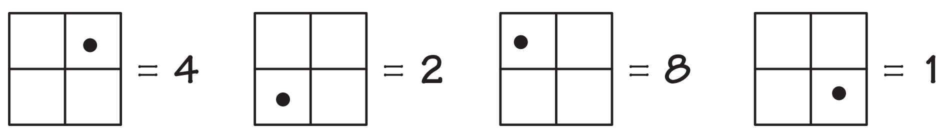
Materials

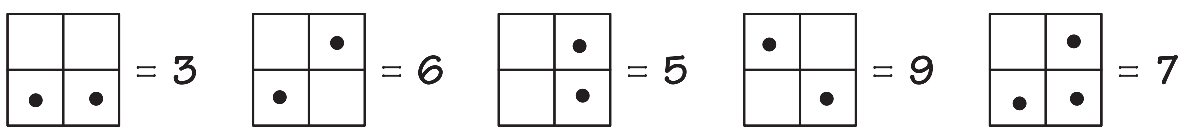
Teacher	• Minicomputer set • Colored chalk	**Student**	• Unlined paper • Checkers • Colored pencils

Description of Lesson

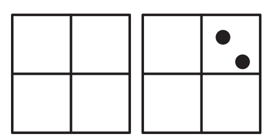
Exercise 1

At a brisk pace, put the following numbers on the Minicomputer, one at a time, and ask the students to show you what each number is by raising the appropriate number of fingers.





After this brief warm-up, put two checkers on the 4-square.



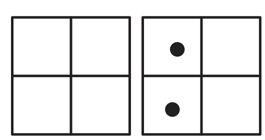
T: ***What number is this?***

S: ***8.***

T: ***Who can put 8 on the Minicomputer with only one checker?***

Stress that a student use both hands to remove two checkers; then demonstrate the 4 + 4 = 8 trade yourself.

Follow the same procedure with this configuration and demonstrate the 8 + 2 = 10 trade.



Exercise 2

You may like students to work with a partner during this exercise. Distribute paper and colored checkers (or colored pencils) to the students.

T: ***Let's pretend that you are all zoo-keepers. In your zoo there are four lions. Put a yellow checker (or draw a yellow dot) on your paper for each lion.***

F63

Write 4 in yellow on the board.

T: ***There are also six tigers in your zoo. Put a blue checker (or draw a blue dot) for each tiger.***

Write +6 in a developing number sentence on the board.

T: ***And there is one leopard in your zoo. Put a red checker (or draw a red dot) for the leopard.***

Extend the number sentence on the board.

$4 + 6 + 1 =$

T: ***How many animals are there altogether?***

S: ***11.***

If only a few students give the correct answer, ask them to check that they have four lions, six tigers, and one leopard. Then count the checkers (dots) again. You may like to use one student's display to check and do the counting collectively.

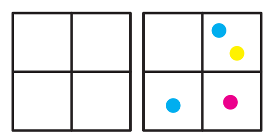
Complete your number sentence.

$4 + 6 + 1 = 11$

T: ***Let's tell the story on the Minicomputer.***

Call on a student to put 4 on the Minicomputer with yellow checkers for the four lions; another student to put 6 on the Minicomputer with blue checkers for the tigers; and a third student to put 1 on the Minicomputer with a red checker for the leopard.

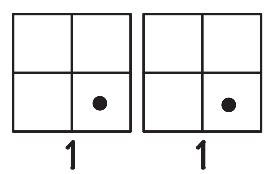
T: ***What number is on the Minicomputer now?***



S: ***11.***

Ask for suggestions of how to make it easier to read. You may need to suggest making trades yourself. Call on students to make trades until the standard configuration is obtained, and write 11 below (above) the Minicomputer.

T: ***11; this is what we found when we used checkers (drew dots) for the animals, isn't it?***



If this activity has gone quickly, the students can use checkers (or draw dots) and tell another story with this number sentence:

$$7 + 5 + 2 = 14$$

F63.2 CLASS PLAN

Capsule Lesson Summary

Draw an array of dots for students in the classroom using the relative position of the dots to locate various students. Draw arrows and loops for the relation “I have the same first name as you.”

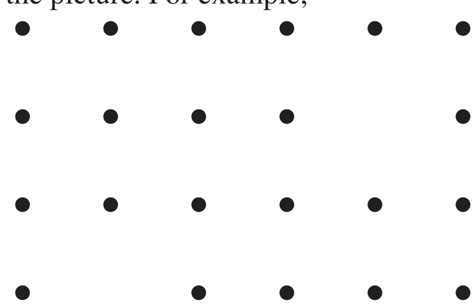
Materials

Teacher • Colored chalk

Student • None

Description of Lesson

On the chalkboard, draw a dot diagram of the students as they are sitting in the class, making it obvious that you are studying the class arrangement. Arrange your diagram so that the front of the room is at the top of the picture. For example,



T: ***What do you think about this picture?***

If no one refers to it as a picture of the class, remind the students that you were examining the class very carefully before you drew the picture. Look directly at one student and point to the student’s dot.

T: ***This dot is for one of you. Who do you think it is?***

Continue in this way, offering stronger hints if necessary, until someone suggests that the dots are for the students in the classroom. When this has been established, continue.

T: ***Can you find your dot?***

Invite several students to point out their dots, each time asking the class to check that they are correct. Choose students from different places in the room.

T: ***This time, I’ll point to a dot. If it is your dot, raise your hand.***

Select a variety of dots in the picture until you believe all the students know where they are in the picture.

T: ***Now, we’re going to play a game called “I Have the Same First Name as You.” Who can point to whom in this game?***

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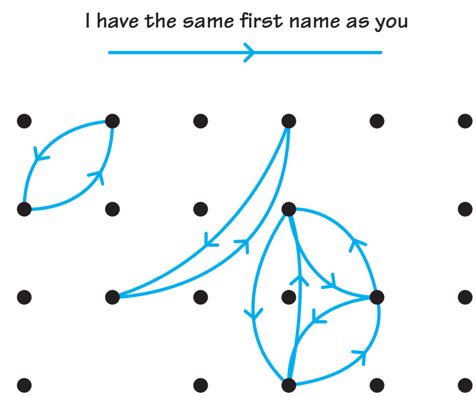
Very likely, at least two children in your class share the same first name and may point to each other (disregard any differences in spelling). If this is not the case, the parts of the lesson involving loops may still be conducted; or, you may wish to use another relation such as "I have the same last name as you" or "I live on the same street as you." In any event, add the appropriate key arrow to your drawing at the board.

Let students who can point to each other come to the board, find their dots, and trace the appropriate arrows. Then, draw the arrows yourself. Repeat the process for other students who can point to each other. Your picture might resemble the illustration below.



If students do not suggest drawing loops, call on someone who has not yet pointed in this game.

T: ***Jarrod (or whomever you have chosen), there is someone in the class who has the same first name as you do. Who is it?***

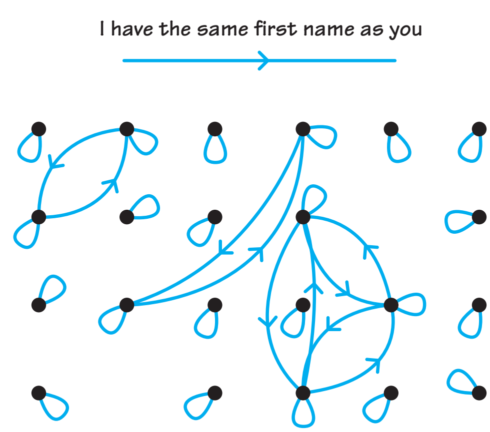
Ultimately, someone will realize that Jarrod has the same first name as himself.

T: ***Jarrod can point to…***

S: ***Himself.***

T: ***Who can show us how to draw that?***

Someone should come to the board and trace a loop. Draw it, and invite several other students to trace loops. Then complete the picture by drawing a loop at every dot.



Capsule Lesson Summary

Conduct a mental arithmetic activity that involves adding 2 and 3 to various numbers. Label the dots in a +3 arrow road starting at 0. Relate adding threes to counting by threes and demonstrate the relation on the number line. Repeat this activity with a +2 arrow road starting at 7.

Materials

Teacher		Student	
	• Colored chalk • Overhead calculator (optional)		• Desk number line • Worksheet F64

Description of Lesson

Exercise 1: Mental Arithmetic

Conduct a mental arithmetic activity involving adding 2 to a given number. Explain to students that each time you give them a number, they must add 2 to it. Alternate easy and more difficult problems to encourage everyone to participate.

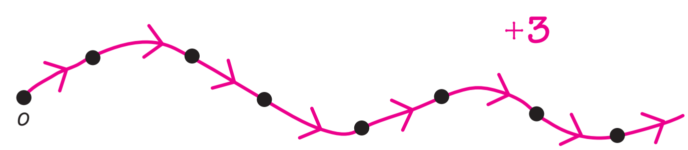
Another way to conduct this activity is to use an overhead or class calculator. Program the calculator to add 2 to any given number; that is, press $\boxed{C}$ $\boxed{+}$ $\boxed{2}$ $\boxed{=}$. Then, every time you enter a number and press $\boxed{=}$, the calculator will display that number plus 2. To begin, you or the students can put a given number on the display. Then, before pressing $\boxed{=}$, ask students to predict what number the calculator will display when you press $\boxed{=}$.

You may suggest to students that they can use their desk number lines during this activity. Suggest they point to the given number with their left hand and then count forward (to the right) two spaces with their right hand.

Repeat this activity, adding 3 to a given number.

Exercise 2: +3 Arrow Road

Distribute Worksheet F64 and draw the +3 arrow road from side one on the chalkboard.



T: ***All of the arrows in this picture are for +3.***

Point to the dot for 0 with one hand and trace the arrow starting there with the other hand. Ask the students to point to 0 and follow the arrow on their papers.

T: ***0 plus 3. What number goes here?***

S: ***3.***

T: ***Label the dot for 3 on your papers.***

F64

Invite a student to label the dot in the picture on the board as you assist students who are having difficulty. Ask for a number fact told by this first arrow (0 + 3 = 3), write it on the board, and suggest students write it on their papers.

Point to the dot for 3. Instruct the class to point to 3 and follow the arrow starting at 3 on their papers.

T: ***What number is 3 plus 3?***

S: ***6.***

T: ***Let's see if that is right. With your left hand point to 3 on your number line. Then count three numbers forward (to the right) with your right hand.***

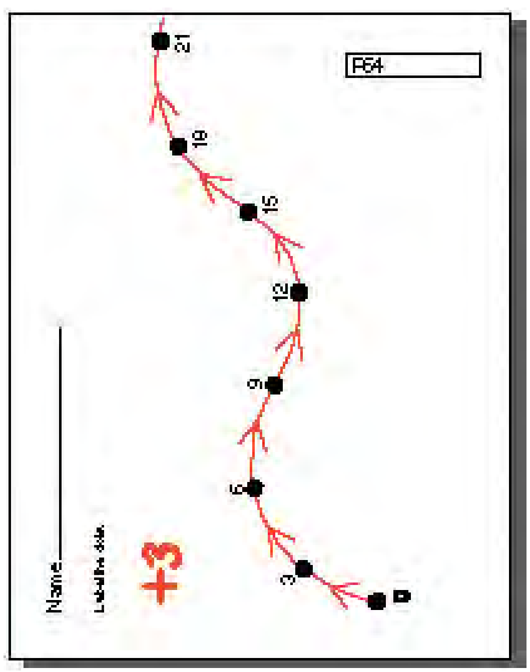
Demonstrate this method on the classroom number line and help students do the same on their desk number lines. Instruct the students to label the dot for 6 on their papers. Ask for a number fact told by the arrow (3 + 3 = 6) and suggest students write it on their papers.

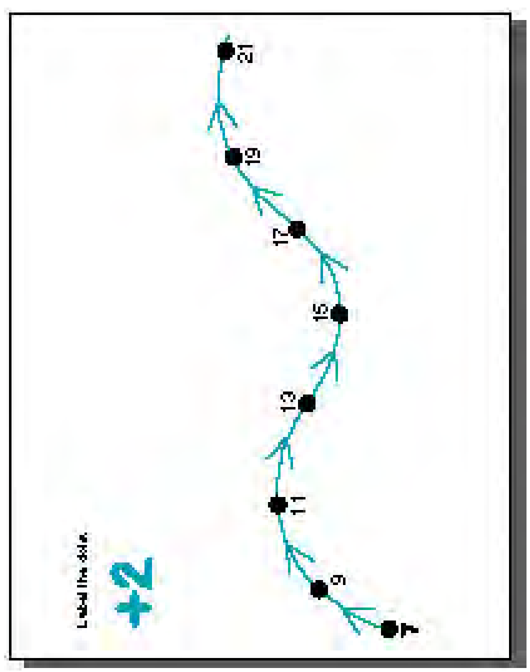
Continue labeling the dots and writing number facts collectively as far as you feel is appropriate for your class, but do not feel obligated to label all the dots. At some point you may want students to continue by themselves, using their desk number lines or other aides. Students who finish quickly can be encouraged to extend the picture.

When most students finish labeling the dots on the worksheet, you may like to ask how a counting calculator could be used to follow this arrow road. Using the overhead or class calculator, demonstrate counting by threes starting at 0.

Exercise 3: +2 Arrow Road

Erase the chalkboard and repeat Exercise 2 with the +2 arrow road from side two of the worksheet. When students finish labeling the dots in their arrow roads, suggest they extend the road.





F65.1 INDIVIDUAL MINICOMPUTER ACTIVITY #1

Capsule Lesson Summary

Put selected numbers from 0 to 90 on the Minicomputer one at a time. Encourage standard configurations by requiring the use of at most two checkers for each number.

Materials

Teacher		Student	
	• Minicomputer set		• Minicomputer set

Description of Lesson

Distribute one Minicomputer sheet (two boards) and two checkers to each student or pair of students.

T: ***I am going to say some numbers. Put each number on your Minicomputer as quickly as you can, using at most two checkers. Now take a checker in each hand and get ready.***

Maintain a brisk rate throughout the lesson, choosing numbers at random from the following:

0, 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 14, 18, 20

Circulate around the room checking the students' work. There is more than one way to put 2, 4, 8, 10, 12, and 20 on the Minicomputer (some require only one checker). If a certain number seems to be particularly difficult, ask a student to put that number on the demonstration Minicomputer and to write the numeral below (above) the boards. Occasionally, when two different ways to put on a number are found, let students put both configurations on the demonstration Minicomputer.

If this activity goes particularly well, extend the list of numbers to include some of the following:

21, 22, 24, 28, 40, 41, 42, 44, 48, 80, 81, 84, 88, 90

All of these numbers can be put on the Minicomputer with either one or two checkers.

F65.2 MINICOMPUTER INTRODUCTION #7

Capsule Lesson Summary

Read and put numbers less than 100 on the Minicomputer.

Materials

Teacher
- Minicomputer set

Student
- Paper
- Minicomputer set

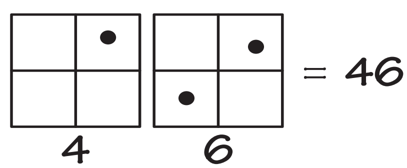
Description of Lesson

Exercise 1

Display two Minicomputer boards. Tell the students that you are going to put various numbers on the Minicomputer and that they should write each number on their papers (or whisper it to you). You may wish to alternate easier numbers with more difficult ones so that the whole class remains involved in this activity.

Feel free to use any numbers up to 99 and to represent some numbers (those less than 20) in a non-standard configuration. Be sure to include many examples of numbers less than 10, especially if some of your students need practice.

For each number, check four or five responses and then ask a student to answer aloud. If the number has two digits, you may ask a student to write it below (above) the Minicomputer. When the number is more than 9, occasionally write "=" and the numeral to one side of the Minicomputer. For example,

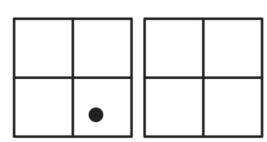


This is especially appropriate when a student has written very small or widely separated numerals below the Minicomputer.

Exercise 2

Distribute one Minicomputer sheet (two boards) and three checkers to each student or pair of students. Ask the students to follow along on their desk Minicomputer as you and others put numbers on the demonstration Minicomputer.

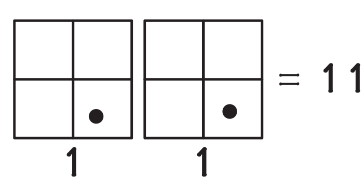
Put this number on the Minicomputer.



T: ***What number is this?***

S: ***10.***

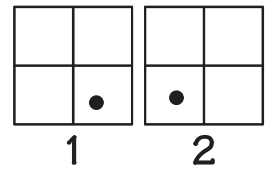
T: ***Who can put 11 on the Minicomputer?***



Write 11 below and to the side of the Minicomputer.

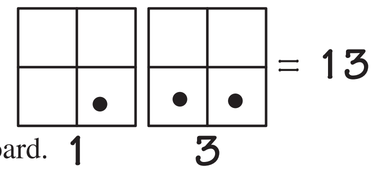
Remove the checker from the 1-square and erase the chalkboard.

T: ***This is 10; who can put 12 on the Minicomputer?***



If a student puts 12 on the Minicomputer in a non-standard configuration, ask another student to make a trade to get the standard configuration. Write 12 below the Minicomputer.

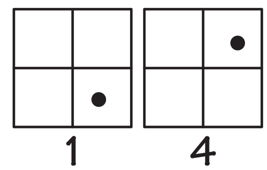
T: ***This is 12. Who can put 13 on the Minicomputer?***



Write 13 below and to the side of the Minicomputer.

Remove the checkers from the ones board and erase the chalkboard.

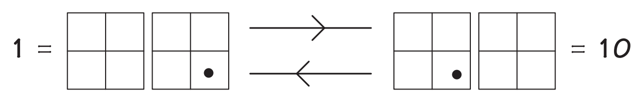
T: ***This is 10. Who can put 14 on the Minicomputer?***



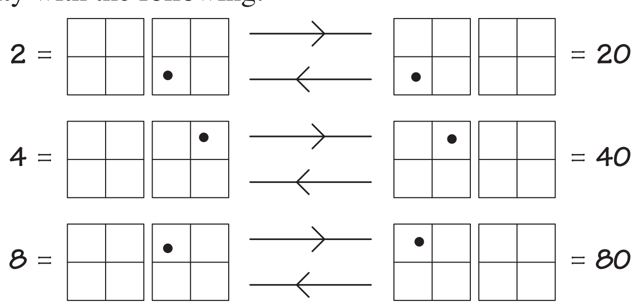
Continue this activity for as long as you feel your class is interested. Occasionally, ask students to write the numerals below the Minicomputer.

Exercise 3

Ask the class to put their individual Minicomputers aside for a few minutes. Quickly move a checker from the 1-square to the 10-square and vice versa. Lead the class in saying, "one–ten–one–ten…" as you do this.



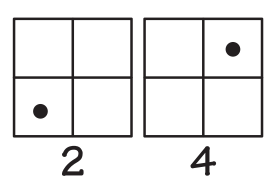
Continue this activity with the following:



Exercise 4

If you wou~~ld like students to f~~ollow along on their individual Minicomputers for this exercise, they may need a couple more checkers. To begin, remove all checkers from the Minicomputer.

T: ***Who can put 24 on the Minicomputer?***
Who can write 24 below the Minicomputer?



Repeat this activity with 27, 45, 89, and 31. If a student writes very small or widely-spaced digits below the Minicomputer, write the numeral to one side of the Minicomputer yourself.

F66.1 SUBTRACTION STORY #1

Capsule Lesson Summary

Present a subtraction story using a string picture and counters. Do the subtraction calculation and write appropriate number stories.

Materials

Teacher	• Colored chalk	Student	• Counters or checkers • Paper

Description of Lesson

Choose a student to be the star of this story. You may also wish to substitute another story which would be more appropriate for your class.

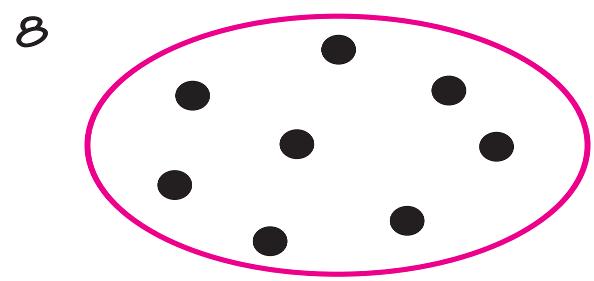
T: ***Ricky has eight pets at his house. Who can tell us what a pet is?***

Allow some time for the class to discuss this.

T: ***All of Ricky's pets are gerbils and some of these gerbils are still babies. Today Ricky gave five of the gerbils to his cousin. How many gerbils does Ricky have now?*** (Three)

Allow the students to comment. You may wish to ask students who answer correctly to tell the class how they found the answer.

On the chalkboard, draw a string with eight dots in it and write 8 near the picture.



T: ***Inside this string are all of the gerbils that were living at Ricky's house before he gave some away. How many gerbils did Ricky have?***

S: ***Eight.***

T: ***Put 8 counters on your desk for 8 gerbils. How many gerbils did Ricky give away?***

S: ***Five.***

T: ***I am going to cross out the gerbils Ricky gave away. You can show that Ricky gave away the gerbils by taking five counters away.***

T: ***How many gerbils does Ricky have now?***

S: ***Three.***

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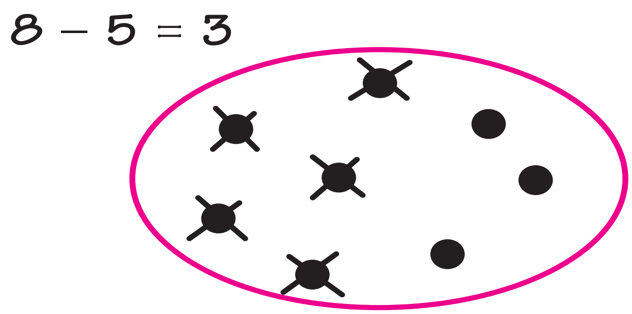
T: ***Who can write a number sentence for this story?***

T: ***Who can point to the gerbils Ricky gave away? Who can point to the gerbils Ricky still has?***

Call on students to point to the dots.

Accept all number sentences that are appropriate. If necessary, suggest 8 – 5 = 3 yourself and read, "Eight take away five is three," or "Eight minus five is three."



Repeat this activity with other subtraction stories. Use strings and counters and ask for number sentences.

F66.2 +1 AND +2 ARROW PICTURE #2

Capsule Lesson Summary

Draw a picture with alternating +1 and +2 arrows and label the dots. Label the dots of other +1 or +2 arrow pictures given on worksheets.

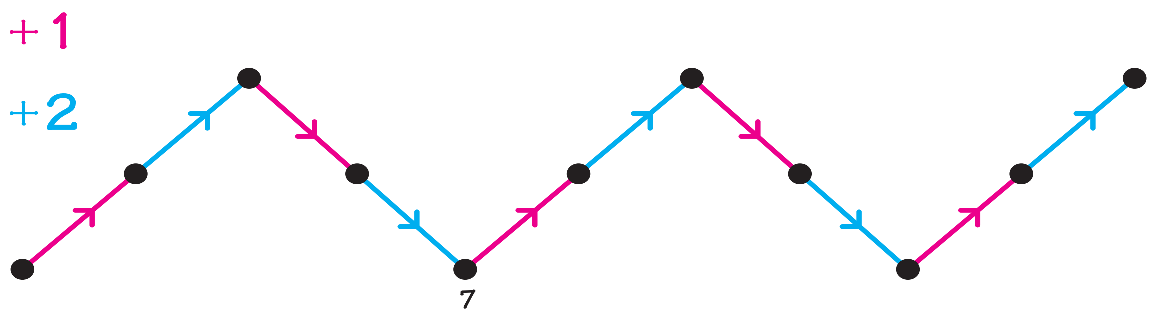
Materials

Teacher
- Colored chalk

Student
- Desk number line
- Colored pencils
- Worksheets F66.2* and **

Description of Lesson

Draw the following arrow picture on the chalkboard.



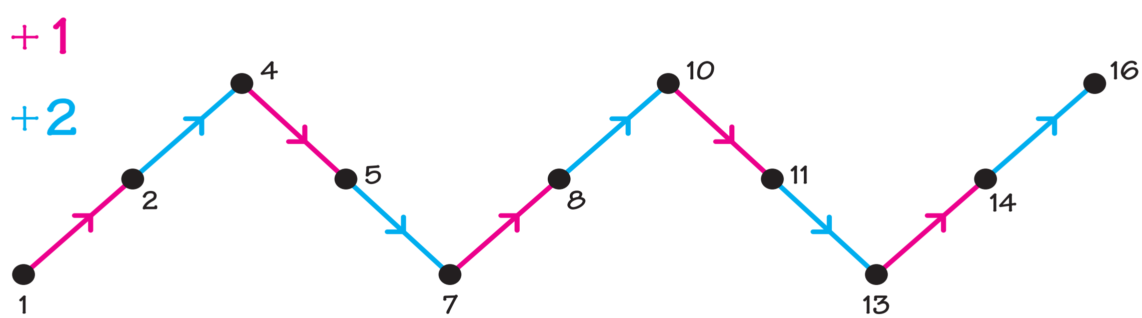
T: ***What are these arrows for?***

S: ***The red arrows are for +1.***

S: ***The blue arrows are for +2.***

T: ***When we follow a red arrow, we add 1. When we follow a blue arrow we add 2. Who would like to label one of these dots?***

Continue calling on students until all the dots are labeled. Frequently ask students to explain how they know a dot is for a particular number. Encourage students to use their desk number lines to check a calculation.



Worksheets F67.2 * and ** are available for the remainder of the lesson.

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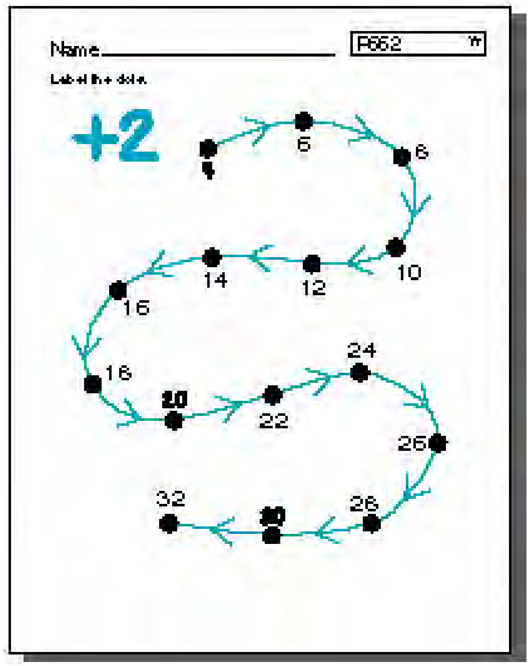
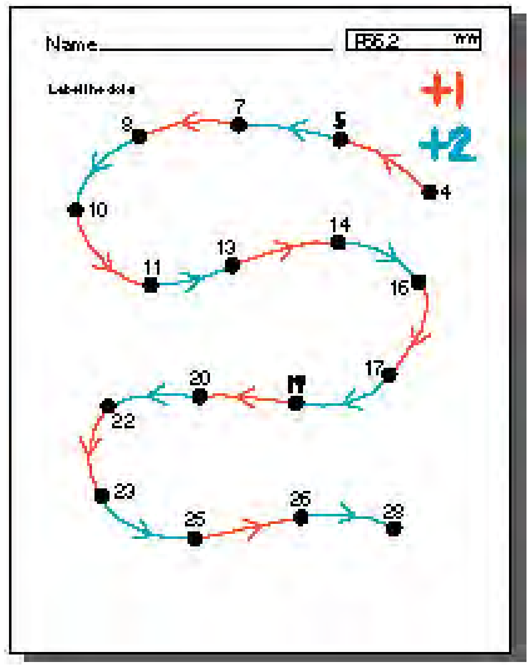
Home Activity





F67.1 TRADES ON THE MINICOMPUTER #5

Capsule Lesson Summary

Introduce standard trades on the tens board of the Minicomputer. Put numbers greater than 100 on the Minicomputer.

Materials

Teacher
- Minicomputer set

Student
- Base-10 blocks or other place value manipulatives

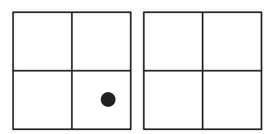
Description of Lesson

Exercise 1

Display two Minicomputer boards. Using only one checker, quickly put on each of these numbers in random order: 1, 2, 4, 8, 10, 20, 40, and 80. As you move the checker from one square to another, ask the students to say each number.

Arrange for students to work with a partner using base-10 blocks or other place value manipulatives. Then, as you put tens on the Minicomputers, students can show the same with the base-10 blocks.

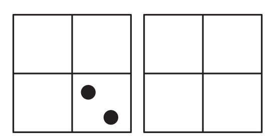
Put a checker on the 10-square.



T: ***What number is this?***

S: ***10.***

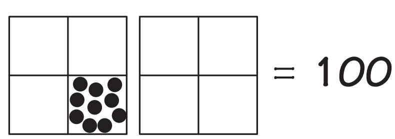
Put another checker on the 10-square.



T: ***What number is this?***

S: ***20.***

Continue this activity until there are ten checkers on the 10-square. Point to each checker as you count by tens with the students and then write "= 100" to one side of the Minicomputer.



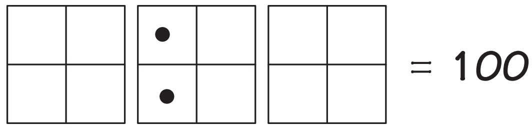
T: ***Who can make a trade on the Minicomputer?***

Invite a student to make a trade and insist that the student use both hands. The student may make the trade correctly, but may say "1 + 1 = 2." Casually point out that the trade was made correctly, but that one should say "10 + 10 = 20" because the checkers are on the tens board.

Continue asking for trades until there is one checker on the 80-square and one checker on the 20-square.

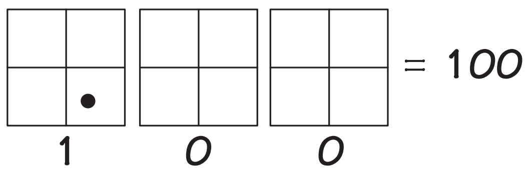
T: ***We can make another trade, but first we need another board.***

Display the hundreds board and ask the students what they think about the value of the squares on this board.



Ask for a trade to be made with these two checkers. A student may suggest the correct trade but have difficulty verbalizing it. Be prepared to help, if necessary. This may be the first time your students encounter the standard configuration for 100; some children will become excited by this new discovery! You may also want to refer the students to their display of ten 10s with base-10 blocks and observe a trade of ten 10s for one 100 block.

Repeat the 80 + 20 = 100 trade yourself. Ask a student to write 100 below the Minicomputer.



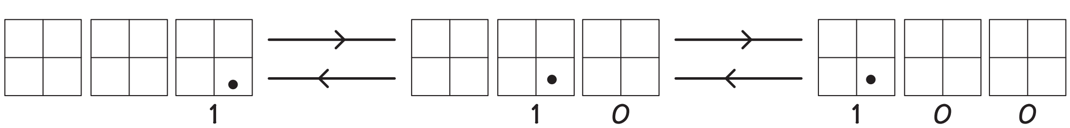
T: ***There are many numbers which are more than 100 that we can put on the Minicomputer. Would you like to put some of these numbers on the Minicomputer?***

Invite students to put numbers of their choice on the Minicomputer. Ask a volunteer to write the appropriate numeral below (above) the Minicomputer. As numbers are put on the Minicomputer, student pairs can model the same number with base-10 blocks. Try to keep this activity as spontaneous as possible. A student may attempt to put a certain number on the Minicomputer, but actually put on another number. You need not insist that the student put the chosen number on the Minicomputer, but do insist that the number be read correctly.

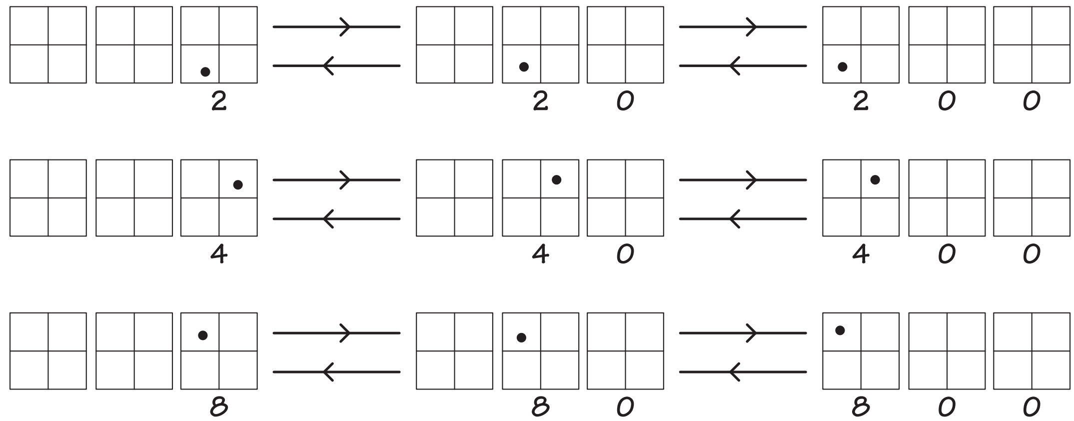
If no student volunteers a number between 100 and 110, suggest some yourself, such as 102, 103, or 108. Continue this activity as long as the class remains interested.

Exercise 2

Remove all~~ checkers from the~~ Minicomputer. Put a checker on the 1-square and move this checker from the 1-square to the 10-square to the 100-square and vice versa. Lead the class in saying, "one–ten–one hundred–ten–one…" as you do this.



Continue this activity with the following configurations.


2
2 0
2 0 0
4
4 0
4 0 0
8
8 0
8 0 0

F67.2 ADDITION ON THE MINICOMPUTER #2

Capsule Lesson Summary

Present an addition problem in a story situation with a string picture and solve the problem on the Minicomputer. Make use of a backward trade on the Minicomputer.

Materials

Teacher	• Minicomputer set • Colored chalk	Student	• Paper

Description of Lesson

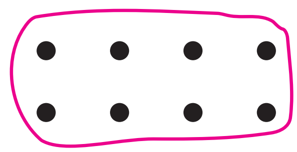
Choose a student to star in the following story.

T: ***Yesterday, Laticia was walking in the woods and she saw some squirrels, chipmunks, and deer. Let's draw a picture with the animals she saw on her walk.***

Draw a red string on the board. Give a student eight magnetic checkers to put into the string.

T: ***Ryan is putting the squirrels Laticia saw in the red string. How many squirrels?***

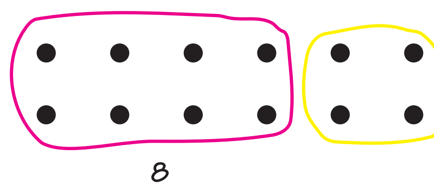
S: ***Eight.***



Write 8 under the picture and then add a yellow string. Give a student four magnetic checkers to put into the yellow string.

T: ***Haley is putting the chipmunks Laticia saw in this yellow string. How many chipmunks?***

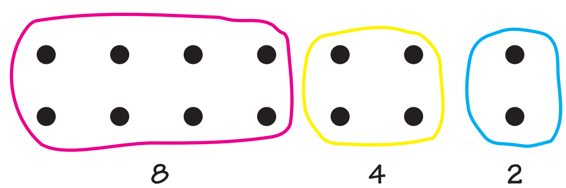
S: ***Four.***



Write 4 under the yellow string and then draw a blue string. Give a student two checkers to put in the blue string.

T: ***Sang is putting the deer Laticia saw in the blue string. How many deer?***

S: ***Two***



Write 2 under the blue string.

Enclose all three strings inside one string as you ask,

T: ***How many animals did Laticia see altogether?***

S: ***Fourteen.***

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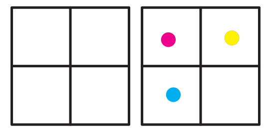
Ask a student to count the checkers. Write this number sentence on the board and read it aloud. Ask the students to copy the number fact on their papers.

$$8 + 4 + 2 = 14$$

T: ***Let's tell our story on the Minicomputer.***

Point to the appropriate part of the string picture and give students corresponding colored checkers to use on the Minicomputer as you ask,

T: ***Who can put on the number of squirrels?***
Who can put on the number of chipmunks?
Who can put on the number of deer?



T: ***Here*** (point to the checker on the 8-square) ***we have the eight squirrels, and here*** (point to the checker on the 4-square) ***the four chipmunks, and here*** (point to the checker on the 2-square) ***the two deer. How many animals altogether?***

S: ***Fourteen.***

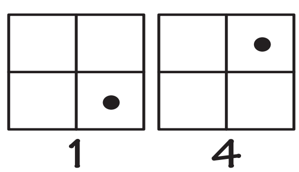
T: ***This is not how we usually put 14 on the Minicomputer. Who can suggest another way to put 14 on the Minicomputer?***

Let a student point to the squares (the 10-square and the 4-square).

T: ***Correct; we could have a checker here*** (point to the 10-square) ***and here*** (point to the 4-square)***. Which trade would give us a checker here*** (on the 10-square)***?***

S: ***8 + 2 = 10.***

Invite a student to make the trade and then write 14 below (above) the boards.



If the lesson has gone quickly, continue by solving one or two other addition problems using both string pictures and the Minicomputer.

F68.1 COIN PROBLEM #1

Capsule Lesson Summary

Using several clues about the coins in a container, discover which coins they are. After each clue, explore the many possibilities of coin combinations and corresponding amounts of money.

Materials

Teacher
- A dime, a nickel, and a penny
- A small container

Student
- Paper

Description of Lesson

Before the lesson begins, put a dime, a nickel, and a penny into a small container (chosen so that the students cannot see the coins, but can hear them clearly when the container is shaken).

T: ***Today you are going to be detectives again. You must discover which coins are in this container.***

Hold the container up high and shake it. Allow a few students to shake it also.

T: ***Which coins could be in this container?***

S: ***Three dimes.***

T: ***There could be three dimes in this container. Three dimes is how many cents?***

S: ***30¢.***

A student might suggest 100 pennies. Shake the container and ask the student to shake the container also.

T: ***Do you still think there could be 100 pennies in this container?***

S: ***No, there aren't that many coins.***

T: ***Do you have another idea?***

S: ***27¢.***

T: ***What coins could we use to make 27¢?***

S: ***Two dimes and seven pennies.***

Keep this part of the lesson moving briskly. If the class lingers for too long on one problem—such as deciding which coins could make 27¢—allow the problem to remain unresolved and move on to accept another student's suggestion.

When a student suggests a specific group of coins, ask how many cents that would be. If a student suggests an amount (in cents), ask which coins could make that amount. Do not record these suggestions on the board. After a few minutes, continue.

F68

Clue 1

T: ***Here is a clue. There are exactly three coins in this container. What could these three coins be?***

Accept some additional suggestions. Continue as before, but emphasize that there are three coins in the container. This time you may want to record some of the possibilities on the chalkboard. For example,

10¢	10¢	10¢	30¢	5¢	5¢	1¢	11¢
10¢	1¢	1¢	12¢	10¢	5¢	1¢	16¢

You need not get all the possibilities.

Clue 2

T: ***Here is another clue. One of the coins is a dime and one of the coins is a penny.***

If you recorded possibilities in Clue 1, decide which ones also satisfy Clue 2. Erase those that do not. On the chalkboard, draw three circles of equal size.

10¢ 1¢ ?

T: ***What could this third coin be?***

S: ***A quarter.***

T: ***It could be a quarter. How many cents would that be altogether?***

S: ***36¢.***

Continue accepting suggestions for the third coin as long as the students make them; there are six possibilities. Record those that your class finds. Do not worry if they do not find all six, especially because students may not think about half dollars or silver dollars.

10¢	1¢	1¢	12¢	10¢	1¢	25¢	36¢
10¢	1¢	5¢	16¢	10¢	1¢	50¢	61¢
10¢	1¢	10¢	21¢	10¢	1¢	100¢	111¢

Clue 3

T: ***Here is the last clue: There is between 15¢ and 20¢ in this container. When you know what the third coin is, write it on your paper (or whisper it to me).***

Look at (or listen to) several responses before asking a student to answer aloud. Then reveal that the coins in your container are indeed a penny, a dime, and a nickel.

Home Activity

Repeat a home activity similar to that suggested in Lesson F35.2.

F68.2 MULTIPLICATION STORY #1

Capsule Lesson Summary

Draw a string picture for a story that involves a multiplication problem; use the picture to solve the problem. Write calculations for this problem.

Materials

Teacher	• Colored chalk	Student	• Paper • Colored pencils

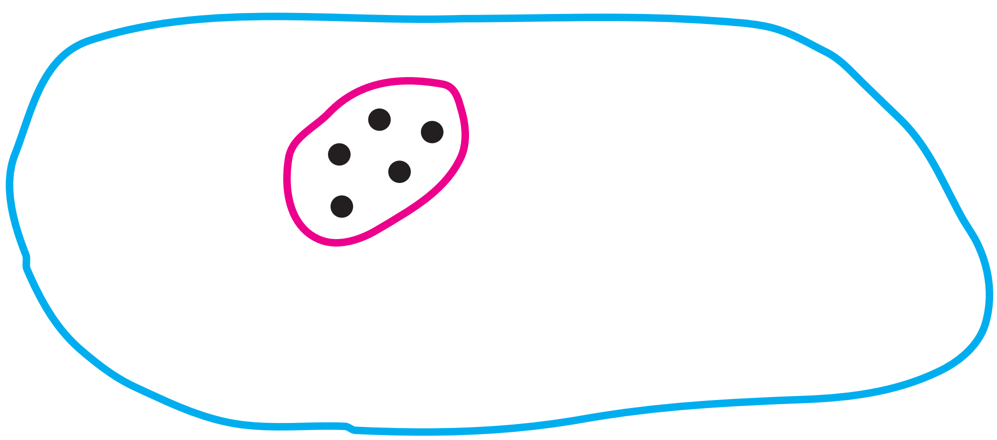
Description of Lesson

Distribute paper and colored pencils to the students.

T: ***Suppose Brenda*** (substitute the name of a student in your class) ***has eight packs of chewing gum. Each of her packs has five pieces in it. Do you think she has enough pieces to give a piece of gum to everyone in the class?***

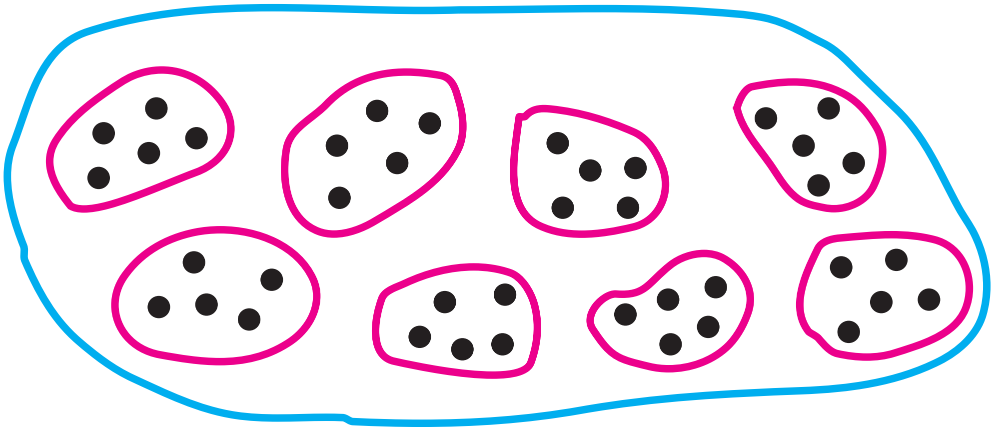
Allow time for a short discussion of this problem and encourage the students to guess how many pieces of gum Brenda has. Record several guesses on the chalkboard. Students who guess 40 may be asked later how they obtained this answer.

Draw the following picture on the chalkboard.



T: ***Here I have one of the packs of chewing gum containing five pieces of gum. Draw a picture on your paper showing all of the pieces of gum that Brenda has. Remember, she has eight packs of gum.***

As you observe students' work, offer advice and encouragement where it is needed. Some students may require help getting started. When you see several students whose drawings are similar to the completed one shown on the next page, ask these students to take turns helping to complete the drawing on the board. Of course, students' drawings need not look like this. Some students may prefer to draw sticks of gum or something that looks more like tally marks.



As students complete their pictures, ask them to write a number sentence that tells how many pieces of gum Brenda has altogether.

T: ***Who knows a number sentence about this picture? What calculation should I write?***

S: ***5 + 5 + 5 + 5 + 5 + 5 + 5 + 5.***

Write this expression on the board and then ask for a shorter calculation. If no one suggests 8 x 5, hint at this calculation by asking how many times five pieces of gum were drawn. When 8 x 5 is suggested, write it on the board.

T: ***How many pieces of gum are there altogether?***

S: ***40.***

T: ***Let's count them to be sure. There are five pieces in each pack, so we can count by fives.***

Point to each pack of gum in the picture as the class counts by fives up to 40. Then, complete the calculations on the board.

$$5 + 5 + 5 + 5 + 5 + 5 + 5 + 5 = 40$$

$$8 \times 5 = 40$$

F69.1 TRADES ON THE MINICOMPUTER #6

Capsule Lesson Summary

Investigate counting by tens to 100 using fingers. Put multiples of 10 successively on the Minicomputer and review standard trades on the tens' board.

Materials

Teacher
- Minicomputer set
- Dimes
- Base-10 blocks
- Overhead calculator (optional)

Student
- None

Description of Lesson

Exercise 1

T: ***How many students do we need to show ten fingers?***

S: ***One.***

T: ***To show 20 fingers?***

S: ***Two.***

T: ***30 fingers?***

S: ***Three.***

T: ***90 fingers?***

S: ***Nine.***

Students	Fingers
1	10
2	20
3	30
4	40
.	.
.	.
.	.
9	90

To emphasize the emerging pattern, you may like to record the responses in a chart on the chalkboard as shown here.

Choose ten students to come to the front of the class. Ask the rest of the class to count with you by tens as each of the ten students, in turn, holds up ten fingers. Move behind the students, holding up their hands and counting by tens up to 100. Then, instruct the class to count backward from 100 as the ten students, in turn, lower their hands.

You may also like to recall how to make a calculator count. Then use a calculator to count by tens starting at 0.

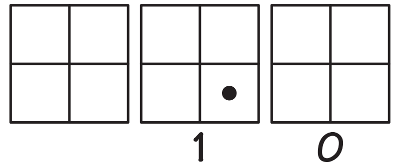
Review some other things you might use counting by tens to count. For example, show the class a pile of dimes. Recall that a dime is 10¢ and use counting by tens to count the amount of money in your pile of dimes. Or use base-10 blocks and count the number displayed by several ten-blocks (longs).

F69

Exercise 2

Display three Minicomputer boards.

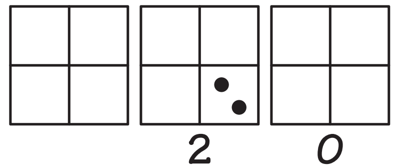
T: ***Who can put 10 on the Minicomputer with one checker?***



Write 10 below the Minicomputer and put another checker on the 10-square.

T: ***What number is on the Minicomputer now?***

S: ***20.***



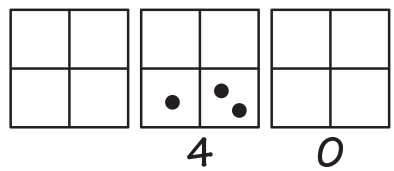
Erase the 10 and write 20 below the Minicomputer.

T: ***Can we make a trade?*** (Yes)

Ask a student to make the 10 + 10 = 20 trade. Then, put another checker on the 10-square.

T: ***What number is on the Minicomputer now?***

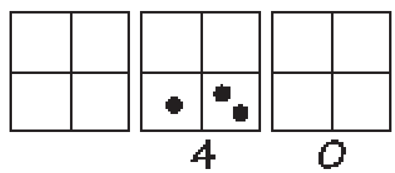
S: ***30.***



Erase the 20 and write 30 below the Minicomputer. Put another checker on the 10-square.

T: ***What number is on the Minicomputer now?***

S: ***40.***



Erase the 30 and write 40 below the Minicomputer.

T: ***Can we make a trade?***

Ask students to make the 10 + 10 = 20 and 20 + 20 = 40 trades. Continue in this way until 100 is reached.

Starting at 100, count backward by tens until 10 is reached. As the class says each number, put it on the Minicomputer (do not demonstrate the various trades). Then, ask the class to count forward from 10 to 100 once again, as you put each number on the Minicomputer.

Center Activity

Provide additional practice counting by tens with dot-to-dot pictures in centers or as home activities. Blackline F69.1 provides an example.

F69.2 ADDITION ON THE MINICOMPUTER #3

Capsule Lesson Summary

Present an addition problem in a story situation and solve the problem on the Minicomputer. Make trades so that the number is easier to read.

Materials

Teacher
- Minicomputer set

Student
- Worksheet F69.2

Description of Lesson

This is the first of several activities for addition practice using two Minicomputer boards. When you tell a story to introduce the addition problem, use names of students in your class if you wish. The story below is only an example. You may prefer to create your own story situation, especially if you know a subject that would be more interesting to your class.

T: ***Yesterday, Juan went to the bakery with his mother. What can a person buy at a bakery?***

Allow time for a brief discussion.

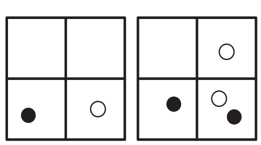
T: ***At the bakery, Juan was allowed to pick out something for himself and something to take home for his brother.***

At this point, you can ask the student (Juan) to pick two items. If he has difficulty doing this, offer some suggestions. Use his choices in telling the rest of the story.

T: ***Juan picked a sugar cookie for himself and a blueberry muffin for his brother. A cookie costs 15¢ and a muffin costs 23¢. How can we find out how much Juan spent altogether?***

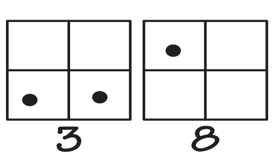
Allow time for a brief discussion of this problem, during which someone should suggest adding the two amounts on the Minicomputer. Accept some estimates and write these on the board.

Write the calculation on the chalkboard and ask students to write it on their papers. Then invite two students to put the two numbers on the Minicomputer using checkers of two different colors.



$$\begin{array}{r} 15 \\ +\ 23 \\ \hline \end{array} \quad \text{or} \quad 15 + 23 =$$

Then, invite students to make trades until you arrive at the standard configuration.



$$\begin{array}{r} 15 \\ +\ 23 \\ \hline 38 \end{array} \quad \text{or} \quad 15 + 23 = 38$$

Call the students' attention to the list of their estimates and recognize the best estimate.

F69

Note: It is not necessary to write the calculation both ways during the lesson. You should, however, vary the format so that the students will be familiar with both the horizontal and vertical formats.

T: ***Juan spent 38¢ on the two items. Could he pay for his purchase with one quarter?***

S: ***No.***

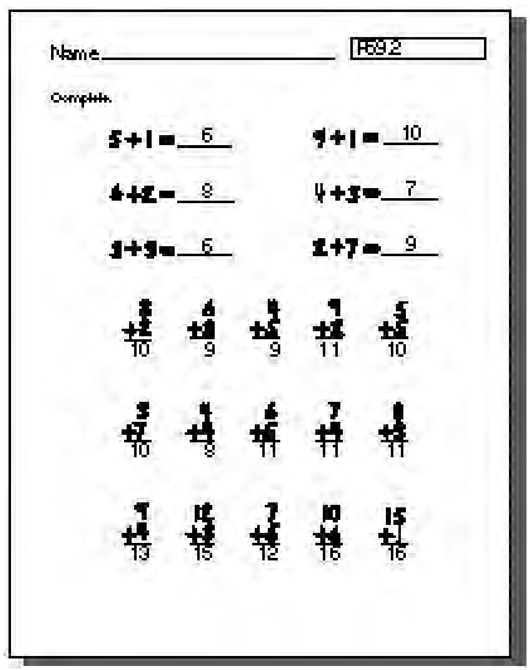
T: ***What coins could he use?***

S: ***One quarter, one dime, and three pennies.***

S: ***Three dimes and eight pennies.***

T: ***Suppose Juan gave the clerk four dimes*** (40¢)***. Would he get money back?*** (Yes) ***How much change?*** (2¢)

Worksheet F69.2 is available for addition fact practice. Facts are presented in both horizontal and vertical formats.



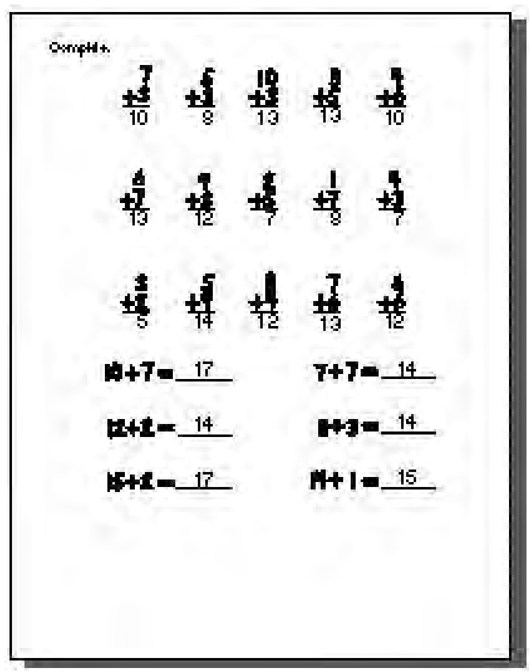
Name ______________ F69.2

Complete.

5 + 1 = 6   9 + 1 = 10

6 + 2 = 8   4 + 3 = 7

3 + 3 = 6   2 + 7 = 9



Complete.

10 + 7 = 17   7 + 7 = 14

12 + 2 = 14   11 + 3 = 14

15 + 2 = 17   14 + 1 = 15

F70 ADJUSTMENT/ASSESSMENT DAY #7

Note: See Section One, page 1-9, for a full explanation of the purpose of scheduled adjustment days. Worksheet F70 is available for a short, written assessment.

Today you may wish to repeat an earlier lesson either for a group of students or for the entire class. Many of the lessons can be made to appear completely different by changing the story and/or the numbers. If you omitted exercises or worksheets from from an earlier lesson, you may like to include these. This is also a good time to allow students to work in centers or on a project of your choice.

The following activities may be appropriate for students who need additional practice.

What's Your Number?

Form a group of up to ten students. Write whole numbers, from 1 up to the number of students in the group, on large cards, one number per card. Tape a card to each student's back and direct students to face each other in a circle. No one should be able to see his or her own number.

Ask one of the students what her number is. Have the student then walk around the outside of the circle, several times if necessary, looking at the other students' numbers and trying to discover her own number. When the student decides what the number is, she should point to it on the number line and face away from the group. The students in the group should check to see if the chosen number is the correct one. (As the number of players increases, this game becomes more difficult.)

Coin Trading

Provide a group of two to four students with a collection of pennies (for example, 27). Count and note that there is 27¢. Instruct the students to arrange the pennies in piles of five with leftover pennies together. Then, discuss and trade a pile of five pennies for a nickel. Count the nickels by fives (5, 10, 15, 20, 25) plus the two leftover pennies and note that there is still 27¢.

Repeat this activity, grouping in piles of ten and trading a pile of ten pennies for a dime.

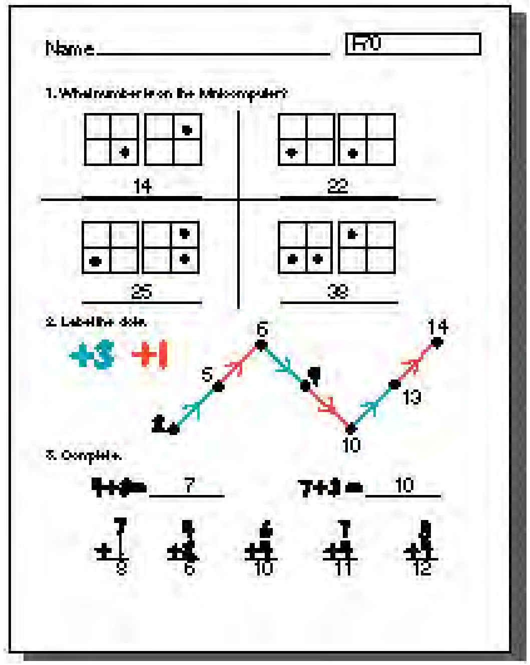
If your class is experiencing little difficulty with the *CSMP* curriculum, you may wish to omit this adjustment day and continue immediately with F71.1 *Subtraction Story #2*.

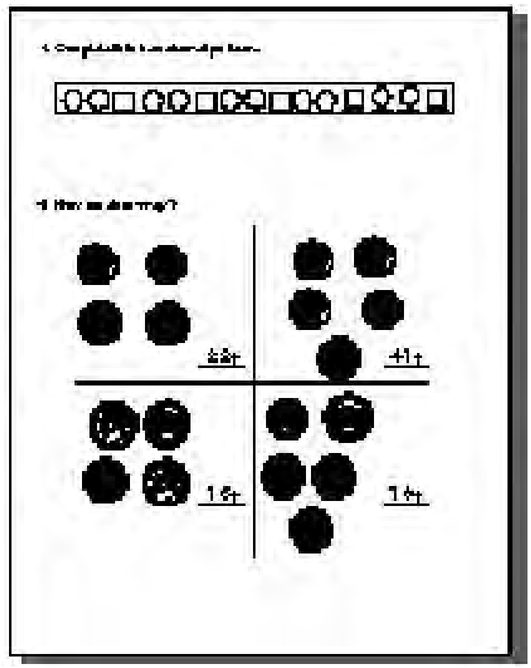
Early Warning

Among the next nine classroom lessons are some that require extra preparation time, or that involve materials not included with the *CSMP* Classroom Set. The lessons have been listed here for your convenience in preparing for them. A more detailed description of the needed materials can be found on the first page of each lesson. (These special materials have been listed here only once, even if they are needed more than once during the nine-day period.)

F73.2 *The Function +5*: Counters; paper cups; calculators (optional)
F76 *Tina Visits the Library*: Post-it™ notes; grid board; favorite books graph

F70


Name
F70
1. What number is on the Minicomputer?
14
22
25
38
2. Label the dots.
6
14
5
13
10
3. Complete.
7
10



F71.1 SUBTRACTION STORY #2

Capsule Lesson Summary

Use a string picture to present a story that involves subtraction and solve the subtraction problem. Write the related subtraction and addition sentences for this story.

Materials

Teacher		Student	
	• Colored chalk		• Unlined paper • Checkers • Colored pencils

Description of Lesson

You may like students to work in pairs for this lesson. Provide each pair of students with eleven checkers. Choose a student to be the star of this story. You may also wish to make up a story that would be more interesting to your class.

T: ***Sandra's family has 11 dogs. Who can tell us some different kinds of dogs?***

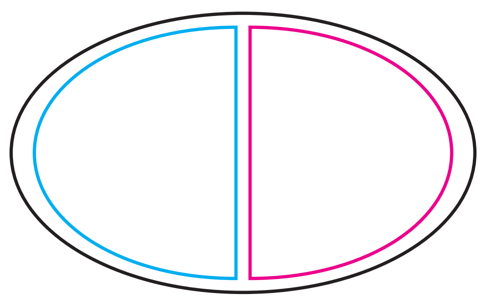
Allow students to name several kinds of dogs. Then instruct students to put 11 checkers on their papers to represent the 11 dogs.

T: ***Three of the dogs are poodles. All of the other dogs are Dalmations. How many Dalmation dogs does Sandra's family have?***

S: ***Eight.***

Allow several students to answer or comment before affirming an answer. You may wish to ask students who answer correctly to tell the class how they found the answer.

Draw this string picture on the board.



T: ***The black string is for all the dogs that Sandra's family has. The blue string is for the poodles. The red string is for the Dalmations.***

How many poodles does Sandra's family have? (Three) ***Who can draw dots in this string picture for the poodles?***

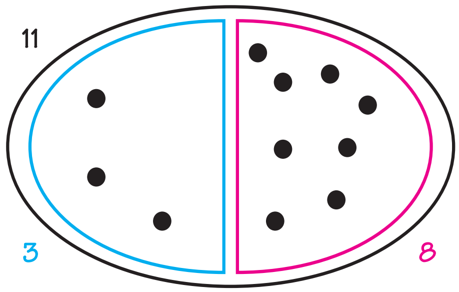
Instruct students at their desks to draw a blue string around three checkers for the poodles.

T: ***There are three dots inside the blue string so I will write 3 in blue near the picture.***

How many dogs does Sandra's family have altogether? (11) ***I will write 11 in black near the picture. Three of the dogs are poodles. The other dogs are Dalmations. Who can draw dots inside the red string for the Dalmations?***

Instruct students at their desks to draw a red string around the rest of the checkers for Dalmations.

F71



T: ***How many dots are in the red string?*** (Eight) ***I will write* 8 *in red near the picture. Who can write a number sentence for this string picture?***

Let students write number sentences on their papers and then call on some students to put their sentences on the board. Try to get these four facts; if necessary, suggest some yourself.

$3 + 8 = 11$	$11 - 3 = 8$
$8 + 3 = 11$	$11 - 8 = 3$

At this time, you may like to discuss the three numbers and the four facts as a *fact family*. Ask for other numbers you could use to get a fact family. For example,

5, 4, and 9 with facts	$5 + 4 = 9$	$9 - 4 = 5$
	$4 + 5 = 9$	$9 - 5 = 4$

If students enjoy looking for fact families, ask each pair of students to find a fact family. Suggest they use their checkers in the string picture to display the numbers and then write the four facts on the paper.

Extension Activity

Choose a number between 5 and 15 and give the partners that number of checkers or counters. Both partners should see the total number of checkers. Direct one student to put some checkers in each hand while the partner is not looking (the student may choose to put all the checkers in one hand). Then the first student opens one hand to show how many checkers are there; the second student must say how many checkers are in the other hand.

F71.2 +1 AND +2 ARROW PICTURE #3

Capsule Lesson Summary

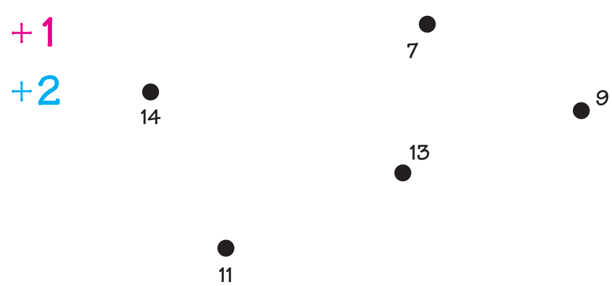
Given a set of numbers in a dot picture, draw all the possible +1 and +2 arrows and write the related addition sentences.

Materials

Teacher	• Colored chalk	**Student**	• Unlined paper • Colored pencils

Description of Lesson

Draw this picture on the board. Ask students to copy the picture on their papers. Students can add arrows to their pictures as you do so at the chalkboard.



T: ***Who can show us where we could draw a +1 arrow?***

Invite a student to the board to trace an arrow. If the arrow is correct, draw it yourself. Write the appropriate number sentence on the chalkboard to one side of the arrow picture. Ask the class to help you check each arrow that is suggested. For example, with an incorrect response, trace the suggested arrow again and ask,

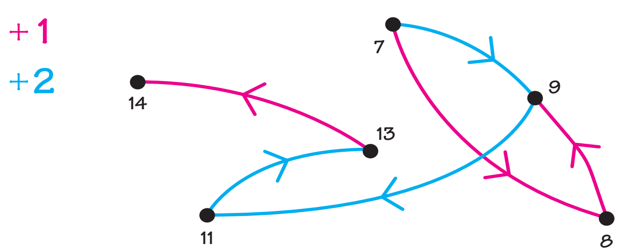
T: ***Is 7 plus 1 equal to 9?***

S: ***No.***

T: ***We cannot draw a +1 arrow from 7 to 9.***

Continue asking for arrows and the corresponding number sentences until the picture is complete.

$7 + 1 = 8$
$7 + 2 = 9$
$8 + 1 = 9$



$11 + 2 = 13$
$13 + 1 = 14$
$9 + 2 = 11$

F72.1 TRADES ON THE MINICOMPUTER #7

Capsule Lesson Summary

Count forward and backward by tens, going from 0 to 100 and from 100 to 0. Put multiples of 10 on the Minicomputer and review standard trades on the tens' board.

Materials

Teacher
- Minicomputer set
- 0–109 numeral chart

Student
- Minicomputer set

Description of Lesson

Display two Minicomputer boards. Quickly review, in random order, the numbers that can be put on the ones or tens board of the Minicomputer with a single checker; for example, 40, 8, 10, 80, 1, 4, 20, and 2. Ask the class to read the numbers as you move the checker.

Display the 0–109 numeral chart, point to the left column (beginning with 0), and ask the students to read down, saying the numbers aloud. Next ask them to close their eyes and count by tens. You may wish to repeat this once or twice. Now point to 100 and ask the class to read aloud, going up the column. Finally, ask the students to close their eyes and count backward by tens.

Return to the Minicomputer and put three checkers on the 10-square. Ask students to follow along on their individual Minicomputers.

T: ***What number is on the Minicomputer?***

S: ***30.***

Point out that there are three tens and count: 10, 20, 30.

T: ***If I were to put two more checkers on this same square, what number would it be?***

S: ***50.***

Put two additional checkers on the 10-square.

T: ***If I were to put two more checkers on this square, what number would it be?***

S: ***70.***

Put two more checkers on the 10-square.

T: ***And one more…?***

S: ***80.***

Add this last checker.

T: ***Eight checkers on the 10-square is one way to put 80 on the Minicomputer.***

F72

With the class, count by tens from 10 to 80 and then write 80 below (above) the Minicomputer.

T: ***Who remembers how to make trades on the Minicomputer?***

Invite students to make trades until there is just one checker on the 80-square. Students can follow along making trades on their individual Minicomputers. If a student has difficulty, cover all of the checkers except two which can be used to make a trade. Encourage students to use both hands to make a trade and to say the trade aloud. At several points during these trades, emphasize that the number on the Minicomputer is always 80, but it is being shown in different ways. When the standard configuration for 80 is on the Minicomputer, continue.

T: ***How many students do we need to show 80 fingers?***

S: ***Eight.***

Choose eight students to come up to the front of the room. Move behind the students and hold up their hands in turn. Ask the class to count by tens from 10 to 80 as you do this. Separate the eight students into two groups of four.

T (pointing to one of the two groups)**:** ***How many fingers in this group?***

S: ***40.***

T: ***How many fingers in the other group?***

S: ***40.***

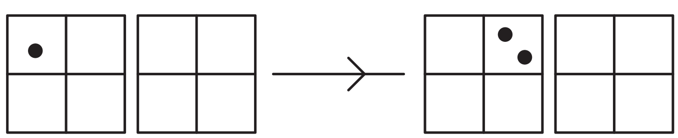
T: ***40 fingers and 40 fingers is 80 fingers.***

As the students return to their places, continue.

T: ***Who can make a backward trade on the Minicomputer to get 80 with two checkers?***

If necessary, help a student to use both hands and say,

S: ***80 is the same as 40 + 40.***



You may wish to stop at this point or continue to make backward trades (until there are eight checkers on the 10-square), depending on the interest of the class.

F72.2 ADDITION ON THE MINICOMPUTER #4

Capsule Lesson Summary

Present an addition problem in a story situation, estimate the solution, and solve the problem on the Minicomputer. Use trades to make the number easier to read.

Materials

Teacher • Minicomputer set

Student • Paper

Description of Lesson

Use the following story or make up one of your own. Choose a student in the class who has recently had a birthday to star in the story.

T: ***Suppose Katrina got an aquarium for her birthday. Who can tell me what an aquarium is?***

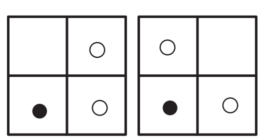
Allow some discussion (some of the students may even own an aquarium).

T: ***The aquarium was empty, but Katrina recieved some money to buy some fish to put in it. She went to the pet store to pick out two fish. There were cardinal fish, zebra fish, glow light fish, guppies, and many others.***

Discuss different kinds of fish and how they might look.

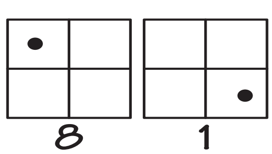
T: ***Katrina had a difficult time deciding which fish to buy. She finally picked out a zebra fish and a guppy. A zebra fish costs 59¢ and a guppy costs 22¢. How can we find out how much money Katrina spent altogether?***

The students will probably tell you to add the amounts using the Minicomputer. Call on a student to write the calculation on the chalkboard while the others write it on their papers. Then invite two students to put the numbers on the Minicomputer using checkers of two different colors.



$$\begin{array}{r} 59 \\ +\ 22 \\ \hline \end{array} \quad \text{or} \quad 59 + 22 =$$

Encourage students to estimate the answer and write several of their estimates on the board. Let students make trades until the standard configuration for the sum (81) is on the Minicomputer. Ask students whose estimates were close to explain how they made their estimates and then complete the calculation on the board.



$$\begin{array}{r} 59 \\ +\ 22 \\ \hline 81 \end{array} \quad \text{or} \quad 59 + 22 = 81$$

T: ***What coins could Katrina use to pay for the fish?***

S: ***Eight dimes and one penny.***

S: ***Two quarters, three dimes, and one penny.***

T: ***Suppose Katrina gave the clerk 85¢*** (for example, three quarters and one dime, or eight dimes and one nickel)***. How much change would she get?*** (4¢)

If time permits, do a few more calculations, such as 60 + 22, 59 + 21, and 59 + 23 using the Minicomputer. The calculations can be derived from the aquarium story, if you wish.

F73.1 STRING PICTURE WITH A-BLOCKS

Capsule Lesson Summary

Place A-block pieces in string pictures and introduce the idea of "not" labels.

Materials

Teacher
- Colored chalk
- A-block set

Student
- None

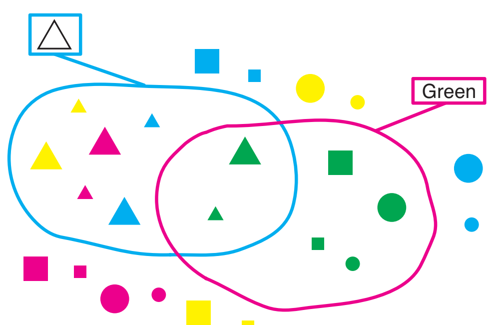
Description of Lesson

Exercise 1

Draw two overlapping strings with labels as in the next illustration. Arrange the A-block pieces on a board, but not so close to the picture that they appear to be a part of it.

T: ***This string*** (trace the blue string) ***is for triangles, and this string*** (trace the red string) ***is for green pieces.***

Ask several students to place A-block pieces into the picture. Each time, ask if the piece is green, if it is a triangle, and if it is in the right place. If no one chooses a piece that should be placed outside both strings (such as a yellow circle), choose one yourself and ask the class where this piece should be placed. The correct placement for all the A-block pieces is shown below. Do not ask the students to place all of the A-blocks; however, after six or seven pieces have been placed, the class should be ready for a change.



Exercise 2

Clear the board and draw one string labeled as in the next illustration.

T: ***This string is for the pieces that are not circles. What pieces should we put inside the string?***

S: ***Triangles.***

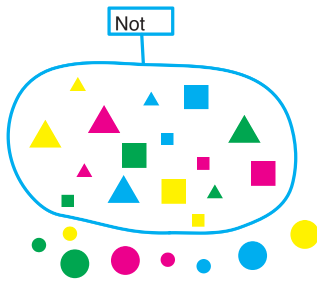
S: ***Squares.***

Ask several students to place A-block pieces. Each time, ask if the piece is not a circle.

T: ***Where do the circles go in the picture?***

S: ***Outside the string.***

Ask one or two students to place pieces outside the string. The correct placement for all A-block pieces is shown below even though your picture may only have some of the pieces in it.



Exercise 3

Clear the board and draw two overlapping strings with labels as in the next illustration.

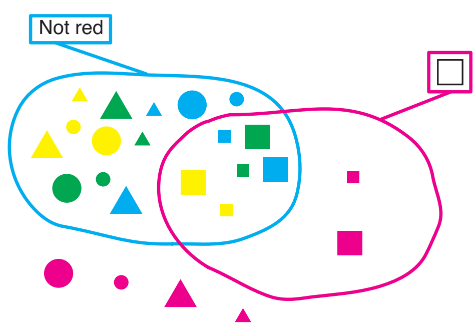
T: ***This string*** (trace the blue string) ***is for the pieces that are not red, and this string*** (trace the red string) ***is for squares.***

Spend a moment discussing pieces that are not red. Invite students to place pieces in the picture. As each piece is placed, ask the students how they know it is in the right place.

T: ***Is it not red? Is it a square? Where do red pieces go?***

Allow correctly placed pieces to remain and call on students to move incorrectly placed pieces to their correct place.

The correct placement for all the A-block pieces is shown below. Do not insist that all the pieces be placed, but be sure at least one piece is placed in each of the four regions, even if it is necessary to select some pieces yourself. Ten pieces, correctly placed, should be sufficient to demonstrate the idea of the “not” label to the class.



Center Activity

Place A-blocks, loops of colored string, and string labels in a center. Students can set up games for each other or pose problems for themselves.

F73.2 THE FUNCTION +5

Capsule Lesson Summary

Count forward and backward by fives and tens. Use a story to generate a +5 arrow picture and label the dots in the picture to solve a problem from the story.

Materials

Teacher		Student	
	• Colored chalk • Counters or beans • Paper cups • Overhead calculator (optional)		• Worksheets F73.2 * and ** • Calculator (optional)

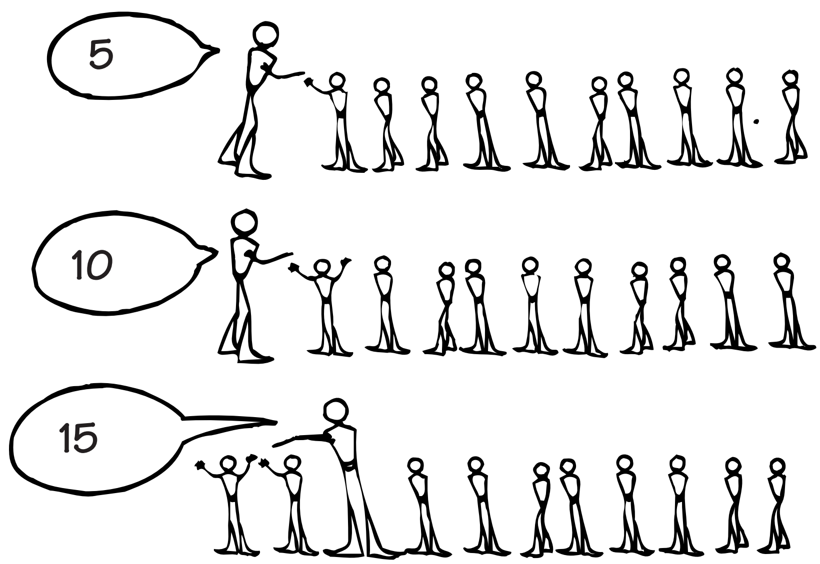
Description of Lesson

Exercise 1

T: ***How many children do we need to show 100 fingers?***

S: ***Ten.***

Invite ten students to stand at the front of the room and ask the class to count by fives as the ten students, in turn, hold up their hands one at a time. Move behind the students, helping them to raise one hand at a time, in order.



Continue in this manner up to 100. Then, ask the class to count backward by fives as the ten students, in reverse order, lower their hands one at a time.

Repeat this activity, but count forward and backward by tens this time. Then, ask the students to sit down.

You may also like to discuss how to use a counting calculator to count forward and backward by fives or by tens.

F73

Exercise 2

Tell the following story or one similar to it.

T: ***Do you know about Johnny Appleseed? Johnny Appleseed was a man who, in the early days of our country, traveled throughout Ohio and Indiana. Wherever he saw a good place, he planted some apple seeds. People moved into these states and they were happy to find the apple trees which had grown from the seeds Johnny had planted many years earlier.***

As Johnny Appleseed traveled from place to place, he was always looking for a good place to plant apple seeds. Whenever he found such a place, of course, he would plant seeds. To increase the chance that a tree would grow, he would plant five seeds each time.

You may wish to allow the students to discuss what a good place to plant apple seeds would be like.

T: ***One day, Johnny found twenty places to plant his apple seeds. Can you estimate how many seeds Johnny planted in all twenty places?***

Record some students' estimates on the board and occasionally ask for an explanation of an estimate.

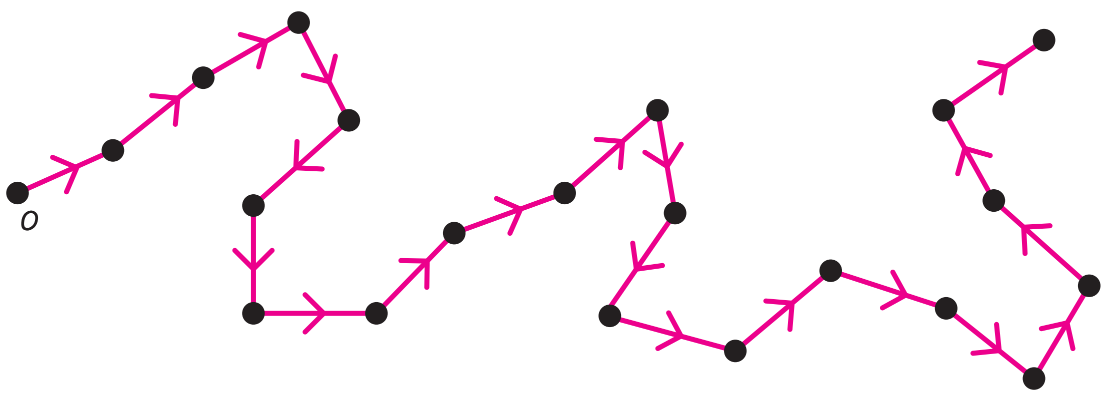
T: ***Let's show the twenty places Johnny planted seeds in an arrow picture. I will draw an arrow each time Johnny planted apple seeds. How many arrows shall I draw?***

S: ***Twenty.***

Draw twenty consecutive arrows on the board (see the next illustration).

T: ***Each arrow shows one time Johnny planted apple seeds. At the beginning of the day, Johnny has not planted any seeds yet, so we can label this dot 0.***

Label the starting dot.



T (tracing the first arrow)**:** ***What does this arrow tell us?***

S: ***He planted some apple seeds.***

T: ***How many apple seeds does Johnny plant each time?***

S: ***Five.***

Use counters or dried beans and drop them into paper cups to act out the story as you follow the arrows in the arrow picture. Invite students to "plant" the seeds.

T: ***After Johnny has planted seeds just once, how many seeds have been planted?***

S: ***Five.***

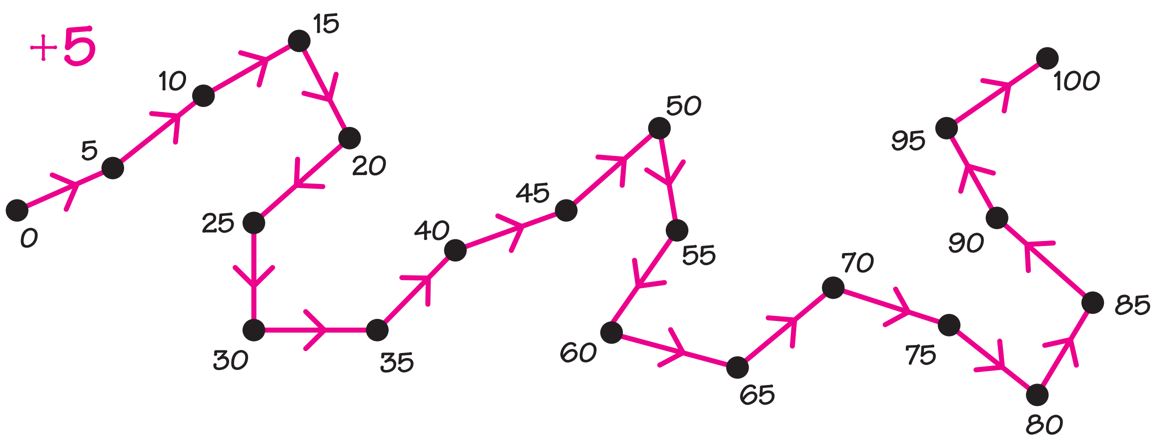
Label the next dot 5.

T: ***What could this red arrow be for?*** (+5)

In red, write +5 near the arrow picture. Trace the second arrow.

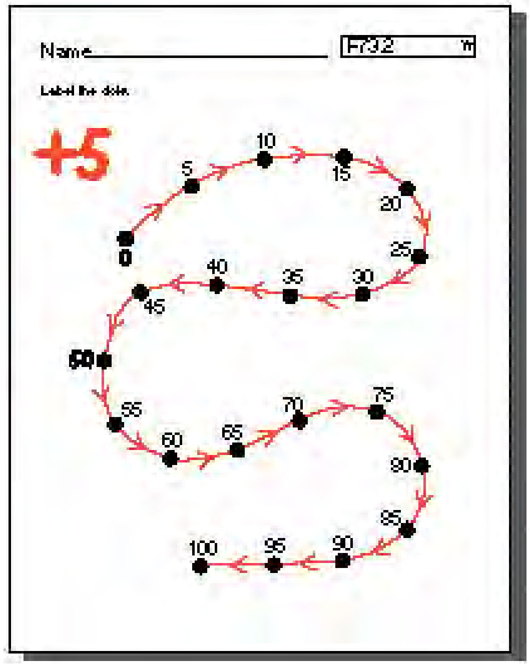
T: ***He planted some seeds a second time*** (drop counters into a second cup)***. How many seeds has he planted so far?*** (Ten) ***How do you know?*** (5 + 5 = 10) ***Who can label this dot?***

Continue in this manner until all the dots have been labeled.



When the arrow picture is completed, conclude with your students that if Johnny Appleseed planted seeds 20 times, then he must have planted 100 seeds altogether. Count the number of counters (seeds) in the cups by fives and compare it to the arrow picture. Compare 100 with the students' estimates.

Worksheets F73.2* and ** are available for the remainder of the lesson. You may want to allow students to use calculators to check their work on the worksheets.


Name
F73.2
Label the dots.
+5
0
5
10
15
20
25
30
35
40
45
55
60
65
70
75
90
95
90
95
100


Name
F73.2
Label the dots.
+5
9
13
18
23
28
33
38
43
48
58
63
68
73
79
83
88
93
98
103

F74.1 THE FUNCTIONS +2 AND −2

Capsule Lesson Summary

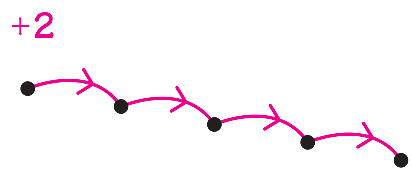
Label the dots and draw the return arrows in a +2 arrow picture.

Materials

Teacher	• Colored chalk	**Student**	• Paper • Colored pencils

Description of Lesson

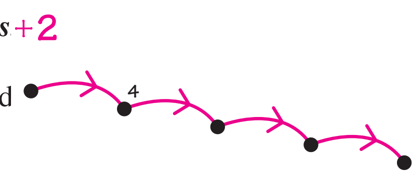
Draw this arrow picture on the chalkboard and ask students to copy it on their papers.



T: ***What are these red arrows for?*** (+2)
Point to the least number in this picture.
Point to the greatest number in this picture.
Do you know which numbers are in my picture?

The students will probably suggest several numbers; ask if they know for sure the suggested numbers are in the arrow picture. Emphasize that the numbers in the picture are still unknown because none of the dots are labeled.

T: ***I will label a dot and then you can label the others***



Write 4 above the second dot from the left. Students should the same in their pictures, following the class discussion.

T: ***Who can label another dot for us?***

The following dialogue assumes that a student labels the dot for 6.

T: ***How do you know that is 6?***

S: ***Because 4 + 2 = 6.***

If necessary, help the student verbalize this. Emphasize how to read the arrow by pointing to the dot for 4 and then tracing the arrow to 6 as you repeat, “four plus two equal six.”

T: Can you show us how you know 4 + 2 = 6?

Accept any correct method and demonstrate it to the class. Do not insist that a student be able to verbalize a method; simply invite another student, who is able, to explain a method.

Continue in this manner until a student labels the dot for 2.

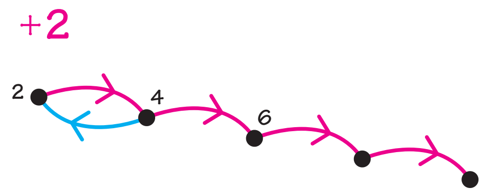
T: ***How do you know that is 2?***

S: ***Because 2 + 2 = 4.***

S: ***Because 4 – 2 = 2.***

F74

Even if the second response is not given, draw a blue arrow from 4 to 2 in your picture.



T: ***What could this blue arrow be for?***

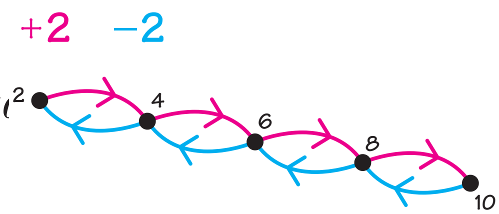
S: ***– 2.***

Write –2 in blue near the arrow picture. Then start at 4 and trace the blue arrow from 4 to 2 as you say,

T: ***4 – 2 = 2. Could we draw anymore –2 arrows in our arrow picture?***

Ask students first to trace an arrow, and then to draw the arrow if correct. After an arrow is drawn, either ask the student to read the fact for this arrow or offer it yourself.

Continue in this manner until the arrow picture is complete.



T: ***If I continued to draw red arrows beyond 10, what other numbers would we meet?***

Consider each number as it is suggested. Trace more red arrows on the board as necessary to determine whether you would meet a suggested number. For example, suppose that 15 has been suggested. Start at 10 and trace one arrow.

T: ***10 + 2 = …?***

S: ***12.***

Trace another arrow.

T: ***12 + 2 = …?***

S: ***14.***

Trace another arrow.

T: ***14 + 2 = …?***

S: ***16.***

T: ***We passed 15 without meeting it. If we go on adding 2, will we ever meet 15?***

Allow students to comment and observe that the numbers will increase as you continue to add 2, so you will never meet 15.

When it is impractical to check by tracing arrows, simply state whether the suggested number will or will not be met.

Capsule Lesson Summary

Provide individual practice with the Minicomputer, arrow pictures, counting problems, string pictures, and so on.

Materials

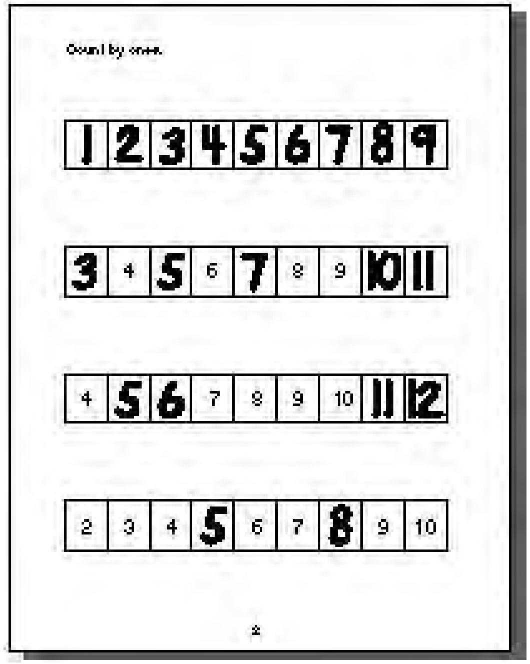
Teacher		Student	
	• None		• *Parade of Problems #1* Workbook • Colored pencils

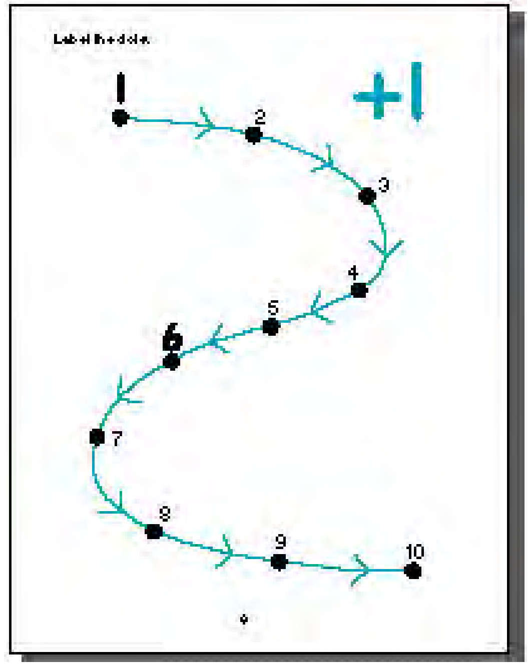
Description of Lesson

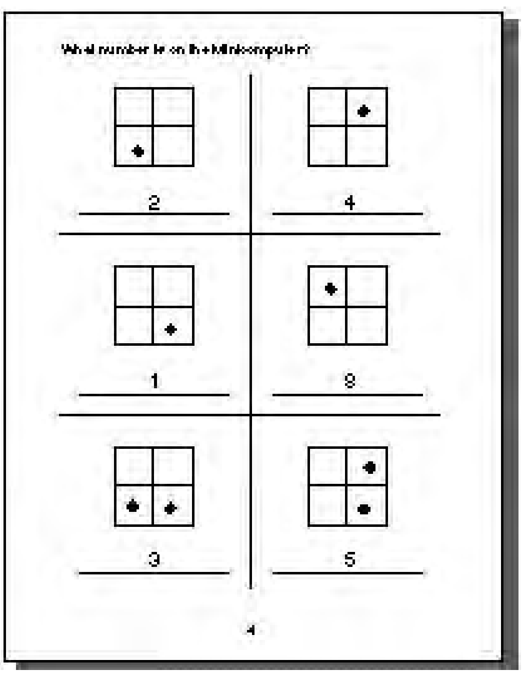
Distribute copies of the workbook *Parade of Problems #1* and let students work at their own rates. Circulate among the class to give help where needed. Encourage students to be careful and to check their work.

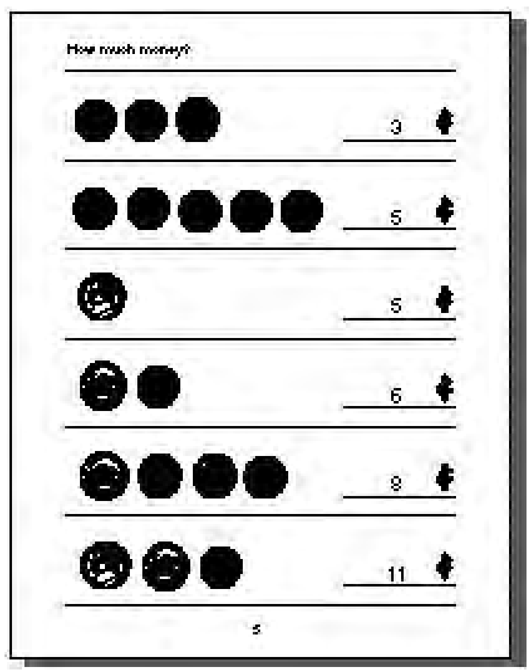
Allow about twenty minutes for this independent work. Because the pages of the workbook increase in difficulty as the students progress through them, some students will naturally complete more pages than others. Still, there should be enough exercises so that even your brightest students remain challenged.

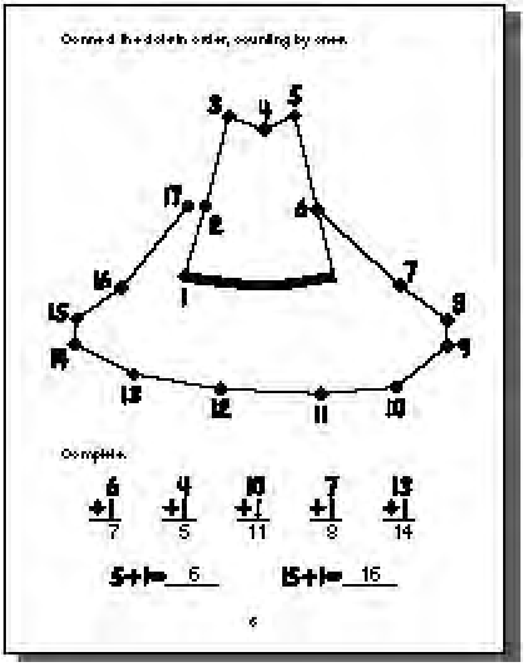
A second lesson is scheduled for these workbooks. When the period is over, collect the workbooks for your review. On the workbook cover, you may like to indicate which pages are complete and which pages need some corrections by students when the workbooks are used again (Lesson F80).


Count by ones.
1 2 3 4 5 6 7 8 9
3 4 5 6 7 8 9 10 11
4 5 6 7 8 9 10 11 12
2 3 4 5 6 7 8 9 10
2


Label the dots.
+1
1 2 3 4 5 6 7 8 9 10


What number is on the Minicomputer?
2
4
1
8
3
5
4


How much money?
3 ¢
5 ¢
5 ¢
6 ¢
8 ¢
11 ¢
5



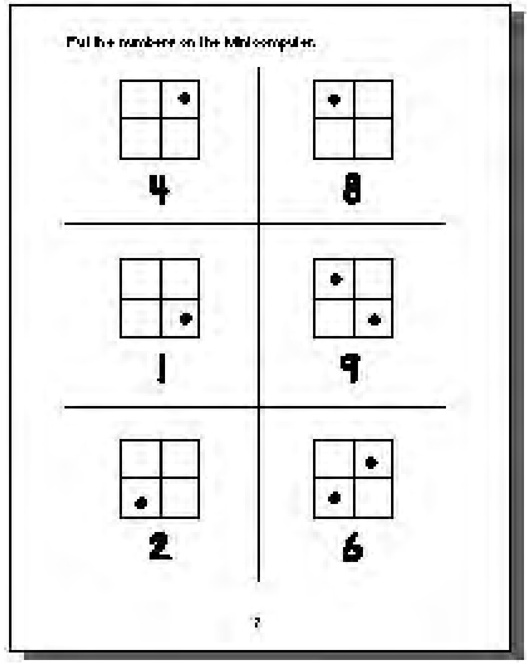
Connect the dots in order, counting by ones.

Complete.

$6+1=7$ $\quad 4+1=5$ $\quad 10+1=11$ $\quad 7+1=8$ $\quad 13+1=14$

$5+1=$ 6 $\qquad 15+1=$ 16

6



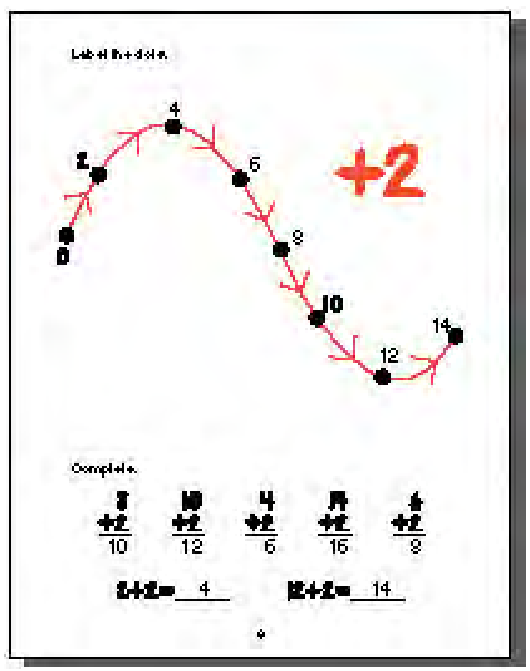
Put the numbers on the Minicomputer.

4 $\quad$ 8

1 $\quad$ 9

2 $\quad$ 6

7



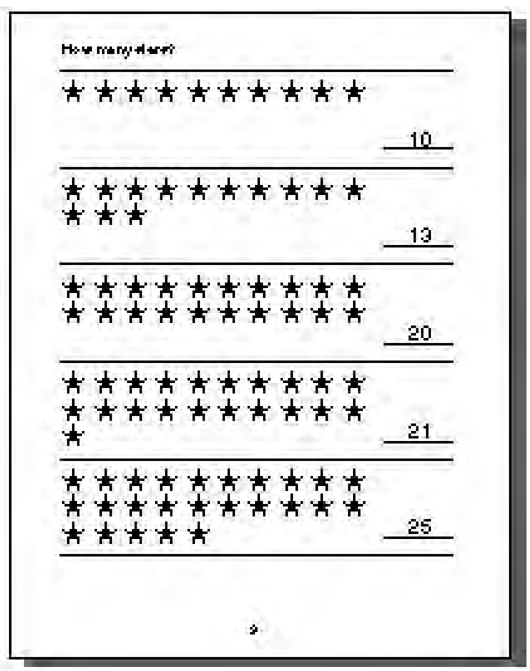
Label the dots.

Complete.

$8+2=10$ $\quad 10+2=12$ $\quad 4+2=6$ $\quad 14+2=16$ $\quad 6+2=8$

$2+2=$ 4 $\qquad 12+2=$ 14

8



How many stars?

★★★★★★★★★★ 10

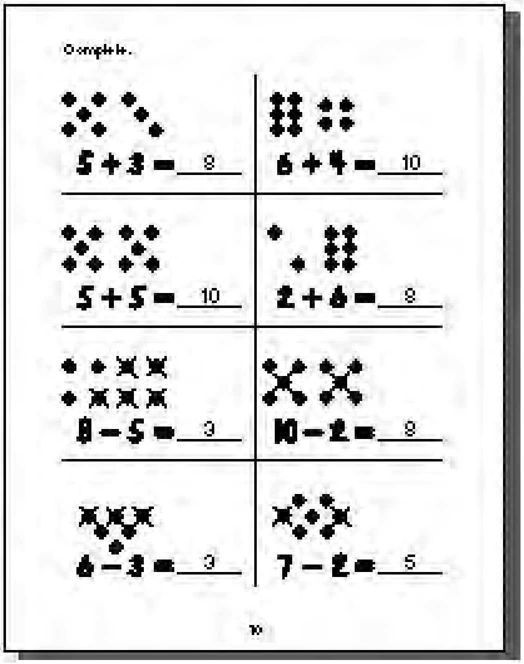
★★★★★★★★★★ ★★★ 13

★★★★★★★★★★ ★★★★★★★★★★ 20

★★★★★★★★★★ ★★★★★★★★★★ ★ 21

★★★★★★★★★★ ★★★★★★★★★★ ★★★★★ 25

9



Complete.

$5 + 3 =$ 8

$6 + 4 =$ 10

$5 + 5 =$ 10

$2 + 6 =$ 8

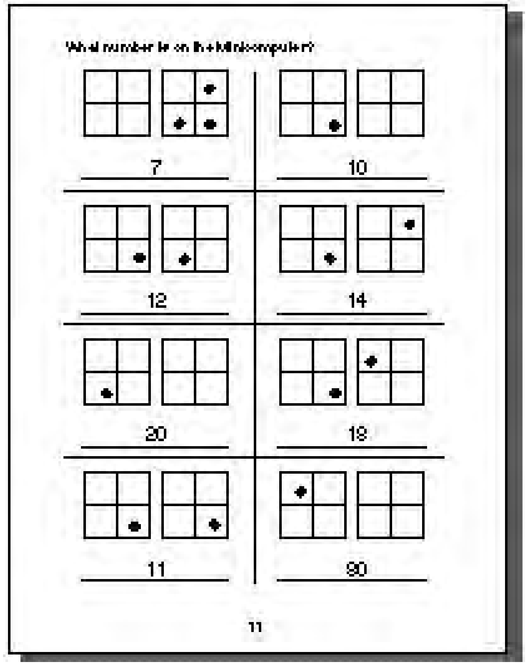
$8 - 5 =$ 3

$10 - 2 =$ 8

$6 - 3 =$ 3

$7 - 2 =$ 5

10



What number is on the Minicomputer?

7

10

12

14

20

18

11

90

11

Label the dots.

Complete.

$7 + 2 = 9$

$5 + 2 = 7$

$15 + 2 = 17$

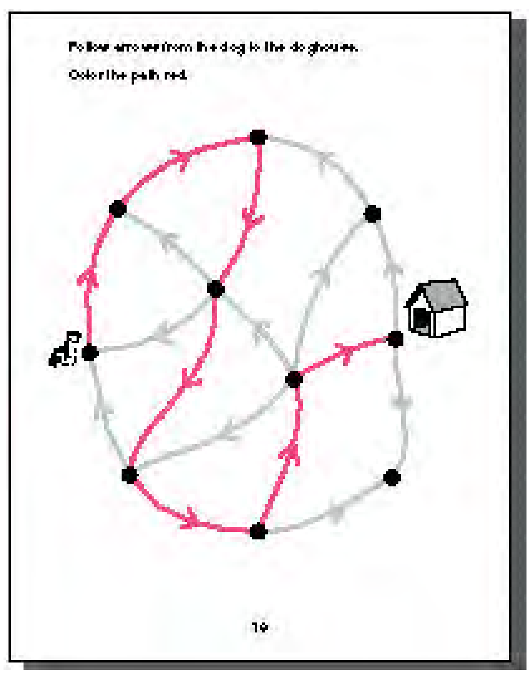
$11 + 2 = 13$

$17 + 2 = 19$

$9 + 2 =$ 11

$19 + 2 =$ 21

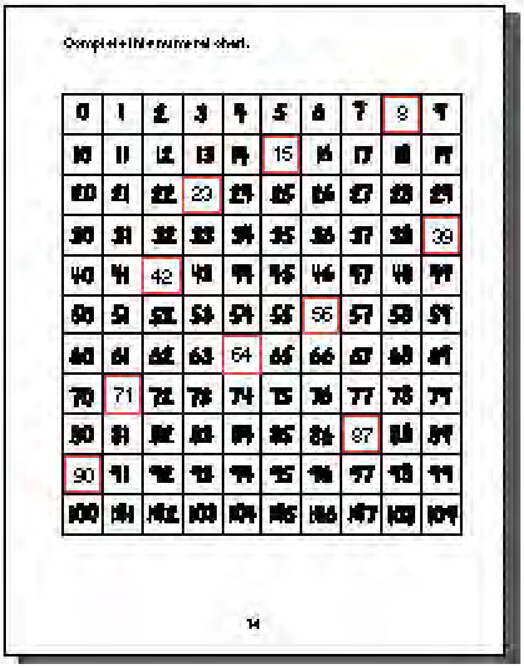
12

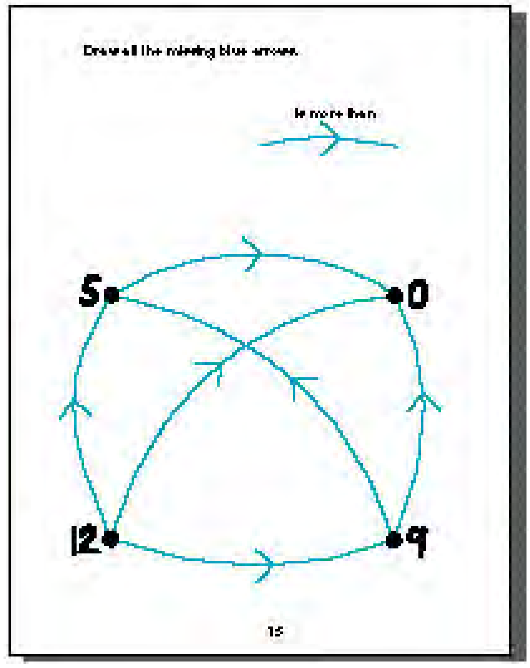


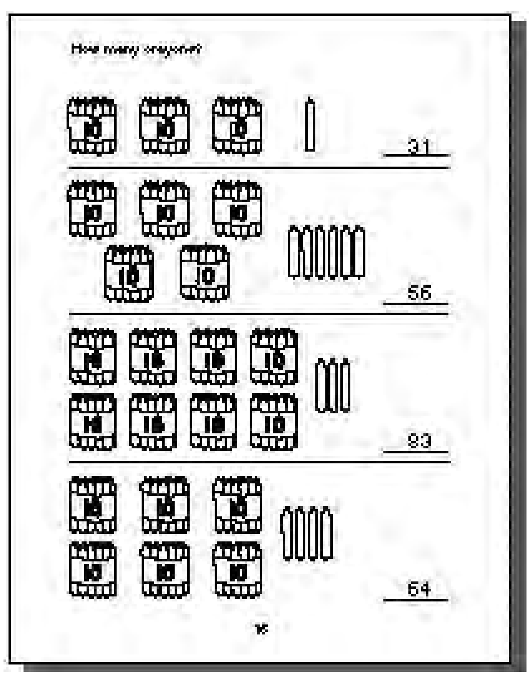
Follow arrows from the dog to the doghouse.

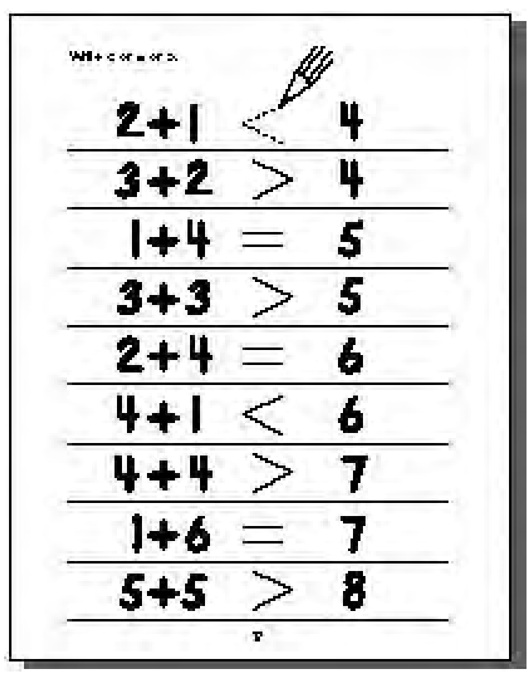
Color the path red.

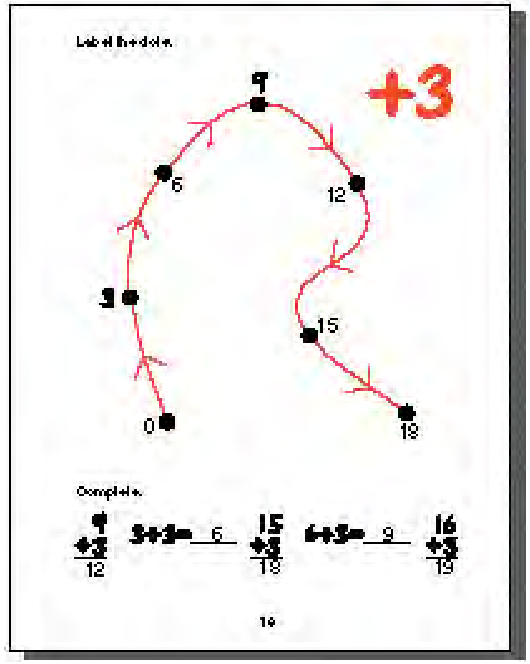
13

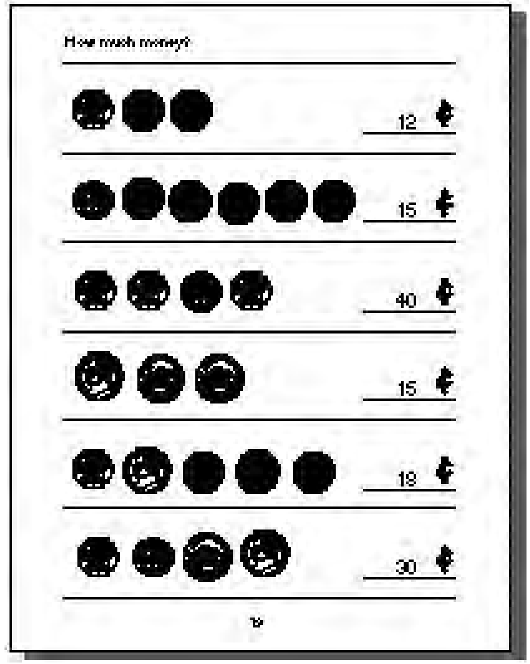

0 1 2 3 4 5 6 7 8 9
15
23
39
42
56
64
71
87
90

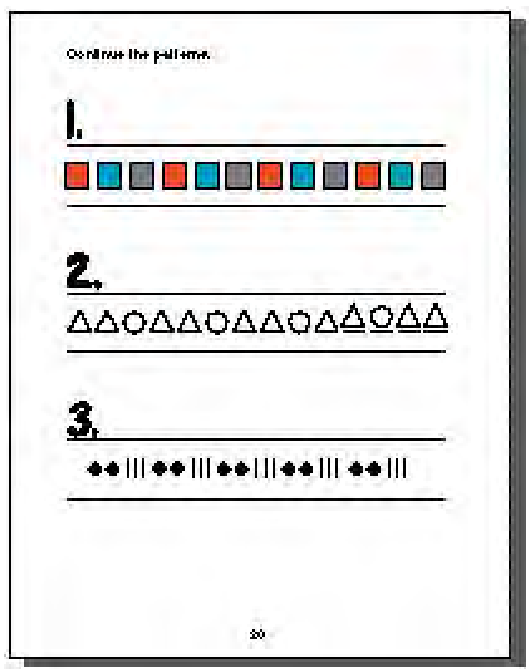

5
0
12
9

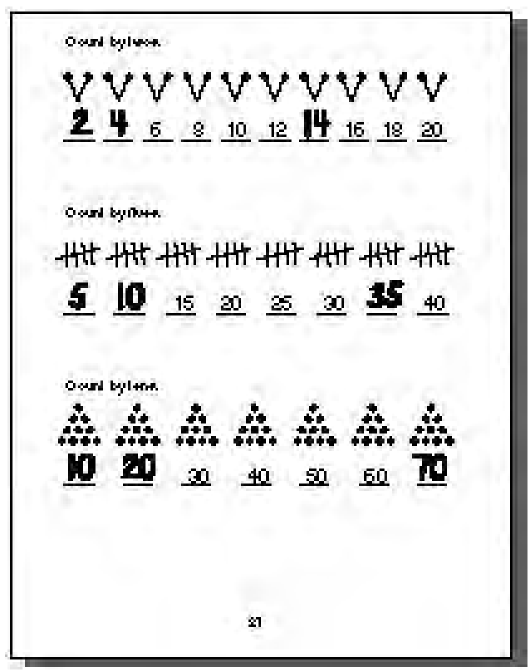

31
56
83
64

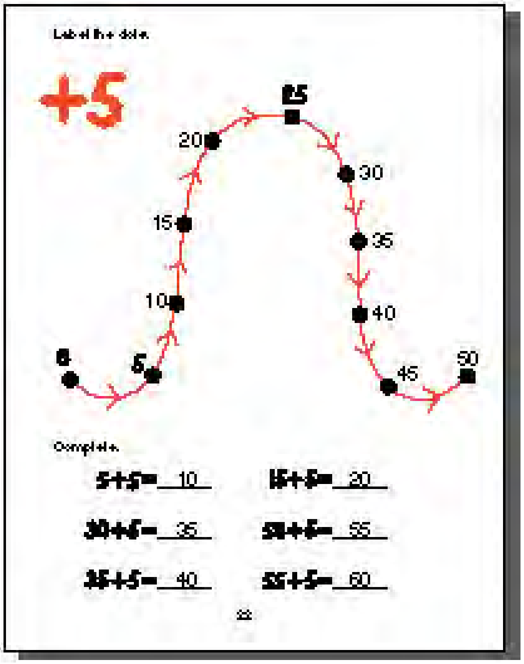

2+1 < 4
3+2 > 4
1+4 = 5
3+3 > 5
2+4 = 6
4+1 < 6
4+4 > 7
1+6 = 7
5+5 > 8

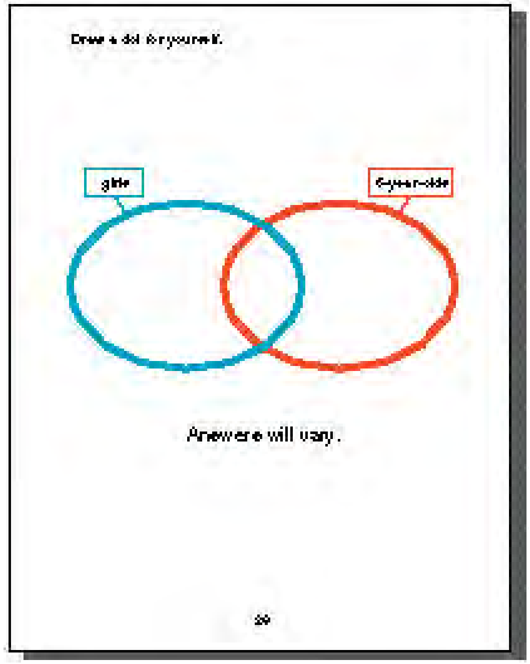

Label the dots.
+3
9
6
12
3
15
0
18
Complete.
9 +3 12
3+3= 6
15 +3 18
6+3= 9
16 +3 19
19

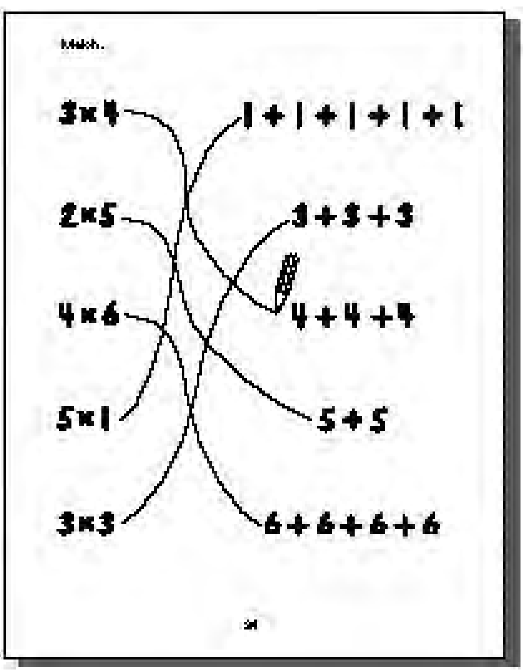

How much money?
12 ¢
15 ¢
40 ¢
15 ¢
19 ¢
30 ¢
19

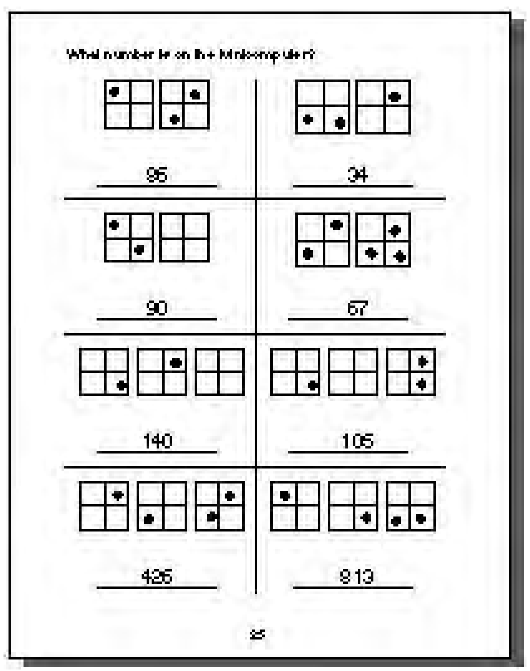

Continue the patterns.
1.
2.
3.
20

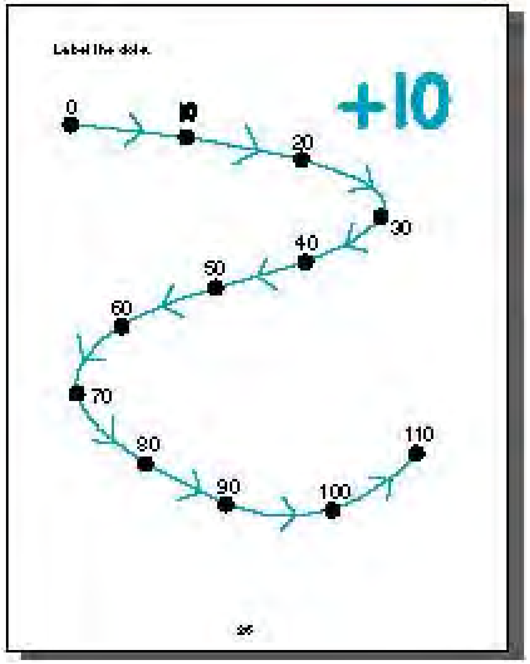

Count by twos.
2 4 6 8 10 12 14 16 18 20
Count by fives.
5 10 15 20 25 30 35 40
Count by tens.
10 20 30 40 50 60 70
21

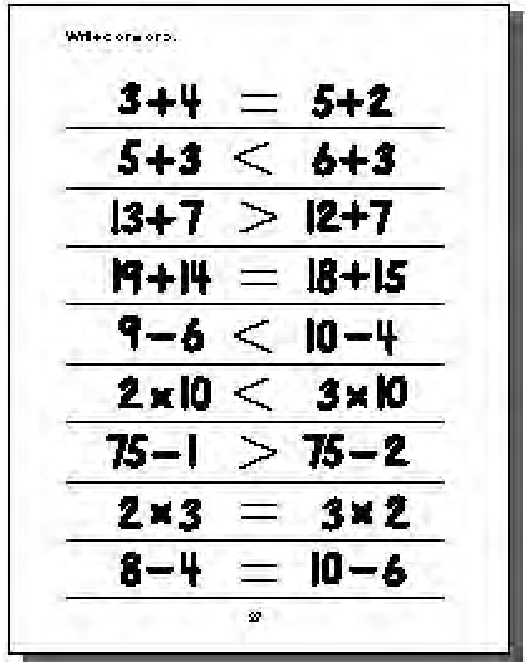

Label the dots.
+5
0
5
10
15
20
25
30
35
40
45
50
Complete.
5+5= 10
15+5= 20
30+5= 35
50+5= 55
35+5= 40
55+5= 60


Answers will vary.


Match.
3×4
2×5
4×6
5×1
3×3
1+1+1+1+1
3+3+3
4+4+4
5+5
6+6+6+6

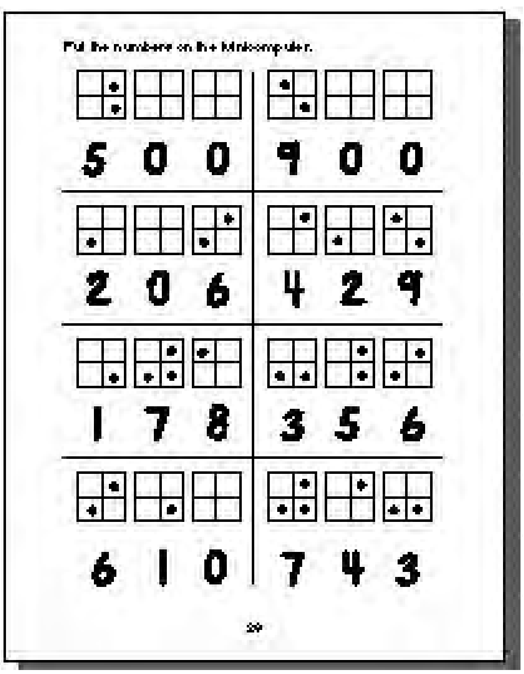

What number is on the Minicomputer?
95
34
90
67
140
105
426
813





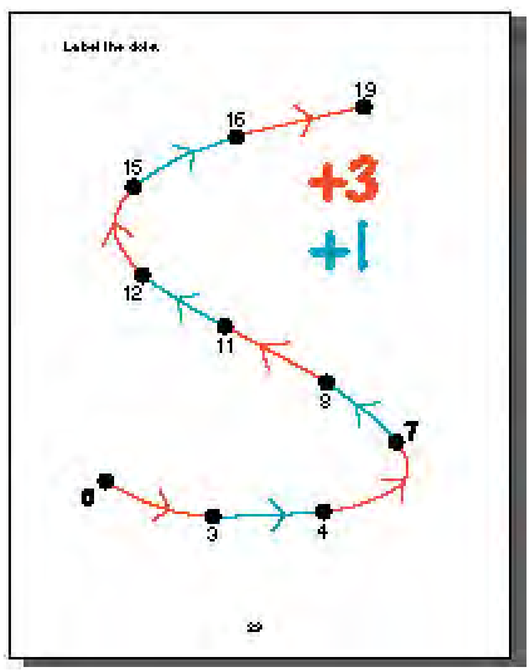
Write < or = or >.

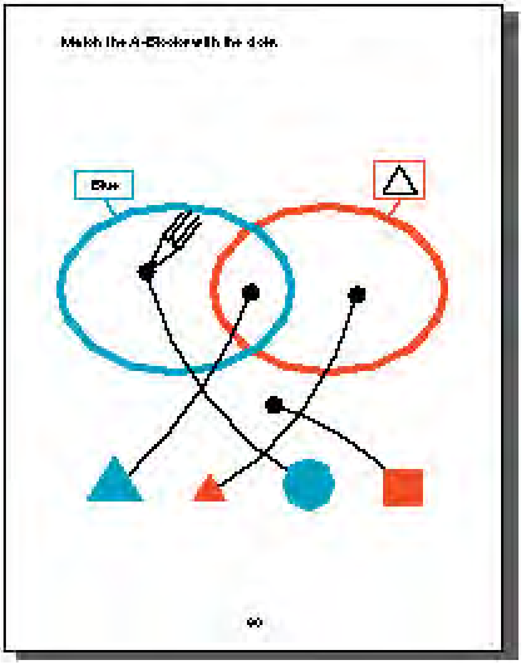
3+4	=	5+2
5+3	<	6+3
13+7	>	12+7
19+14	=	18+15
9−6	<	10−4
2×10	<	3×10
75−1	>	75−2
2×3	=	3×2
8−4	=	10−6

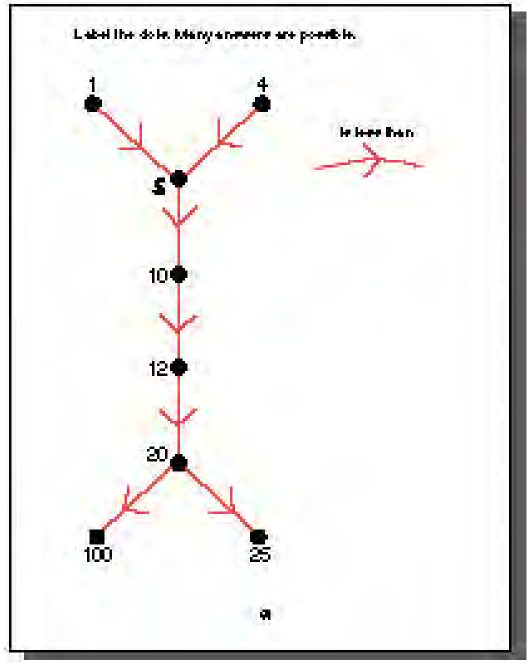


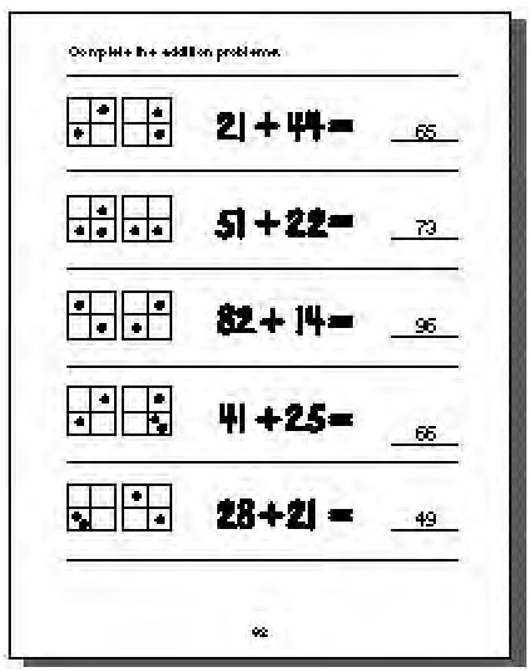
Put the numbers on the Minicomputer.

5 0 0	9 0 0
2 0 6	4 2 9
1 7 8	3 5 6
6 1 0	7 4 3




Match the A-Blocks with the dots.
Blue
90


Label the dots. Many answers are possible.
1
4
is less than
5
10
12
20
100
25
91


Complete the addition problems.
21 + 44 = 65
51 + 22 = 73
82 + 14 = 96
41 + 25 = 66
28 + 21 = 49
92

F75 INDIVIDUAL MINICOMPUTER ACTIVITY #2

Capsule Lesson Summary

Using different colored checkers on the Minicomputer, examine ways to represent 7. Individually put selected numbers from 0 to 100 on the Minicomputer. Solve addition and multiplication problems on the Minicomputer and write the corresponding number sentences.

Materials

Teacher	• Minicomputer set	Student	• Minicomputer set

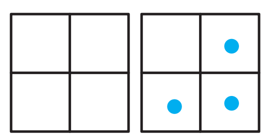
Description of Lesson

Exercise 1

Display two Minicomputer boards.

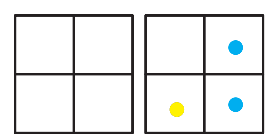
T: ***Who can put 7 on the Minicomputer?***

Give the student who volunteers several (more than three) blue checkers. Although the student is likely to suggest the standard configuration, if not, ask who can put 7 on the Minicomputer with fewer checkers until the standard configuration is obtained.



T: ***Watch carefully; I'm going to change the color of one of the checkers.***

Substitute a yellow checker for one of the blue checkers.



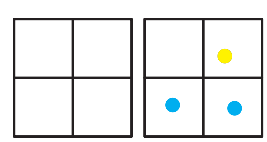
T: ***What number is in yellow?*** (2)
What number is in blue? (5)
What number is in both colors together? (7)

Write this number fact on the chalkboard.

$$2 + 5 = 7$$

T: ***Can anyone rearrange these three checkers and still show 7?***

Here is one possible suggestion.



T: ***What number is in yellow?*** (4)
What number is in blue? (3)
What number is in both colors together? (7)

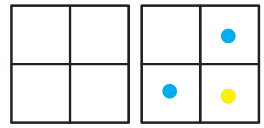
Write this new fact on the chalkboard.

$$4 + 3 = 7$$

F75

T: ***Who can rearrange these checkers in another way and still show 7?***

Here is a third possibility.



T: ***What number is in yellow?*** (1)
What number is in blue? (6)
What number is in both colors together? (7)

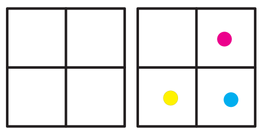
Write this number fact on the chalkboard.

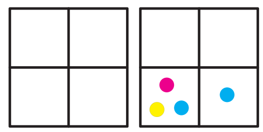
6 + 1 = 7

If students suggest 1 + 6 = 7, 3 + 4 = 7, or 5 + 2 = 7 in addition to the other facts, write these also.

T: ***Can anyone put 7 on the Minicomputer using three colors?***

There are many correct possibilities, two of which are shown below.





For any correct configuration, ask what number is shown in blue, what number in yellow, what number in red, and then what number is in the three colors together. Write the appropriate number sentence (4 + 2 + 1 = 7 for the first example, 3 + 2 + 2 = 7 for the second example) for each suggestion.

Exercise 2

Distribute individual Minicomputers (one sheet—two boards) and checkers. Instruct the students to take out only two checkers.

T: ***I will say a number. As quickly as you can, put it on your Minicomputers. You won't need more than two checkers. Hold one checker in each hand and be ready and thinking.***

Choose several numbers, at random, from the following list.

0, 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 14, 18, 20, 21, 22, 24, 28,
30, 40, 41, 42, 44, 48, 50, 60, 80, 81, 82, 84, 88, 90, 100

Walk around the room observing individual work. If a certain number seems particularly difficult, ask someone to put it on the demonstration Minicomputer.

T: ***Take out one more checker. How many checkers do you have now?*** (Three) ***I'm going to give you some new numbers to put on your Minicomputers. This time, you may use all three checkers if necessary.***

Offer several numbers for the students to put on their Minicomputers. Choose numbers from the list above or from this new list.

7, 13, 15, 16, 19, 23, 25, 26, 29, 31, 32, 34, 38, 43, 45, 46, 49,
51, 52, 54, 58, 61, 62, 64, 68, 70, 83, 85, 86, 89, 91, 92, 94, 98

Continue this activity for as long as it remains interesting.

Exercise 3

Tell the following story, substituting names of students in your class.

T: ***Suppose Patty is going to a birthday party for Ming. She must buy a present. Her mother takes her to a toy shop and Patty decides to buy two little toy cars. She picks out a station wagon for 42¢ and a sports car for 29¢. How can we find out how much she spends on the two cars?***

S: ***Add 42 and 29.***

Write an appropriate calculation on the chalkboard.

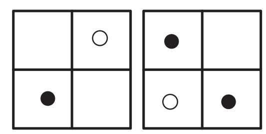
$42 + 29 =$

T: ***Let's do the calculation on the Minicomputer. Put 42 on your Minicomputers.***

Invite a student to put 42 on the demonstration Minicomputer.

T: ***Since we are adding, leave 42 on the Minicomputer and put on 29.***

Invite a student to add 29 to the demonstration Minicomputer.

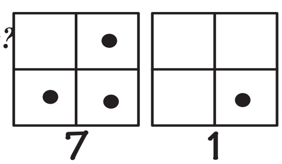


T: ***Your Minicomputer should now look like mine.***
Has anyone figured out the answer?

Give the students a moment to make a trade on their own. Then, ask a student to make the 8 + 2 = 10 trade on the demonstration Minicomputer and write the sum below (above) the boards.

T: ***Who can complete our number sentence?***

Call on a student to complete the calculation.



$42 + 29 = 71$

Exercise 4

T: ***Yesterday, I went to the store and bought three cartons of soda. Each carton had six bottles in it. How many bottles of soda did I buy yesterday?*** (18)

Accept several responses and record these on the board. Students who respond correctly may be questioned later (when the calculation is completed) about how they arrived at this answer.

T: ***What calculation could we use to find out how many bottles of soda I bought?***

The most likely response is 6 + 6 + 6. Write this expression on the chalkboard.

$6 + 6 + 6$

T: ***Who knows a shorter way to write this?***

S: ***3 times 6.***

Ask the student to write this shorter expression on the board.

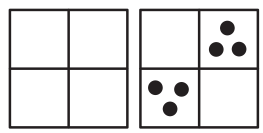
3×6

You might give the class a hint by asking the students how many times you wrote 6. When "three times" is the response, write the expression on the board as you say, "Three times six."

T: ***Let's use the Minicomputer to solve the problem. How many times do we need to put 6 on the Minicomputer?***

S: Three times.

Select three students and ask each to put 6 on the Minicomputer. Instruct students to put 6 on their desk Minicomputers three times. While only the standard configuration for 6 is used in the illustration below, you should accept any correct way of putting on 6.

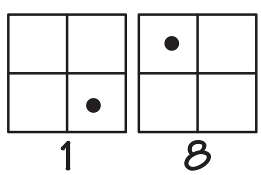


T: ***Who sees a trade we can make?***

Call on students to make trades. Emphasize using both hands and saying the calculation as the trade is made. The trades to be made here are straight forward; they are: one 2 + 2 = 4 trade, two 4 + 4 = 8 trades, and one 8 + 2 = 10 trade. (Additional trades may be needed if non-standard configurations for 6 are used.)

T: ***Who can write the answer below (above) the boards?***

Complete the calculation (or calculations) on the chalkboard.



$6 + 6 + 6 = 18$

$3 \times 6 = 18$

Students who suggested this answer before the calculation was done collectively may be asked to explain how they obtained their answers. They may have difficulty verbalizing an explanation, so do not insist on clarity.

Home Activity

This is a good time to send home a letter about the Minicomputer. Blacklines F75(a), (b), and (c) provide a sample. Instruct students to color the Minicomputer boards on the full page to show their parents/guardians how the boards look. They should explain the Minicomputer and practice putting numbers on the Minicomputer and reading them. Objects such as paper clips, pennies, or dried beans can be used as checkers.

F76 TINA VISITS THE LIBRARY

Capsule Lesson Summary

Act out a story situation, draw a string picture for the story, and then write sentences about the picture. Draw paths between two points on a grid board.

Materials

Teacher
- Colored chalk
- Post-it™ notes
- Favorite books graph
- Grid board

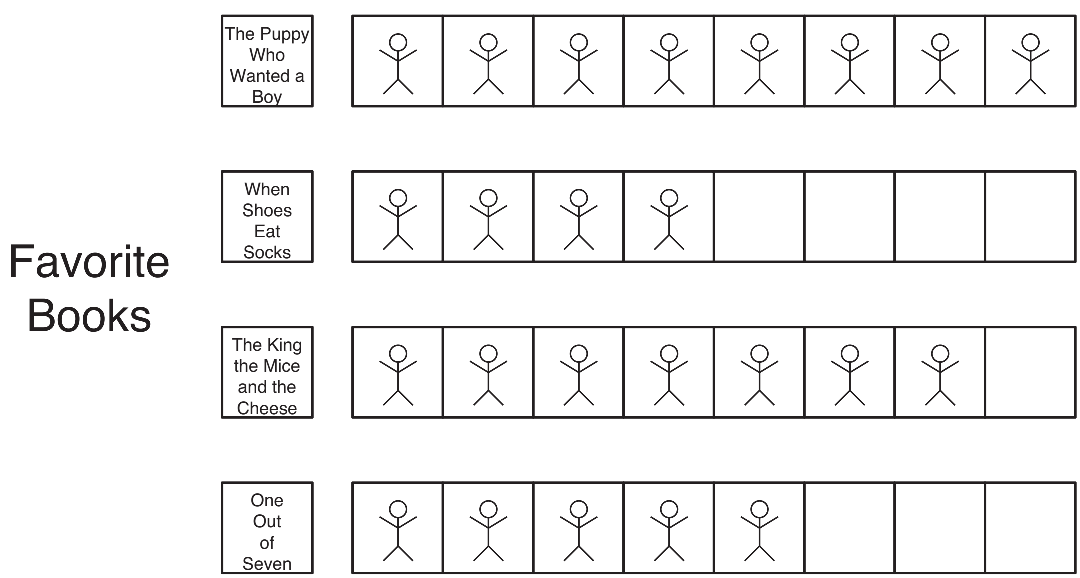
Student
- Small piece of paper (about 5" x 7")
- Colored pencils
- Worksheet F76

Advance Preparation: See Exercise 1 for the description of a graph to make before the lesson begins.

Description of Lesson

Exercise 1

Before this lesson begins, make a class graph of favorite books. For example, you might choose three or four books that you have read aloud to the class. Label a three or four column (or row) graph with the book titles or copies of book jackets. Provide students with small pieces of paper and ask them to draw a picture of themselves. Then invite the students to place (glue or tape) their pictures in the column or row of their favorite book.



Ask some questions to initiate a discussion of the graph.

T: ***What information do we get from the graph?***
Which book was chosen most (least)?
How many children chose **One Out of Seven*****?***
How many more children chose **The Puppy Who Wanted a Boy** ***than chose*** **When Socks Eat Shoes*****?***

Exercise 2

Tell the class a story about a girl named Tina who often goes to the library to check out books. She always checks out seven books because that is as many as the library will allow. Invite a student to count out seven small Post-it™ notes to represent seven books.

Tina only checks out two kinds of books—books about cowboys or dinosaurs. Today Tina checked out five books about cowboys. Ask a student to divide the collection of Post-it™ notes so there are five representing books about cowboys. Then, observe that Tina must have checked out two books about dinosaurs.

Draw a large string on the chalkboard.

T: ***All the books Tina got from the library today are in this string. How many books did Tina get from the library?***

S: ***Seven.***

Write 7 near the string and draw a second string inside the first one (use a different color, such as red, for this second string). See the next illustration.

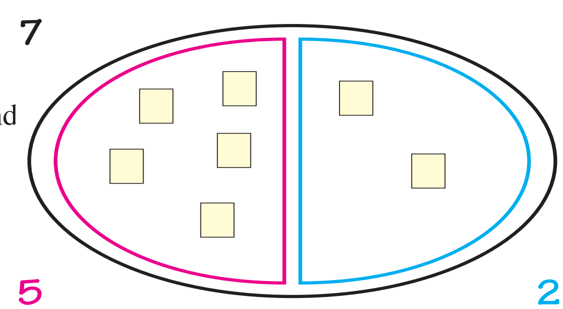
T: ***Tina's cowboy books are in the red string. How many books about cowboys did she check out?***

S: ***Five.***

Invite a student to place the five Post-it™ notes representing books about cowboys in the red string and write 5 in red near the picture. Draw a third string in another color, such as blue, as shown in the next illustration.

T: ***The books about dinosaurs are in the blue string. Who can tell us how many books about dinosaurs Tina checked out? How do you know?***

S: ***Two, because 7 – 5 = 2 (or 5 + 2 = 7).***



Record whatever number sentence is suggested by the students' answer. Invite a student to place the remaining Post-it™ notes in the blue string and write 2 in blue near the picture.

T: ***Can anyone tell us another number sentence about this picture?***

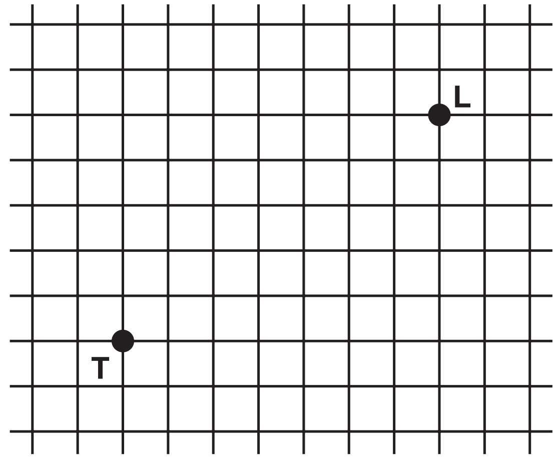
Continue to invite number sentences until the four listed below are suggested. You may need to suggest the subtraction number sentences yourself.

$5 + 2 = 7$ $\quad$ $7 - 2 = 5$

$2 + 5 = 7$ $\quad$ $7 - 5 = 2$

Exercise 3

On a grid board, draw and label two dots as illustrated.



T: ***This is a map of the city where Tina lives. Who can show us where Tina lives?*** (The dot labeled **T**) ***Who can show us where the library is?*** (The dot labeled **L**)

Moving your finger along one of the lines, explain to the students that the grid lines are the streets of Tina's city.

T: ***When Tina walks to the library she always walks along the streets, because she knows it is not polite to walk across the yards of other people.***

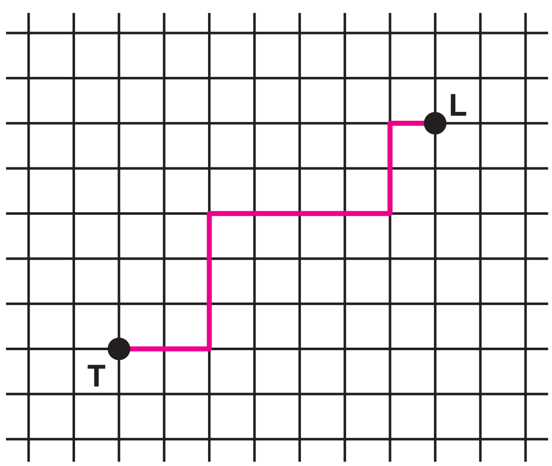
Ask a student to show a path from **T** to **L** using a pointer or a finger. Accept any path that follows the lines. Be prepared to repeat the explanation, if necessary, that the lines of the grid board are the streets of the city. Ask one or two additional students to trace paths on the "map."

T: ***Sometimes, when it is a very nice day, Tina takes a long path to the library. Who would like to show us a path Tina could take on a nice day?***

Ask one or two students to trace long paths on the grid board.

T: ***If it is raining, Tina takes a short path to the library. Who can show us a path Tina could take on a rainy day?***

Accept any path that is relatively short and follows the streets. If the path is correctly traced, draw it on the grid board. One such path is shown below.



F76

Distribute a copy of Worksheet F76 and some colored pencils to each student. Ask the students to draw paths from Tina's house to the library; they should use a different color for each path they draw. Remind them that they must follow the streets.

As the students work on this problem, walk around the classroom observing them. Allow enough time for them to find interesting and original paths. When students have drawn several paths, you can ask them to turn their sheets over and continue on the reverse side. Ask a few students to copy one of their paths on the grid board. Try to obtain paths that vary in length and go through many different areas of the grid. Direct each student to use a different color of chalk.

After awhile (perhaps about ten minutes), call the students' attention to the paths that have been drawn on the grid board.

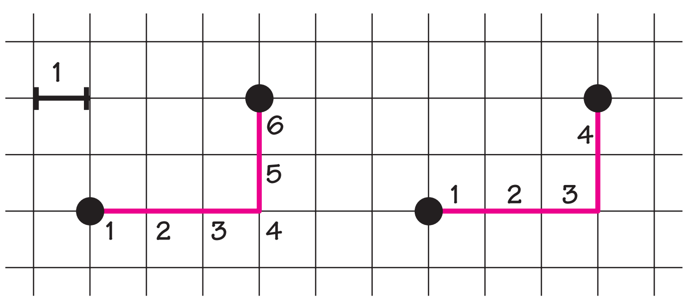
T: ***Here we have several paths Tina could take to the library. Which path do you think is the longest?***

It is possible that your class will not agree on which of the paths is the longest. Do not insist on a concensus.

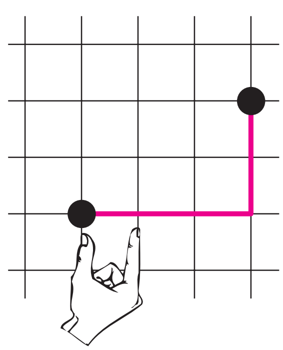
T: ***Why do you think this path is the longest?***

The students will probably say that a certain path "looks" longer. If someone suggests counting blocks, accept this suggestion for comparing the paths. If no one makes this suggestion, leave the comparison question for another lesson.

Note: Some common mistakes may occur when students count the blocks in a path, especially if the path turns a corner. For instance,



These paths are, in fact, both five blocks long. To avoid such mistakes, it may be helpful to ask students to show the blocks with their thumb and index finger as they count them. This is illustrated below.



F77 ADDITION ON THE MINICOMPUTER #5

Capsule Lesson Summary

Practice putting numbers on the Minicomputer and reading them. Solve some addition problems on the Minicomputer and write the calculations.

Materials

Teacher	• Minicomputer set	**Student**	• Minicomputer set • Worksheets F77 *, **, and ***

Description of Lesson

Begin the lesson with five to ten minutes of recognizing and putting various numbers on the demonstration Minicomputer.

T: ***Who would like to put my secret number on the Minicomputer?***

After choosing some number of appropriate difficulty, select a volunteer and whisper your number to the student. When the volunteer has put the number on the Minicomputer, continue.

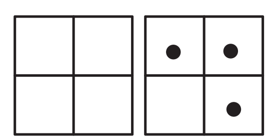
T: ***Who knows what the secret number is?***

Ask a second student to write the numeral below (above) the Minicomputer boards; then ask the first student if this is correct. Repeat this activity several times with new volunteers.

T: ***Now, let's tell a story about Anthony*** (substitute the name of a student)***. Anthony has eight crayons and a friend gave him five more. How many crayons does Anthony have now?***

Several students will know the answer without using the Minicomputer; tell them you will use the Minicomputer to check the answer and then do so.

Ask two students to put on checkers for 8 and 5, respectively. With standard configurations for 8 and 5, the Minicomputer looks like this.

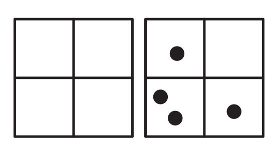


T: ***Who sees a trade we can make?***

If the backward trade 4 = 2 + 2 has already been introduced to the students, one of them may suggest it. If not, say,

T: ***We would like a checker on the 2-square to go with the checker on the 8-square. Then we could make the 8 + 2 = 10 trade. How can we get a checker on the 2-square without changing the number?***

If the backward trade is still not suggested, point to the checker on the 4-square and ask for a trade with this checker. The 4 = 2 + 2 trade will result in this configuration.



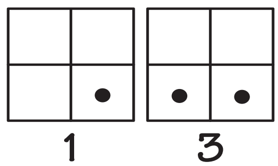
F77

T: ***Who sees another trade?***

Someone may suggest making the 2 + 2 = 4 trade.

T: ***That is a good trade, but it puts us right back where we started. Do you see another trade we could make?***

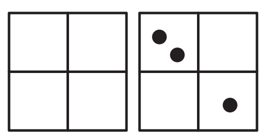
After the 8 + 2 = 10 trade has been made, ask a student to write the numeral below (above) the Minicomputer boards. Next to the Minicomputer, write this number fact.



$8 + 5 = 13$

T: ***Now, let's try a problem that is a little harder. This story is about Tekoa*** (once again, substitute the name of a student)***. Tekoa had eight dollars. One Saturday she worked in the yard and earned nine more dollars. How many dollars does she have now?***

Write this calculation on the chalkboard and ask students to put the appropriate checkers on the Minicomputer.



$8 + 9 =$

Some students will already know the answer and may suggest putting 17 on the Minicomputer in the standard configuration. Tell them you would like to see the calculation on the Minicomputer. Then they can make trades to be sure.

T: ***Who sees a trade?***

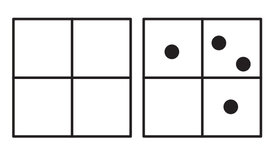
You may have to give hints to suggest a backward trade.

T: ***We need a checker on the 2-square to go with a checker on the 8-square. How did we get a checker to the 2-square last time?***

S: ***With the 4 = 2 + 2 trade.***

T: ***Yes; but we don't have a checker on the 4-square this time. How can we get one there?***

You may have to suggest the 8 = 4 + 4 backward trade by pointing to one of the checkers on the 8-square and asking how to make a trade with this checker. This should lead to the following configuration.

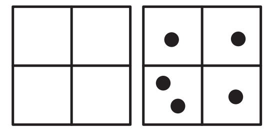


T: ***Who sees another trade?***

Someone may suggest the 4 + 4 = 8 trade.

T: ***That's a good trade, but it puts us back where we started. We still need a checker on the 2-square to go with the one on the 8-square.***

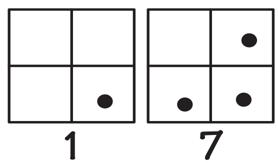
After a 4 = 2 + 2 trade is made, this configuration will be on the Minicomputer.



T: ***Who sees another trade?***

S: ***8 + 2 = 10.***

When 17 is in standard configuration, ask a student to write the numeral below (above) the Minicomputer and complete the calculation on the chalkboard.



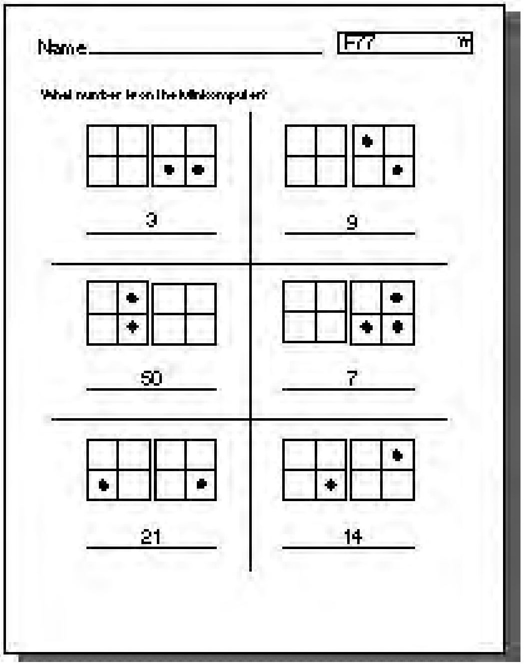
$8 + 9 = 17$

Distribute Worksheet F77* along with individual Minicomputers and checkers. As students complete Worksheet F77*, give them Worksheets F77** and ***.

On some pages of the worksheets, students have simply to read the number on the Minicomputer. On others, they are asked to do some addition problems. The Minicomputers pictured on these latter pages have checkers for the numbers to be added, but no trades have yet been made. Students should put the given numbers on their individual Minicomputers, make the trades, and when they have found the answers, complete the number sentence.

It is to be expected that your students will not be very skilled with their Minicomputers as yet—be patient. Walk around the room during this time and encourage the students to work carefully and not to rush. You may like to let students work with partners on the worksheets.

F77


Name ______________ F77 ★

What number is on the Minicomputer?

3

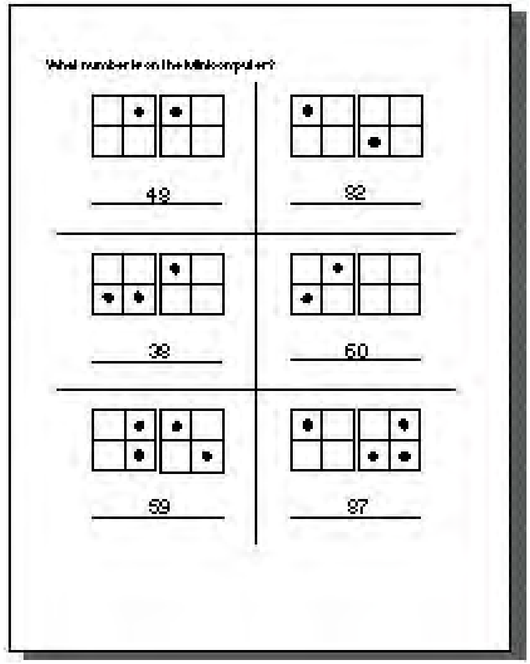
9

50

7

21

14


What number is on the Minicomputer?

49

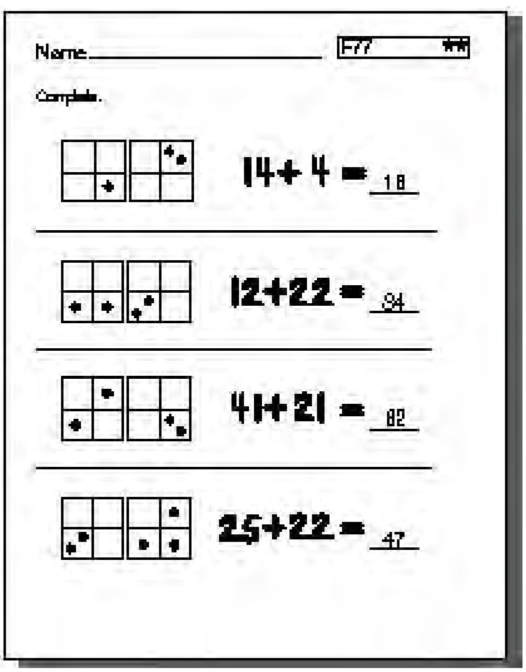
92

38

60

59

97


Name ______________ F77 ★★

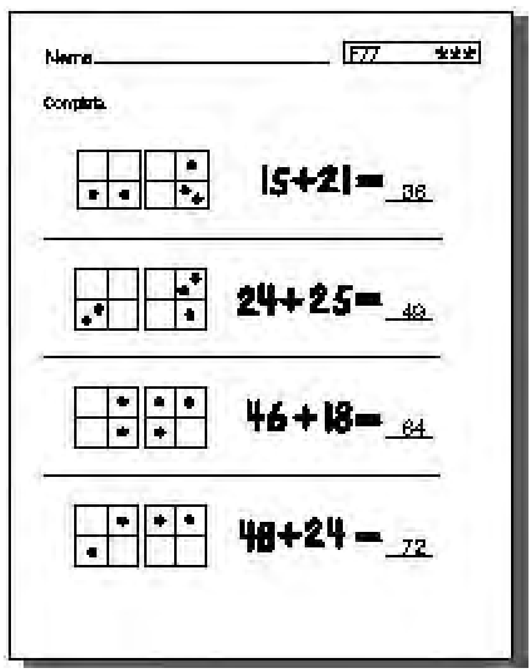
Complete.

14 + 4 = 18

12 + 22 = 34

41 + 21 = 62

25 + 22 = 47


Name ______________ F77 ★★★

Complete.

15 + 21 = 36

24 + 25 = 49

46 + 18 = 64

48 + 24 = 72

F78 THE FUNCTIONS +3 AND –3 #1

Capsule Lesson Summary

Label the dots in a +3 arrow picture and draw return –3 arrows. Locate missing numbers on other similar +3 arrow pictures.

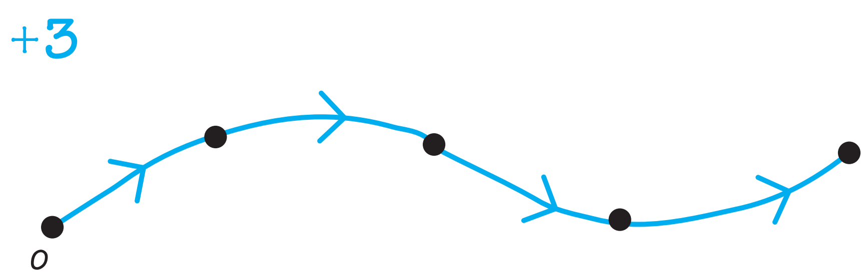
Materials

Teacher
- Colored chalk
- Number line or 0–109 numeral chart
- Counters (optional)
- Calculator (optional)

Student
- Colored pencils
- Worksheet F78

Description of Lesson

Draw this arrow picture on the chalkboard.



T: ***Who can label a dot?***

Call on students to label the dots. Each time a dot is labeled, read the fact told by the arrow ending at that dot. If, for example, a student labels the second dot 3, say,

T: ***0*** (point to the first dot) ***plus 3*** (trace the arrow) ***is 3*** (point to the second dot)**.**

Count three forward on your fingers, the number line, or the numeral chart to demonstrate the correct labeling of a dot. You may prefer to use counters to model counting forward by three.

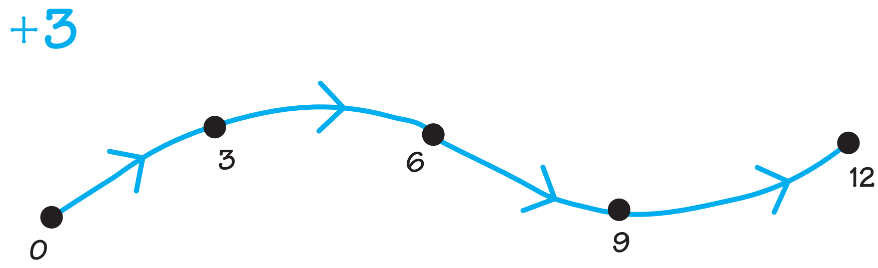
If a student labels a dot following a dot that has not been labeled, say,

T: ***That may be correct; we will check when we know which number is here*** (point to preceding dot)**.**

When the preceding dot has been labeled and checked, be sure to check the earlier suggestion.

F78

Continue until all the dots have been labeled.

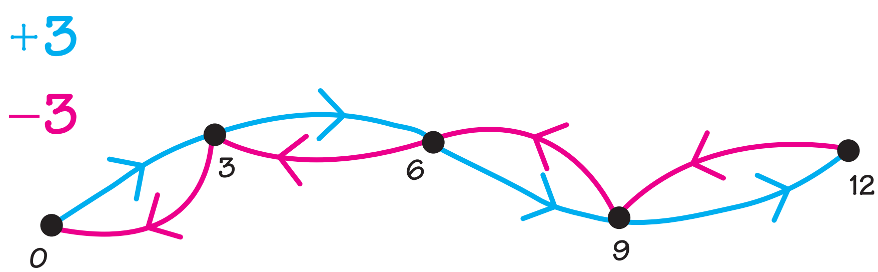


In red, draw an arrow from 6 to 3.

T: ***What could this red arrow be for?***

S: ***–3.***

Write the key –3 in red near the picture; then ask students to show where to draw more –3 arrows. Each time an arrow is suggested, read the number fact told by the arrow and check by counting three backward on your fingers, on the number line or numeral chart, or with counters. Continue until all of the –3 arrows have been drawn.



T: ***We could continue to draw +3 arrows and make a long snake. Who knows a number which would not be on this snake?***

If a student suggests a large number, such as 100, respond,

T: ***That's right, 100 is not on the snake now. If we continued to draw +3 arrows, would we ever meet 100?***

The students will probably not agree on the answer to this last question.

T: ***We could find out by drawing arrows, but we would need a lot of them.***

Note: Perhaps a student will suggest using a calculator programmed to count by threes starting at 0 to check. Or you may like to make this suggestion.

T: ***Who knows a different number we can be sure would not be on the snake, even if more arrows were drawn?***

S: ***7.***

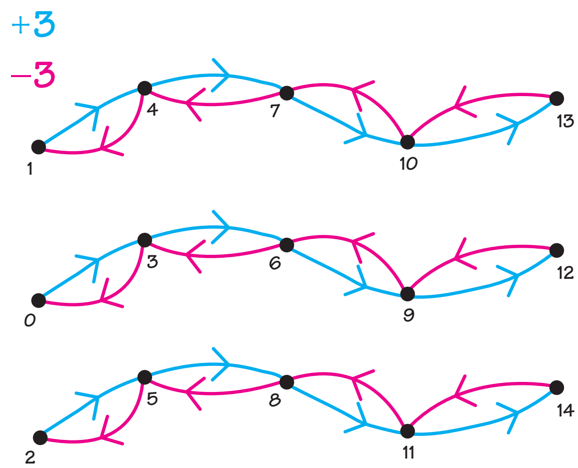
T: ***How do you know this number would not be on the snake?***

S: ***Because there is no dot for 7 now and if you go on drawing +3 arrows, the numbers are more than 12.***

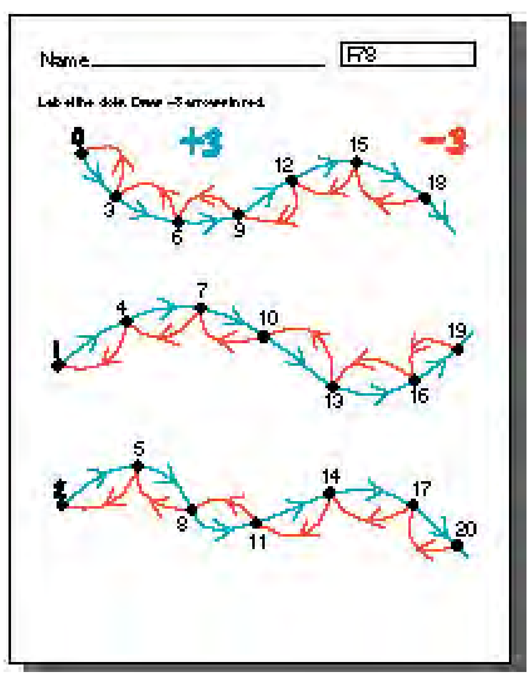
S: ***14; because the next number we meet is 15 and we miss 14.***

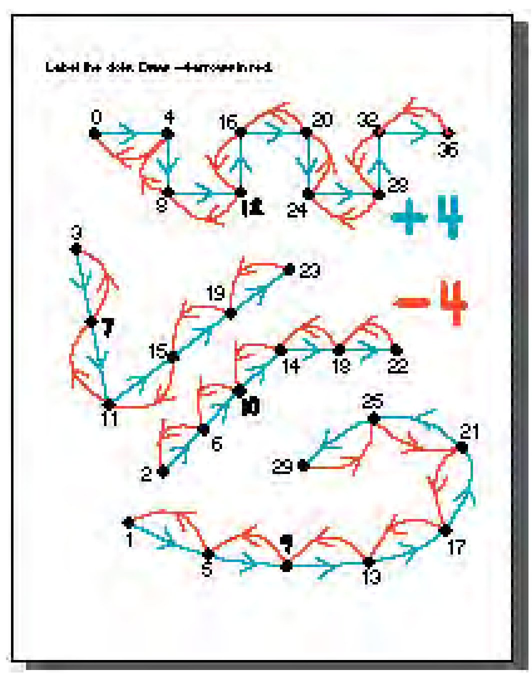
For each suggested number not on this +3 snake, begin to draw a new +3 snake—one on which the number *will* appear. (In the next illustration, notice that each of the numbers from 1 to 14 appears on one of the three +3 snakes.)

Continue to draw the two new snakes as numbers are suggested, each time asking students to label the dots and add +3 arrows.



Display Worksheet F78 to the students and explain that, on the front side, they are to label the dots and then to draw –3 arrows. On the reverse side, there is a similar problem with +4 and –4 arrows. Use side two of the worksheet only for students who need an additional challenge.





F79.1 ADDITION ON THE MINICOMPUTER #6

Capsule Lesson Summary

Present a story involving an addition calculation with four addends, explore strategies to estimate the answer, and then solve the addition problem on the Minicomputer.

Materials

Teacher • Minicomputer set

Student • None

Description of Lesson

T: ***At a school nearby, all of the first graders are going to have a picnic. Each first grader will receive one hot dog at the picnic, but the cook isn't sure how many hot dogs to buy. Let's see if we can help. In this school, there are four first grade classes. One class has 27 students, another has 32, the third one has 29 students, and the last one has 25 students.***

As you say the number of students in each class, write the appropriate numerals on the chalkboard.

27 32 29 25

T: ***What should we do to find out how many first graders there are altogether?***

S: ***Add.***

Let a student put plus symbols in the expression on the board.

$$27 + 32 + 29 + 25$$

T: ***How many hot dogs will the cook need to buy so that every first grader will receive one? How could the cook estimate the number?***

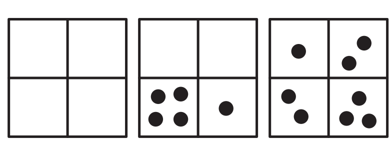
S: ***Count the tens.***

S: ***Get 30 hot dogs for each class; four 30s.***

Accept several estimates from the class and record these on the board. Help students think of ways to get close without calculating the answer exactly.

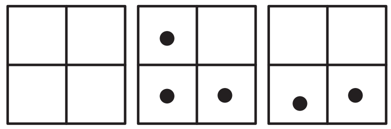
T: ***To find an exact number, let's do the calculation on the Minicomputer.***

Call on four students, one at a time, to put the four numbers on the Minicomputer. If standard configurations are suggested for each number, the Minicomputer should look like this when the students finish.



T: ***Who sees a trade we can make?***

Let many students participate in making trades. Encourage the use of both hands and saying the trades aloud as they are made. If your students are not yet comfortable with the hundreds' board, they may encounter difficulty when this configuration is on the Minicomputer.

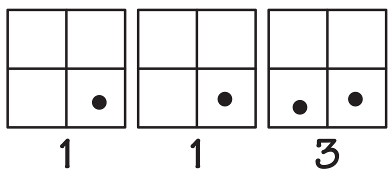


Point to the checkers on the 80-square and 20-square.

T: ***What number is 80 + 20?***

This hint should lead to the 80 + 20 = 100 trade.

T: ***This is the exact number of hot dogs they will need. Who can write the answer below the Minicomputer?***



Complete your number sentence on the board as you affirm the answer. You may like to let a couple students do the calculation on a calculator to verify the result.

T: ***Right. 27 + 32 + 29 + 25 = 113. Which estimate was the best? Would the cook have had enough hot dogs if we used your estimate?***

Let the students discuss which of the earlier estimates was closest. Ask students who made close estimates to explain how they made such good estimates. Do not, however, insist on clear or well-phrased responses.

F79.2 INDIVIDUAL MINICOMPUTER ACTIVITY #3

Capsule Lesson Summary

Individually, put numbers on the Minicomputer and do some addition calculations.

Materials

Teacher	• Minicomputer set	**Student**	• Minicomputer set

Description of Lesson

Distribute individual Minicomputers and checkers to each student. On the chalkboard, draw a large square box.

T: ***I will put a number in this box. As quickly as you can, put that number on your Minicomputers. Raise your hand when you have done this.***

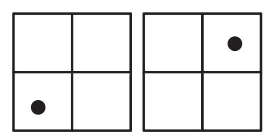
Choose numbers appropriate for the class. If many students still have difficulty associating a square of the Minicomputer with its respective value, use some "one checker numbers" such as 4 or 80. Another approach is to use a pattern of related pairs of number; for example, ask for 6 and then 60; 5 and then 50; and so on. It might also be helpful to choose pairs of numbers with the same digits such as 12 and 21, or 38 and 83.

Rather than writing the number on the chalkboard each time, you may prefer to simply say the number aloud, thus allowing you to circulate among the students and provide help where necessary. The class, however, may find the exercise more difficult this way. If a number seems to be particularly difficult, you may wish to ask a student to put it on the demonstration Minicomputer.

After five to ten minutes of this activity, continue with this problem.

T: ***Let's do an addition problem on our Minicomputers; let's add 24 and 46.***

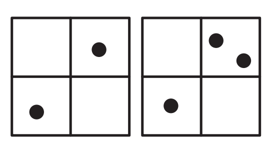
Write 24 on the chalkboard and allow the students time to put 24 on their Minicomputers. Then, ask a student to put 24 on the demonstration Minicomputer. The standard configuration is shown here. If another configuration is offered, accept it, but ask for trades to obtain the standard configuration before continuing. The students should also have the standard configuration on their individual Minicomputers.



T: ***Now since we are going to add, leave 24 on your Minicomputers and add (put on) 46.***

Write the calculation on the chalkboard.

$$\begin{array}{r} 24 \\ +\ 46 \\ \hline \end{array}$$



F79

Give the students time to put 46 on their Minicomputers; then ask a student to put it on the demonstration Minicomputer.

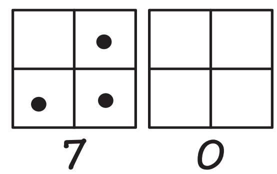
T: ***This is 24 + 46. Make some trades on your Minicomputers so that you can tell me what number this is.***

Allow the students to do this. Only two standard trades are needed here, so little time should be required. Ask several students to tell you the number. Call on students to make the trades on the demonstration Minicomputer and to write the appropriate numerals below (above) the boards.

T: ***Good. 24 + 46 = 70.***

Complete your calculation on the chalkboard.

$$\begin{array}{r} 24 \\ +\ 46 \\ \hline 70 \end{array}$$



Do additional calculations together or assign them to smaller groups of students working cooperatively.

$$\begin{array}{r} 37 \\ +\ 41 \\ \hline \end{array} \qquad \begin{array}{r} 18 \\ +\ 52 \\ \hline \end{array} \qquad \begin{array}{r} 35 \\ +\ 25 \\ \hline \end{array}$$

Center Activity

Put Minicomputer sets and addition problem cards in a center.

Capsule Lesson Summary

Provide individual practice with the Minicomputer, arrow pictures, counting problems, string pictures, and so on.

Materials

Teacher	• Blackline F80	Student	• *Parade of Problems #1* Workbook • Colored pencils

Description of Lesson

Note: This is the second of two lessons using the *Parade of Problems #1* Workbook. The first was Lesson F74.2.

Distribute the students' copies of *Parade of Problems #1*. Instruct students to begin by correcting or completing those pages you have indicated on the workbook cover. Demonstrate this by discussing your checking method and turning to a page that requires corrections or completion. When students have finished correcting or completing pages, they should continue working in the workbook for the remainder of the period.

Collect and check the workbooks.† An individual student progress record for the workbook is available on Blackline F80(a). You may like to use this form to monitor student work.

This is the last time this particular workbook is scheduled, but you may want to let students work on pages that require corrections at a later time. If so, be aware that not all students should be required to complete the workbook. As mentioned earlier, the difficulty of the problems increases and students who are pushed beyond their abilities may become frustrated. If you choose to send workbooks home with students, you may want to include a letter to parents/guardians with this first workbook. A sample letter is included in the blackline masters (Blackline F80(b)).

Early Warning

A few of the next nine classroom lessons require extra preparation time, or involve materials not included with the *CSMP* Classroom Set. The lessons have been listed here for your convenience in preparing for them. A more detailed description of the neccessary materials can be found on the first page of each lesson. (Special materials are listed here only once, even if they are needed more than once during the nine-day period.)

F81.1 *Multiplication Story #2:* Calendar
F81.2 *Length #1*: Masking tape; C-rods; meter stick and foot ruler
F83.1 *The 2x Function #1*: Counters or Unifix® cubes; calculator; overhead projector
F85.1 *Maps of Geometric Solids*: Geometric solids
F86 *The 2x Function #2*: Pennies

†The answer key for this workbook follows Lesson F74.2.

F81.1 MULTIPLICATION STORY #2

Capsule Lesson Summary

Determine how many days are in a week. Show how long a week is on a calendar. Discuss how many days are in a month. Tell a story that poses the problem of calculating 5 x 7. Draw a picture and use the Minicomputer to calculate 5 x 7.

Materials

Teacher
- Minicomputer set
- Calendar
- Colored chalk
- Checkers (optional)

Student
- None

Description of Lesson

Tell the following story or one similar to it. Choose a student to be the star of the story.

T: ***Penny is going to stay at her grandparents' farm this summer. What do you think Penny will do when she is at her grandparents' farm?***

Allow a few minutes for students to discuss Penny's possible adventures.

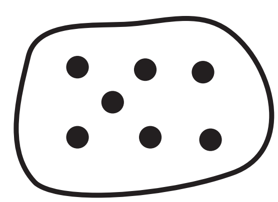
T: ***Penny will stay with her grandparents for five weeks. How many days are there in one week?***

S: ***Seven.***

Call on students to point out the days of a week on a calendar.

T: ***Let's make a picture of the days in a week.***

Draw this dot picture (or use checkers) on the board.



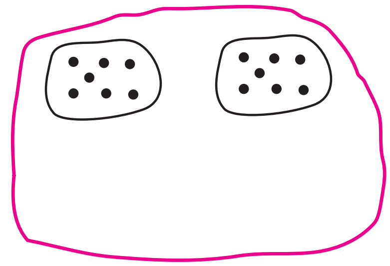
T: ***Each dot (checker) is for one day and all the days in one week are inside this string.***
How many dots are inside this string? (Seven)
How many weeks will Penny stay with her grandparents? (Five)
How many days, altogether, will Penny stay with her grandparents?

Let students make some estimates and record them on the board. Do not affirm an answer yet. Next, draw a large string on the chalkboard as in the following illustration.

T: ***This string is for all the days Penny will stay with her grandparents.***
How many weeks will Penny stay with her grandparents? (Five)
We have shown one week. Who can show another week?

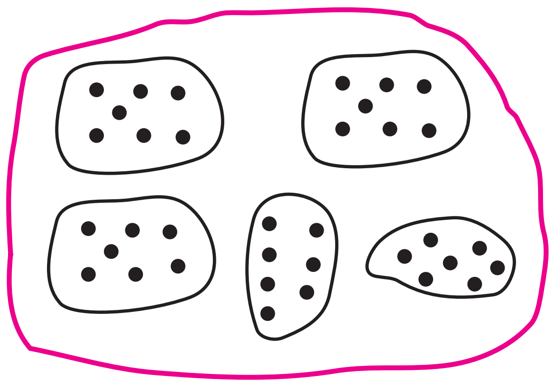
F81

Invite a student to draw another string enclosing seven dots (or checkers).



T: ***How many weeks have we shown so far?*** (Two)
How many days in these two weeks? (14)
How many more weeks need to be shown? (Three)

Send students to the board to complete the picture.



T: ***What calculation can we write about this string picture?***

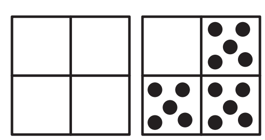
The class may suggest 7 + 7 + 7 + 7 + 7; accept this and record it on the board, but ask for a shorter calculation. If no one suggests 5 x 7, hint at it by asking,

T: ***How many times did we write 7?***

Display two Minicomputer boards.

T: ***How could we do this calculation on the Minicomputer?***

Allow students to suggest that you put 7 on the Minicomputer five times; then ask five students to each put 7 on the Minicomputer.
Write 5 x 7 beside the Minicomputer.


= 5 x 7

Invite students to make trades until the standard configuration for 35 is obtained. Complete the calculations on the board.

T: ***How many days will Penny stay with her grandparents?***

S: ***35.***

T: ***Is that more than, less than, or the same as a month? Look at the calendar.***

Determine the best estimate and, if some students guessed 35, ask them to explain how they found the answer. Some students may want to count the dots in the string picture to ensure that there are, in fact, 35 of them.

Capsule Lesson Summary

Discuss the concept of measurement by measuring the length of an aisle in the classroom in footsteps. Conduct a similar activity measuring the length of a bulletin board (or chalkboard) with handprints. Use a measuring tool to discuss how to get a standard measurement.

Materials

Teacher	• Masking tape • C-rods • Meter stick and foot ruler	**Student**	• C-rods

Description of Lesson

Choose an aisle in your classroom that goes through the middle of the class in a straight line. With pieces of masking tape, mark two spots on the floor, one spot even with the front of the first desk, the other even with the back of the last desk in the aisle.

T: ***I want to measure the length of this aisle*** (indicate the marked aisle)***, but I forgot to bring something to measure with. Is there some way I can find how long the aisle is?***

S: ***You could use your feet; put one foot down and the other right in front of it. Count your steps.***

Place your heel on the tape at the front of the class and measure the length of the aisle by stepping it off, heel-to-toe; ask the class to count the number of steps with you. Here is one possible result.

T: ***1, 2,…, 20; the aisle is a little more than 20 footsteps long.***
Let's do this again to be sure we measured correctly, but this time Juanita (choose someone in the class) ***will measure.***

Instruct the student to walk the aisle, heel-to-toe, as you did. This requires some balance and you may wish to hold the student's hand or shoulders to prevent a fall. Once again, the class should count along as the distance is stepped off.

T: ***1, 2, …, 26 steps; Juanita took 26 footsteps. But I took only 20 footsteps. Did one of us make a mistake?***

S: ***No; her feet are smaller.***

S: ***She needs more steps than you do.***

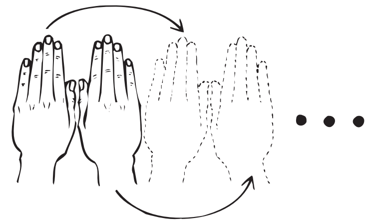
T: ***Very good. She has smaller feet, so she need more footsteps to walk down the aisle.***

Choose a bulletin board (or chalkboard) which is accessible along its entire length.

T: ***How could I measure the length of the bulletin board?***

S: ***Use your hands.***

Start at one end of the chalkboard and measure the other end by alternating hands, palms-down, as shown.The class should count along with you.



Announce the result, for example, "a little more than 32 handprints."

T: ***Now, all of you measure the width of your desks (tables) with handprints.***

Accept several measurements from various students and then continue.

T: ***Mark measured his desk to be seven hands wide, and Joe measured his to be nine hands wide. Does that mean Joe's desk is wider than Mark's?***

S: ***No; maybe Mark's hands are bigger so he can't fit as many on his desk.***

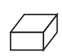
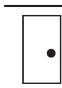
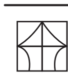
T: ***Very good. If we measure with something small and then with something larger, we need more of the smaller unit.***

T: ***When we need to agree on a measurement, we usually use just one unit that other people know—a standard unit like the meter stick or the foot ruler or a C-rod.***

Instruct students (with a partner) to measure their desks (tables) again, this time with orange C-rods, and to give the measurement. You may need to show students how to place the rods end to end. When most have completed the task, share the results. This time, you might observe that similar desks (tables) have similar measures.

Center Activity

Designate items around the room or place objects in a center to be measured. Make a chart where students can record the results of measurements obtained with hands or orange Cuisenaire rods.

	Hands	Orange Rods
		
		
		

Reading Activity

Read a book such as *How Big is a Foot?* by Rolf Myller in which the measurements for the Queen's bed are confused because they are given in terms of the King's foot.

Home Activity

Suggest that students measure some things at home, both with hands and with a unit like the orange rods. Remind them that they may get different measurements of the same object using different family members' hands.

F82.1 "WHO ARE YOU?" NUMBER GAME

Capsule Lesson Summary

Play a game in which you pretend that everyone in class is a secret number. Reveal one number, offer a clue to compare it to another number, and then ask the students to guess their number identities.

Materials

Teacher		Student	
	• None		• None

Description of Lesson

This is a short and quick warm-up activity that can be repeated whenever your class has a few spare minutes. Be sensitive to the difficulty of your questions, both in terms of the operations and the numbers involved, and adjust the level according to each student's ability; alternate easier questions with more difficult ones. Continue the activity as long as student interest remains. The questions suggested below are only examples; feel free to create your own.

T: ***I am the number 5. Alicia*** (substitute the name of someone in your class) ***is three more than I am. Who are you, Alicia?***

If Alicia cannot answer, call on someone to answer for her.

S: ***8.***

T: ***Alicia is the number 8, Barry is five more than Alicia. Who are you Barry?***

S: ***13.***

T: ***Barry is the number 13. Patty is three less than Barry. Who are you, Patty?***

S: ***10.***

T: ***Patty is the number 10. Jake is seven less than Patty. Who are you, Jake?***

S: ***3.***

T: ***Jake is the number 3. Cheryl is twice (two times) as big. Who are you Cheryl?***

S: ***6.***

At any point during a sequence like this, feel free to begin again with a new number and a new student. Later in the year, you should also include questions similar to the following one.

T: ***I am the number 10. Tina is one-half of me. Who are you, Tina?***

S: ***5.***

See also the number card game "I have…, Who has…?" in Lesson F90 *Adjustment/Assessment Day #8*.

F82.2 ADDITION PROBLEMS #1

Capsule Lesson Summary

Present several addition calculations in a story situation. Do the calculations on individual Minicomputers and write number sentences for these addition problems.

Materials

Teacher
- Minicomputer set

Student
- Minicomputer set
- Worksheets F82.2*, **, and ***

Description of Lesson

Display two demonstration Minicomputer boards. Each student or pair of students will need two individual Minicomputer boards (one sheet) and several checkers. Tell the following story or one more appropriate for your class.

T: ***Barney entered a hot dog eating contest. To win the prize, he had to eat the most hot dogs. Each time he finished one plate of hot dogs, the judge brought out another.***

You may wish to let the class discuss this story briefly.

T: ***The first plate had six hot dogs on it. Put 6 on your Minicomputers.***

Write 6 on the chalkboard and ask a student to put 6 on the demonstration Minicomputer. Be sure all students have 6 on their Minicomputers before continuing. Some students may have used non-standard configurations for 6; accept these, but do not encourage them during this lesson.

T: ***Barney finished his first plate of hot dogs so the judge brought him a second plate. The second plate had ten hot dogs on it. Add 10 to your Minicomputers.***

Continue the calculation 6 + 10 on the chalkboard and ask a student to add 10 to the demonstration Minicomputer.

Point to the numbers in the calculation and on the Minicomputer as you ask,

T: ***How many hot dogs were on the first plate?*** (Six)
How many hot dogs will Barney have eaten if he finishes the second plate?

S: ***16.***

Complete the calculation on the board.

$$6 + 10 = 16$$

T: ***Barney finished the second plate of hot dogs so the judge brought him a third plate, but Barney was so full that he could only eat one more hot dog. Add 1 to your Minicomputers.***

T: ***How many hot dogs did Barney eat in all?***

S: ***17.***

T: ***Here are some number sentences we can write about this story.***

$$16 + 1 = 17$$
or
$$6 + 10 + 1 = 17$$

Remove all checkers from the demonstration Minicomputer and ask the students to remove the checkers from their Minicomputers.

T: ***Barney's friend Vera also entered the contest. Her first plate had five hot dogs on it. Put 5 on your Minicomputers.***

Write 5 on the chalkboard and ask a student to put 5 on the demonstration Minicomputer.

T: ***Vera finished her first plate, so the judge brought a second plate. The second plate had four hot dogs. Add 4 to your Minicomputers.***

Continue the calculation 5 + 4 on the chalkboard and ask a student to add 4 to the demonstration Minicomputer.

Point to the numbers in the calculation and on the Minicomputer as you ask,

T: ***How many hot dogs were on Vera's first plate?*** (Five)
How many hot dogs were on Vera's second plate? (Four)

T: ***Vera finished both plates.***
How many hot dogs did Vera eat from both plates?

S: ***Nine.***

The students may suggest making a trade; if so, ask a student to tell you which trade to make. Students who have not yet made the trade should watch you make it and then do the same on their own Minicomputers. As dramatically as possible, make the 4 + 4 = 8 trade.

Before continuing, check that all the students have 9 on their Minicomputers.

T: ***The judge brought Vera a third plate of six hot dogs, and Vera ate all six.***
Add 6 to your Minicomputers.

Continue the calculation 5 + 4 + 6 on the board and ask a student to add 6 to the demonstration Minicomputer.

Let students suggest making the 8 + 2 = 10 trade. Demonstrate the trade as before and check that students make the appropriate trade. The class should find that 15 is on their Minicomputers.

T: ***What number sentences can we write?***

$$5 + 4 + 6 = 15$$
or
$$9 + 6 = 15$$

T: ***So far, Vera had eaten 15 hot dogs.***
The judge brought her another plateful, but Vera couldn't eat anymore of them.
Who ate more hot dogs, Barney or Vera? (Barney; two more)

On the board, you may wish to record the names of these two children and the number of hot dogs each one ate.

Barney: 17
Vera: 15

Remove all checkers from the Minicomputers.

T: ***Vera's brother, Lenny, also entered the hot dog eating contest. The first plate brought to him had seven hot dogs on it. Put 7 on your Minicomptuers.***

Write 7 on the board and ask a student to put 7 on the demonstration Minicomputer.

T: ***Lenny finished his first plate, so the judge brought him a second plate. It had eight hot dogs on it. Add 8 to your Minicomputers.***

Continue the calculation 7 + 8 on the board and ask a student to add 8 to the demonstration Minicomputer. At this point, the students will probably suggest making a trade.

T: ***What trade shall we make?***

S: ***8 + 2 = 10.***

Demonstrate the trade as you did earlier, and check that the students make the trade on their Minicomptuers.

T: ***How shall we complete the calculation?***

7 + 8 = 15

S: ***7 + 8 = 15.***

T: ***Lenny ate all 15 hot dogs on his first two plates, so the judge brought him a third plate of hot dogs. Lenny tried very hard, but he could only eat one more hot dog. Add 1 to the number on your Minicomputers.***

Ask a student to add 1 to the demonstration Minicomputer.

T: ***Should we make a trade?*** (Yes) ***What trade should we make?***

S: ***1 + 1 = 2.***

Make this trade as obviously as possible and check that the students make the trade correctly on their Minicomputers.

T: ***What number sentences can we write?***

15 + 1 = 16
or
7 + 8 + 1 = 16

Record Lenny's accomplishment on the board.

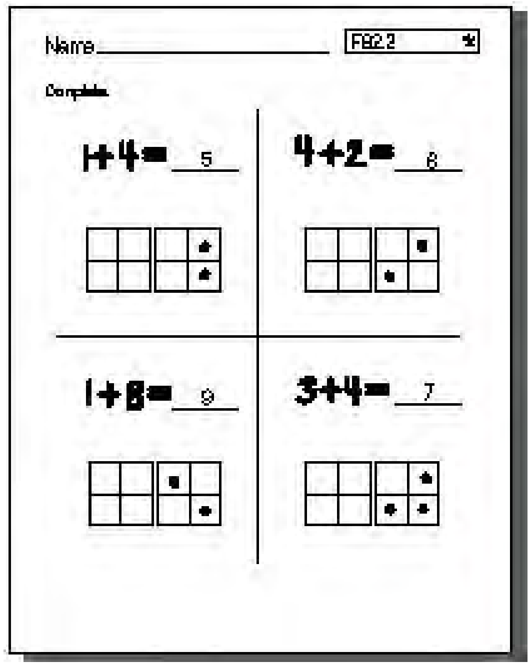
T: ***Who ate the most hot dogs?*** (Barney)
Who ate the fewest hot dogs? (Vera)

Barney: 17
Vera: 15
Lenny: 16

F82

Worksheets F82.2*, **, and *** are available for the remainder of the period. Explain to the students that the first number in a calculation is already on each Minicomputer. They should draw the checkers for the second number, and complete the calculation. (Do not insist that students draw the checkers if they can answer correctly without doing so.)

You may wish to allow students to work with a partner on the worksheets. If so, suggest that one student records while the other places checkers and does the calculation on the Minicomputer. Students should trade roles and complete the back side of a worksheet.


Name ______________ F82.2 *

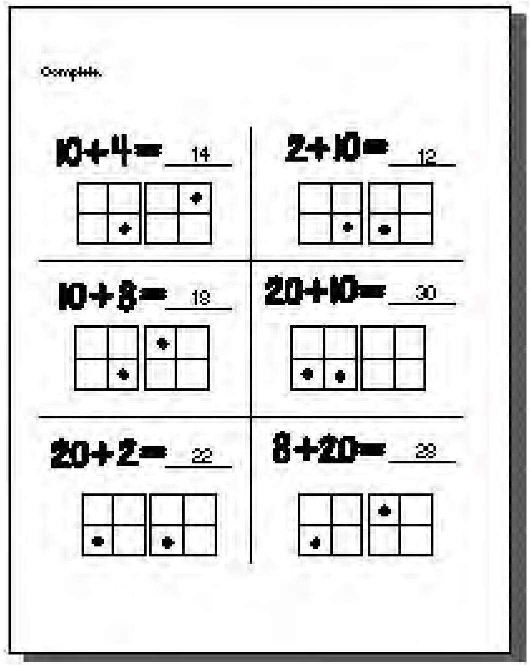
Complete.

1+4= 5

4+2= 6

1+8= 9

3+4= 7


Complete.

10+4= 14

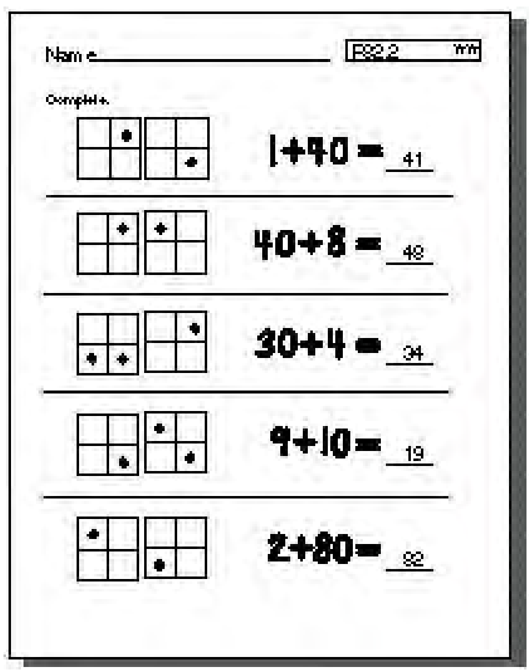
2+10= 12

10+8= 18

20+10= 30

20+2= 22

8+20= 28


Name ______________ F82.2 ***

Complete.

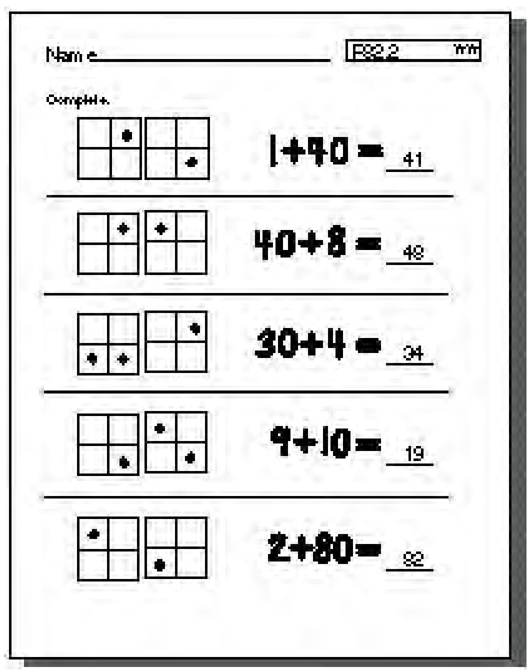
1+40 = 41

40+8 = 48

30+4 = 34

9+10 = 19

2+80 = 82


Name ______________ F82.2 ***

Complete.

1+40 = 41

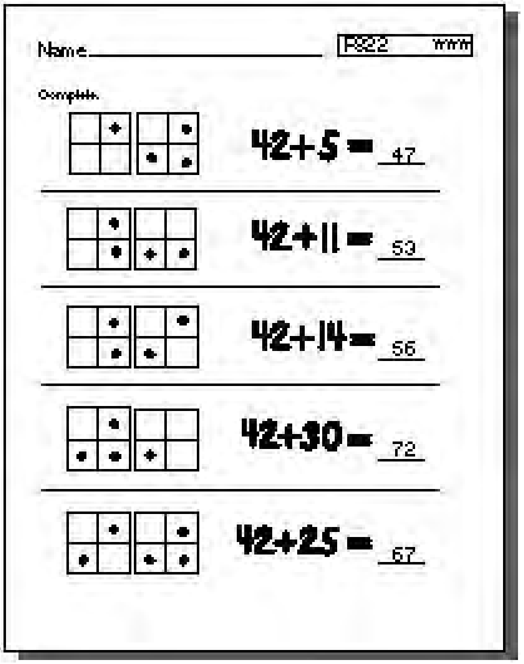
40+8 = 48

30+4 = 34

9+10 = 19

2+80 = 82

F82


Name ____________ F822

Complete.

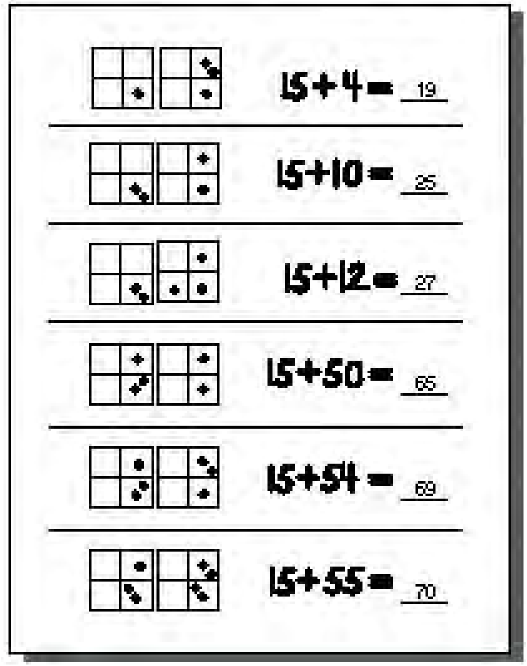
42 + 5 = 47

42 + 11 = 53

42 + 14 = 56

42 + 30 = 72

42 + 25 = 67


15 + 4 = 19

15 + 10 = 25

15 + 12 = 27

15 + 50 = 65

15 + 54 = 69

15 + 55 = 70

F83.1 THE 2x FUNCTION #1

Capsule Lesson Summary

Introduce 2x in a story about doubling. Label the dots in a 2x arrow picture and use a calculator to check some of the calculations.

Materials

Teacher
- Counters or Unifix® cubes
- Calendar
- Calculator
- Minicomputer set
- Overhead projector (optional)

Student
- Worksheet F83.1

Description of Lesson

Tell this doubling story or a similar one to the class, using counters or Unifix® cubes to model the doubling. Choose students to place the counters (cubes) and to count as necessary. Point to the days of the week on a calendar as you mention them.

T: ***When I came to school on Monday there was a new student in my class. This counter (cube) is for the new student. Everything went fine on Monday, but on Tuesday I discovered that my new student had brought a friend. (Place another counter on the table or overhead.) Now there were twice as many or double the new students in my class. How many new students were there on Tuesday?***

S: ***Two.***

Pick up the counters and replace them to reiterate the idea of doubling. Say, "Two times one is two," and write 2 x 1 = 2 on the board.

T: ***Yes, and on Wednesday each of them brought a friend so the number of new students doubled again. Now how many new students are there now?***

S: ***Four.***

Invite students to show doubling using counters for the additional friends. Say, "Two and two is four," or "Two times two is four." Write 2 x 2 = 4 on the chalkboard.

T: ***On Thursday all four brought another friend so the number of new students doubled again. What number is 2 x 4?***

S: ***8.***

Invite students to help you show the new friends with counters and to model doubling. Say, "Four and four is eight," or "Two times four is eight." Write 2 x 4 = 8 on the chalkboard.

T: ***On Friday all eight brought another friend, so again the number of new students doubled. What number is 2 x 8?***

S: ***16.***

F83

Invite students to place additional counters to model doubling. Then count (perhaps by twos) to find the new number and write 2 x 8 = 16 on the chalkboard.

T: ***Thank goodness the next day was Saturday, a no school day, or how many new students do you think there would have been? What number is 2 x 16?***

S: ***32.***

Invite students to place counters and count (perhaps by twos) to find this number. Write 2 x 16 = 32 on the board.

Distribute copies of Worksheet F83.1 and call the students' attention to the arrow picture on the front side.

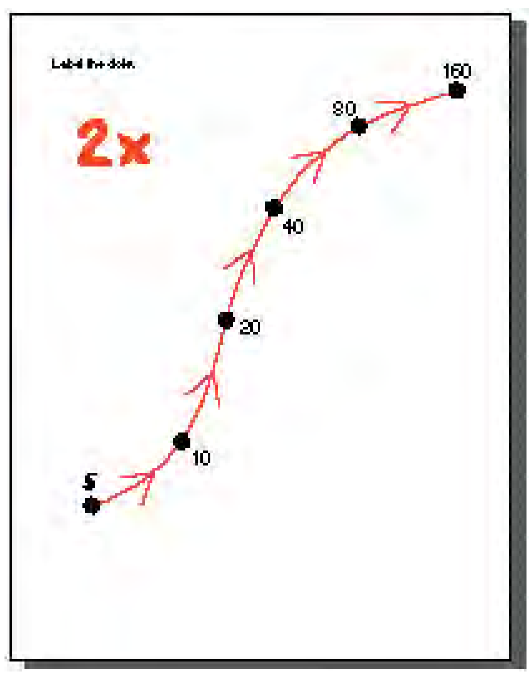
T: ***The arrow picture on this worksheet is about the story we just told.***

Together, label the dots on the worksheet as you briefly retell the story and indicate the appropriate number fact on the board.

Direct the students to look at the arrow picture on the back side.

T: ***Let's tell a story and label the dots in this 2x arrow picture.***

Encourage students to suggest something to double starting with 5. For example, start with a nickel (5 cents) and double it several times. As appropriate, use a calculator or the Minicomputer to help with the 2x calculations.



F83.2 STRING GAME WITH A-BLOCKS #1

Capsule Lesson Summary

Use classification and logical reasoning skills to play a game with A-blocks, placing the pieces in a one-string picture.

Materials

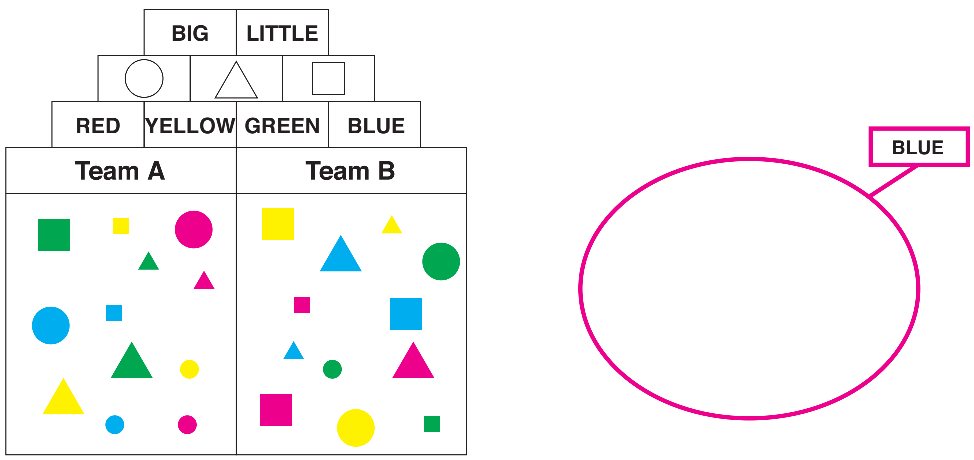
Teacher
- A-Block String Game kit;
- Colored chalk

Student
- None

Description of Lesson

Exercise 1

Before the lesson begins, prepare the game board and game pieces and divide the class into two or more teams. The illustration below shows two teams, but you can easily use several teams. Draw one large string on the board and label it **BLUE**.



T: ***This string is for all of the blue A-blocks. Let's see which team can place its A-blocks in the correct places.***

One by one, students from each team alternate placing their A-blocks in the picture. Team A members use the A-blocks on the their side of the team board, while Team B members use those on the other. This activity may be too easy for your students; if so, interrupt the game after a few pieces have been correctly placed in each area (blue pieces inside the string; other pieces outside the string).

Exercise 2

T: ***Let's start over and play a game that is a little more challenging.***

Replace the pieces on the team board (making sure they are still evenly distributed). Label the string ☐ by placing the card face down as shown in the next illustration.

F83

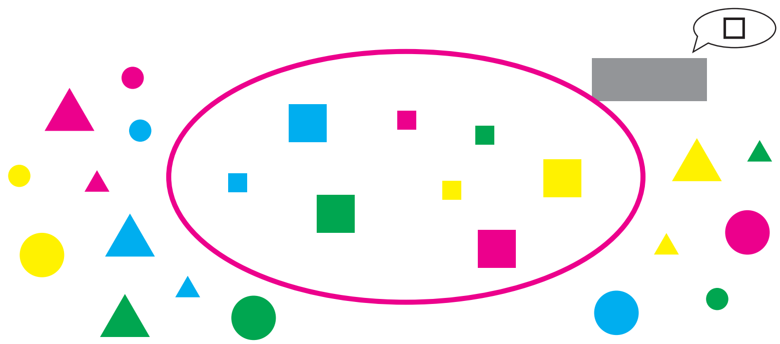
T: ***This time, I won't tell you what the string is for. It could have any of these labels*** (point to the list of possible string labels). ***Let's read them together.***

ALL: ***Big, little, circle, triangle, red, yellow, green, blue.***

T: ***The string label is hidden; only I know what is written on this card. You must guess where each of your A-blocks go.***

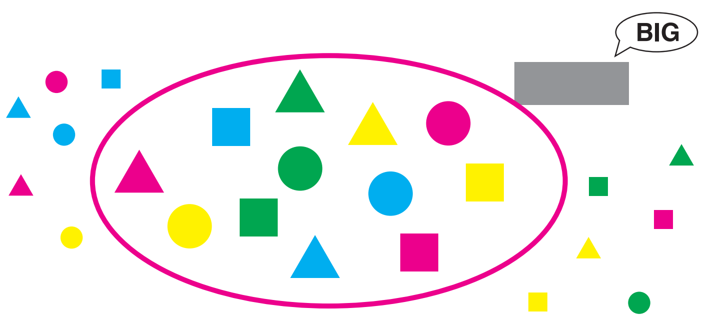
When one of the teams has placed all of its pieces correctly, the last player has a chance to tell what the string is for and win.

If a piece is correctly placed, say "yes," and allow the piece to remain in the picture; if the piece is placed incorrectly, say "no," and return it to the team board. To assist you in judging this game, the correct placement of all pieces is shown below.



If your class enjoyed this game and some time remains, play a second game using **BIG** for the hidden label. You may like to place one of each team's pieces as starting clues.

The correct placement for all of the pieces is shown below.



F84 ADDITION PROBLEMS #2

Capsule Lesson Summary

Practice mental arithmetic strategies for adding single digit numbers. Do the addition calculation 64 + 25 on individual Minicomputers and write the calculation for this addition problem. Practice the addition concept with other similar calculations.

Materials

Teacher
- Number line
- Counters
- Minicomputer set

Student
- Minicomputer set

Description of Lesson

Exercise 1

Spend about ten minutes on a mental arithmetic activity.

T: ***What number is 2 + 3?***

S: ***5.***

T: ***Let's check. 2*** (hold up two fingers of one hand) ***plus 3*** (hold up three fingers of the other hand) ***is 5*** (bring the raised fingers of your two hands together)***.***

What number is 4 + 2?

S: ***6.***

T: ***Let's check. 4*** (point to 4 on the number line) ***plus 2*** (move two places to the right) ***is 6*** (stop at 6 on the number line)***.***

What number is 5 + 4.

S: ***9.***

T: ***Let's check. 5*** (put five counters in one hand) ***plus 4*** (put four counters in the other hand) ***is 9*** (bring the counters together in cupped hands and ask someone to count them)***.***

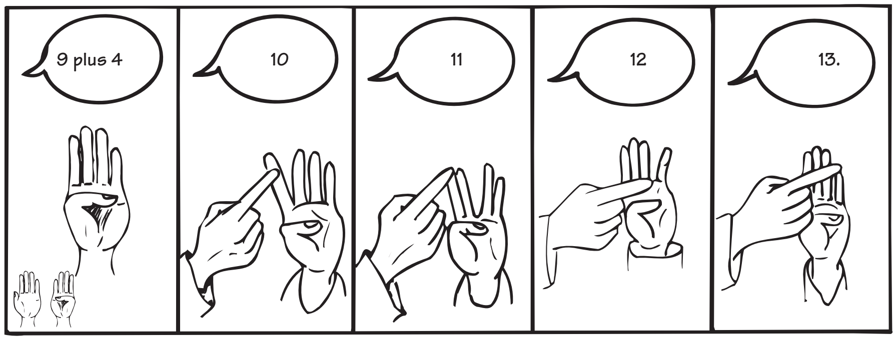
Continue to ask for the sums of two numbers. Choose problems of varying difficulty appropriate for your class. Occassionally check the answers by using one of the three methods suggested above.

To check a sum which exceeds 10, use the number line method, counters, or a different finger method. For example,

T: ***What number is 9 + 4?***

S: ***13.***

T: ***Right. 9 plus 4*** (ask a student to hold up nine fingers while you hold up four fingers). ***9*** (point to the student's fingers and then to each of your four fingers in turn) ***10, 11, 12, 13. 9 plus 4 equals 13.***



Exercise 2

Distribute individual desk Minicomputers to pairs of students.

T: ***I have two friends who are brothers and each has some pennies. Their aunt's birthday is next week and they are going to put all their pennies together to buy a birthday present. Let's see if we can figure out how many pennies they have altogether. What do we need to know to solve this problem?***

S: ***How many pennies each brother has.***

T: ***Yes, that's right. But I'm not going to tell you that; you must discover it yourselves. I will give you clues. The older brother has more than 60 but less than 70 pennies.***

For this example, suppose the older brother has 64 pennies. Each time a student guesses, ask,

T: ***Is that more than 60? Is that less than 70?***

If the answer to either question is "no," tell students that number cannot be the amount. Each time a student guesses a number between 60 and 70 (other than 64), affirm that it is a good guess, but the brother has either more (or fewer) pennies. Accept guesses until 64 is offered.

S: ***64.***

T: ***That's right. The older brother has 64 pennies. Put 64 on your Minicomputers.***

Write 64 on the chalkboard and ask someone to put 64 on the demonstration Minicomputer.

T: ***Leave the 64 on your Minicomputer and let's see if you can discover how many pennies the younger brother has. He has more than 20 but less than 30 pennies.***

For this example, suppose the younger brother has 25 pennies. Accept guesses in the same manner suggested above, asking "Is that more than 20?" and "Is that less than 30?" Continue until students discover that the younger brother has 25 pennies.

S: ***25.***

T: ***That's right; the younger brother has 25 pennies.***

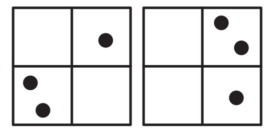
Write this calculation on the chalkboard.

T: ***Since we are adding, leave 64 on your Minicomputer and add checkers for 25.***

$$\begin{array}{r} 64 \\ +\ 25 \\ \hline \end{array}$$

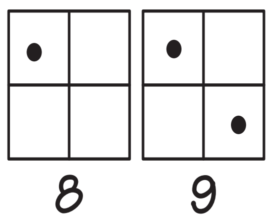
Ask someone to add 25 to the demonstration Minicomputer.
If standard configurations are used, the Minicomputer will look like this.

T: ***If you see some trades, you can make them. Otherwise, just watch carefully.***



Call on volunteers to make trades on the demonstration Minicomputer, allowing enough time for the students to make the trade on their individual Minicomputers, too. The 4 + 4 = 8, 20 + 20 = 40, and 40 + 40 = 80 trades are all useful here; others may be needed if non-standard representations were suggested earlier.

Continue until a standard configuration is on the Minicomputer. Choose a volunteer to write the appropriate numerals below (above) the boards and complete the calculation yourself.



$$\begin{array}{r} 64 \\ +\ 25 \\ \hline 89 \end{array}$$

Do other addition problems as time allows; for example, 33 + 21 or 55 + 23. Ask those who can do mental calculations to predict answers and verify them with the Minicomputer.

Writing Activity

Suggest students write stories to go along with one of the addition problems.

F85.1 MAPS OF GEOMETRIC SOLIDS

Capsule Lesson Summary

Using various geometric solids, students make two-dimensional maps of their faces. Match two-dimensional shapes given as face maps with geometric solids.

Materials

Teacher
- Collection of geometric solids; circle "map"

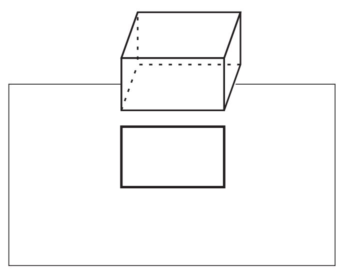
Student
- Geometry solids
- Unlined paper

Advance Preparation: Use one of the solids to draw a circle "map" of a base; for example, use the cone.

Description of Lesson

Display a collection of solids and discuss how some of them are alike and different. Repeat some of the observations made in Lesson F36.1.

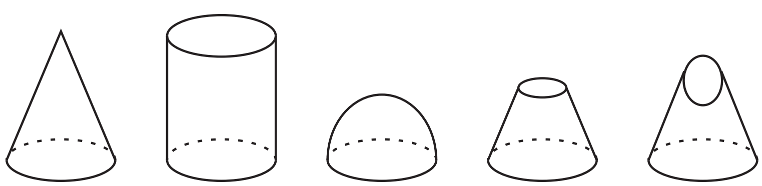
Choose one of the solids and show the class how to use it as a template to draw a map of one of its faces. For example,



Show the class the circle map you made earlier with one of the solids.

T: ***Which of these solids do you think I used to make this circle map?***

Let students find solids you might have used. Depending on your collection of solids, students might find several candidates. For example,



Organize the class into groups and arrange that each group has several different solids to work with. Instruct the groups to use a separate sheet of paper for each solid and draw maps of every face. As the groups are working, discuss with some of them what different shaped maps they are drawing.

When the groups complete their tasks, let groups trade shapes and map pages. Instruct the groups to try to match solids with their maps. You may prefer to do some of this matching activity collectively.

F85.2 STORY PROBLEM #1

Capsule Lesson Summary

Draw pictures to help determine how many dinosaur books are left for Ted to choose from at the library.

Materials

Teacher		Student	
	• None		• Paper • Colored pencils • Counters (optional)

Description of Lesson

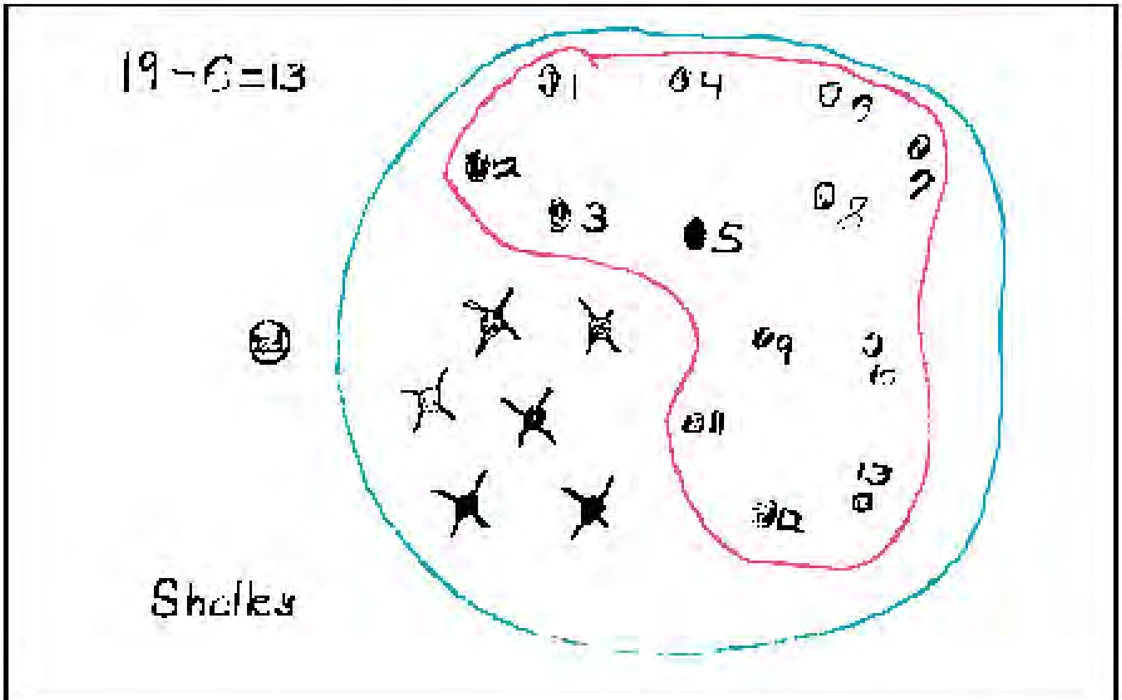
Equip students with unlined paper and colored pencils. Make various kinds of counters available. Tell the following story and instruct students to draw any picture they want to show how to solve the problem.

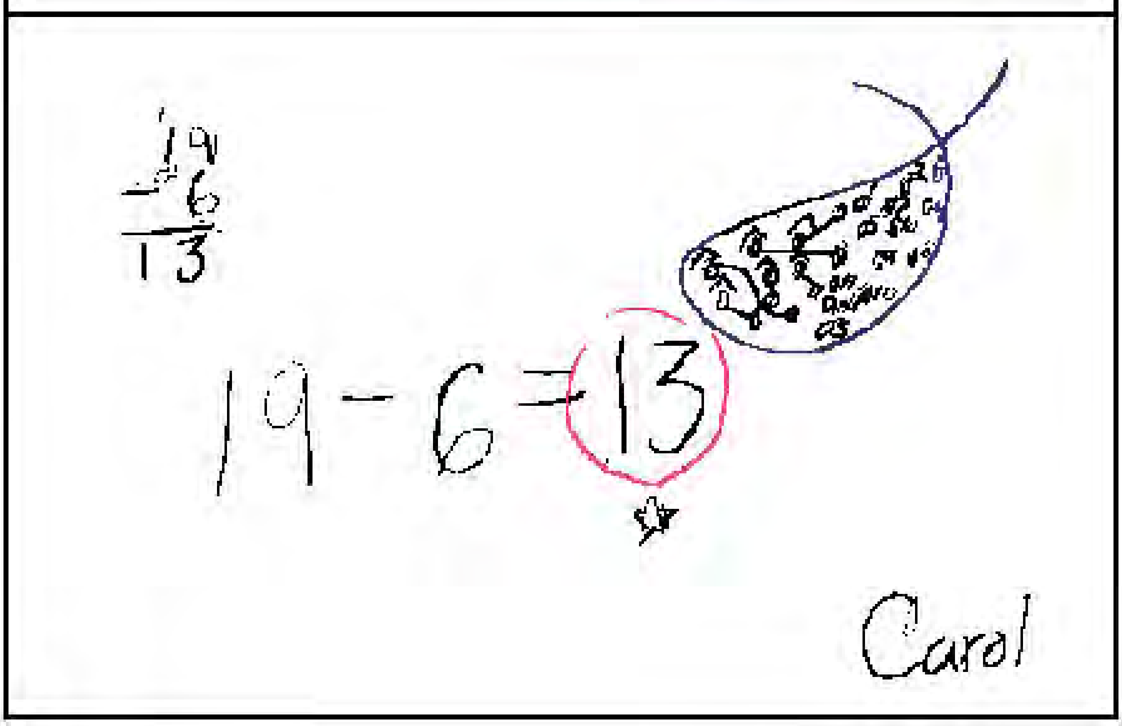
T: ***Ted wants to read a book about dinosaurs. He goes to the library to get a book. The librarian tells him there are 19 books about dinosaurs, but 6 of them are already checked out. When Ted looks for a dinosaur book, how many should he find to choose from?***

As the students begin working, do not offer much guidance, although you may want to repeat the details of the story. Encourage students who finish quickly to write number sentences about their pictures. Show several completed pictures to the class and discuss how each picture relates to the problem. A couple examples of pictures drawn by other *CSMP* students are on the back of this page.

Home Activity

Suggest students ask various family members about the different ways they use math every day. Share with the class.


19 - 6 = 13
Shelby


19
-6
13
19 - 6 = 13
Carol

F86 THE 2x FUNCTION #2

Capsule Lesson Summary

Practice and review representing two- and three-digit numbers on the Minicomputer. Label the dots in a 2x arrow picture using the Minicomputer to help with the calculations.

Materials

Teacher
- Minicomputer set
- Colored chalk
- Pennies or counters

Students
- Unlined paper
- Colored pencils

Description of Lesson

Exercise 1

Begin the lesson with about ten minutes of putting numbers on the demonstration Minicomputer and recognizing them.

T: ***Who would like to put my secret number on the Minicomputer?***

Choose a volunteer and whisper your secret number to him or her. Be sure to pick a number between 10 and 999 with a difficulty level appropriate for that particular student. Numbers that can be shown using checkers on just one board (such as 20, 500, 400, and so on) may be easier than numbers like 43, 240, 401, 128, and so on. The most difficult numbers are those with a standard configuration that uses more than one checker on all three boards, such as 735, 679, and so on.

When the student has put the number on the Minicomputer, continue.

T: ***Who knows the secret number?***

Ask another student to write the appropriate numerals below (above) the Minicomputer boards, and ask a third student to read the number. Then, ask the original volunteer if this, indeed, is the secret number.

Repeat this activity several times allowing many students to participate in putting numbers on the Minicomputer and reading them.

Exercise 2

For this exercise have a collection of 35-40 pennies available.

T: ***Hold up three fingers.***
Now show me twice as many fingers.

Pause to allow the class to respond, and then demonstrate this yourself.

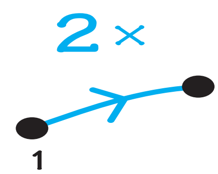
T: ***Three fingers*** (hold up three fingers)***. Now, twice as many*** (hold up the same three fingers on the other hand)***. 2 times 3 is 6.***

Repeat this activity for the double of 2, 5, 1, and 4. You may like to pair the students and repeat this activity for the double of 6 and 10.

T: ***Let's make up a story about Maggie*** (substitute the name of one of your students whose birthday is near)***. Maggie has a birthday soon and Maggie's uncle has promised to give her a special present. On her birthday, he will give her one penny; the next day, he will give her twice as many pennies; and the day after that, twice as many again. Her uncle will continue to double the number of pennies as long as Maggie can figure out how many pennies he has to give her. Let's see if we can help Maggie discover these amounts.***

Place pennies in piles as you double them to emphasize the power of doubling and to differentiate doubling from +2.

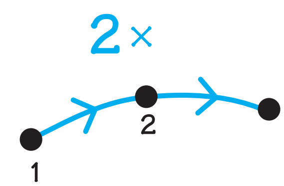
Begin this arrow picture on the chalkboard; ask the students to copy the picture on their papers. As you add arrows to your picture on the board, ask students to do likewise. You may want to make a list of corresponding 2x facts on the board.



T: ***On her birthday, Maggie receives one penny*** (point to the first dot)***.***
On the next day, she gets twice as many pennies (trace the arrow)***.***
What number is 2 times 1?

S: ***2.***

Demonstrate this number fact with your fingers and with pennies. Label the dot, and then draw a second blue arrow starting at 2.

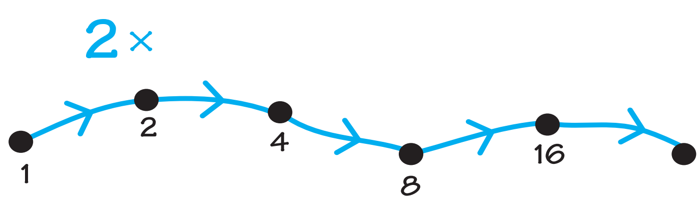


T: ***The second day she gets two pennies.***
How many on the next day (trace the second blue arrow and point to its ending dot)***?***
Label the dot in your arrow picture.

S: ***Four.***

T: ***Very good; 2 times 2*** (demonstrate with your fingers and with pennies) ***is 4.***

Label the third dot 4. Continue to add arrows, asking the class the number of pennies on the next couple days or until the calculation becomes difficult. Suppose the class counts pennies (or fingers), and is able to label dots up to 16.



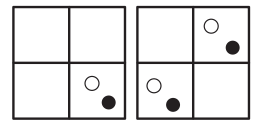
Point to the dot labeled 16 and then to the pile of 16 pennies.

T: ***This day Maggie gets 16 pennies. How many the next day? How can we calculate 2 x 16?***

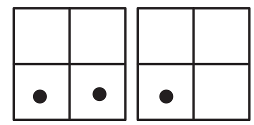
S: ***Put 16 on the Minicomputer and then double—add another 16.***

Encourage the class to discuss how to use the Minicomputer to double a number.

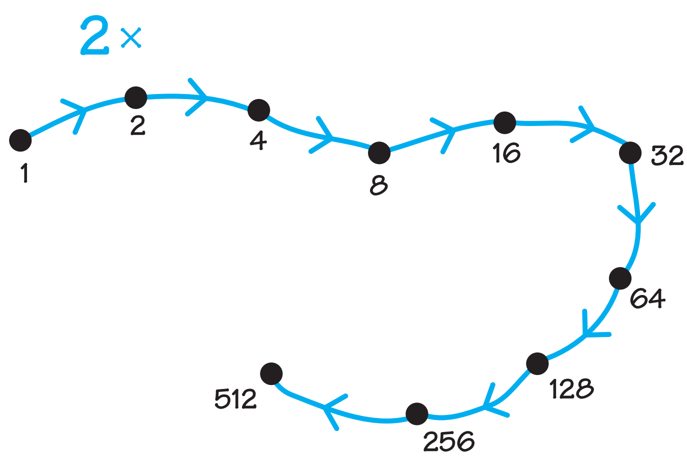
Invite students to put 16, and then 16 again (double), on the Minicomputer.



Then, call on students to make trades until the standard configuration for 32 is obtained.



Label the dot for 32, draw another arrow, and repeat this activity for 2 x 32. Continue as long as time and interest allow. For your reference, an extended arrow picture is shown below.



Home Activity

Prepare a 2x arrow picture with four or five arrows, starting at 3, to send home with students. Tell them to label the remaining dots. Blackline F86 can be used for this purpose. You may suggest students tell their families about Maggie's birthday present and think about what would happen if she got 3¢ (rather than 1¢) on the first day. Encourage students to use their home Minicomputers for more difficult calculations.

F87.1 ADDITION PROBLEMS #3

Capsule Lesson Summary

Using the Minicomputer, determine the cost of a menu order for a pretend visit to a hamburger stand. Determine the coins necessary to pay for the order.

Materials

Teacher
- Minicomputer set
- Coins
- Calculator (optional)

Student
- Paper
- Minicomputer set
- Calculator

Description of Lesson

Choose a student to be the star of this story. Tell the following story or a similar one more appropriate for your class.

T: ***Tonight, Leo is going to go to McDonald's (or Burger King or some similar place) because they are having some terrific specials right now.***

Allow the students to discuss this situation and to ask the star of the story what he would order at McDonald's.

S: ***Cheeseburger, fries, and a chocolate milkshake.***

T: ***Leo is going to buy a cheeseburger, an order of french fries, and a chocolate milkshake. The cheeseburger costs 39¢, the french fries cost 29¢, and the milkshake costs 22¢.***

On the chalkboard, record the price of each item as you say it.

T: ***How can we find how much money Leo is going to spend tonight?***

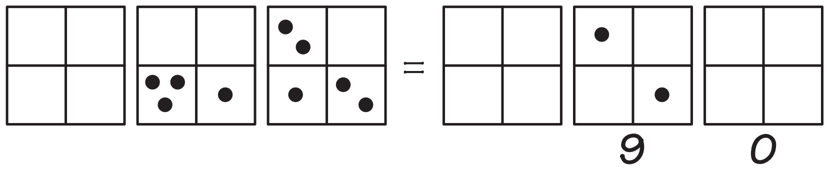
Allow the students to make suggestions. Then direct the class toward using the Minicomputer to add the cost of the three items. Write the calculation on the board in both vertical and horizontal format, indicating that the calculation may be written either way.

$$\begin{array}{r} 39 \\ 29 \\ +\ 22 \\ \hline \end{array} \qquad\qquad 39 + 29 + 22 =$$

You may wish to ask students to predict what the sum will be, recording some of their estimates on the chalkboard.

F87

With student assistance, put the three numbers on the Minicomputer and then make some trades. Continue letting volunteers make trades until the standard configuration for 90 is obtained. Complete the calculations on the board.



You may like to suggest checking the result with a calculator.

T: ***What coins could Leo take with him to pay for his supper exactly?***

Allow the students to discuss this problem for a few minutes. Accept any combination of coins with a value of exactly 90¢. Invite students to come up and choose coins to pay for the meal. Emphasize that many interesting combinations of coins equal 90¢.

T: ***Would Leo have enough money if he took 4 quarters?***

S: ***Yes.***

T: ***How much is 4 quarters?***

S: ***$1.00 or 100¢.***

T: ***Would he get money (change) back?*** (Yes)
How much?

S: ***10¢.***

If students enjoy solving such problems, give them a dinner menu with prices and let them make up problems. This can be done in groups giving students various jobs.

- Record the problem and the calculation.
- Use the Minicomputer to do the calculation.
- Check the calculation on a calculator.

Center Activity

Make up other orders or menus. Direct students to calculate the costs and show what coins could be used to pay for the orders.

F87.2 NUMBER FRIENDS #1

Capsule Lesson Summary

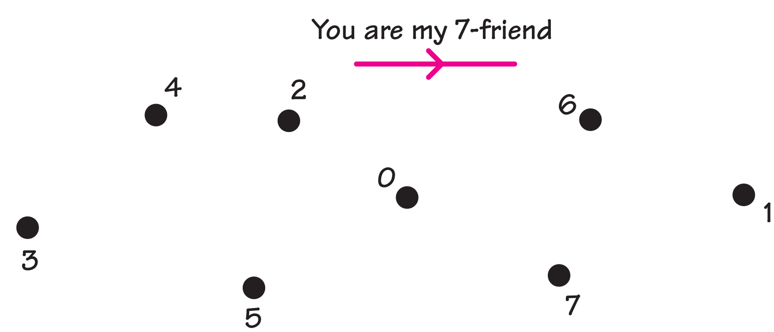
Draw arrows for "You are my 7-friend" between labeled dots. (Two numbers are 7-friends if and only if, their sum is 7.) Worksheets provide practice with 5-friends and 9-friends.

Materials

Teacher	• Colored chalk • Numeral cards	**Students**	• Colored pencils • Worksheets F87.2* and **

Description of Lesson

Begin the lesson by drawing this picture on the chalkboard. Select students to be the numbers in the picture and give them numeral cards for their numbers.



T: ***These numbers are playing a new game. Each number points to its 7-friend.***

In red, draw an arrow from 2 to 5.

T: ***2 says to 5, "You are my 7-friend." Why would 5 be 2's 7-friend?***

Allow the students to offer opinions.

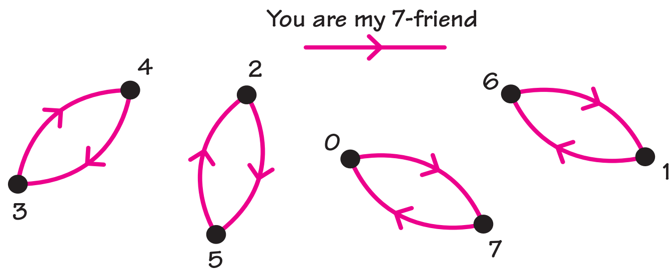
S: ***5 is 2's 7-friend because 2 + 5 = 7.***

T: ***Correct; where else could we draw an arrow for "You are my 7-friend"?***

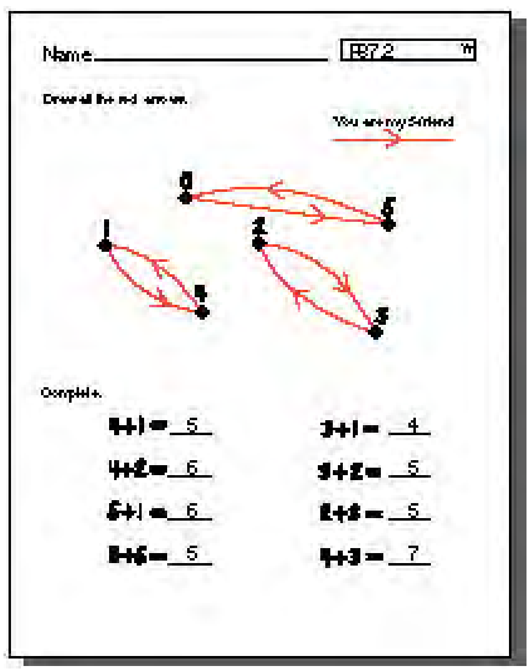
Instruct the students who are playing the numbers to point to their 7-friends.

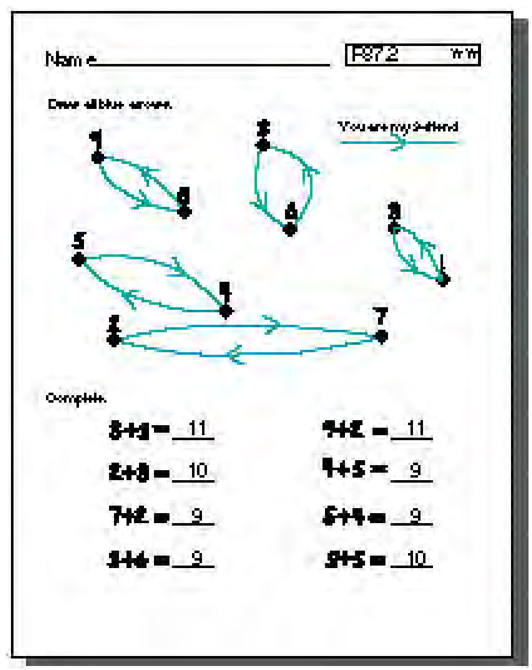
F87

Send other students to the board to draw arrows. Each time an arrow is drawn, ask the student to explain why it is correct. Continue until the arrow picture is completed. You may need to suggest an arrow from 5 to 2 noting that 5 also says to 2, “You are my 7-friend.” Check that the students acting out the game are pointing to each other.



Worksheets F87.2* and ** are available for practice. Instruct the students to draw all the missing arrows. Ask students who finish quickly to draw their own “You are my 11-friend” arrow pictures.





F88.1 MULTIPLICATION ON THE MINICOMPUTER #1

Capsule Lesson Summary

Review the square values on the Minicomputer. Do a 2x calculation on the Minicomputer to determine how many hands the students in your class have altogether.

Materials

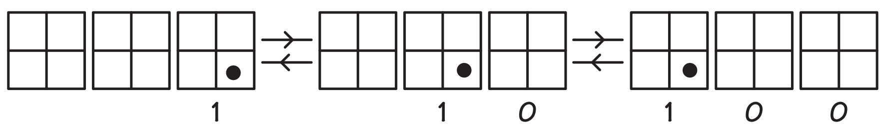
Teacher • Minicomputer set

Student • Minicomputer set (optional)

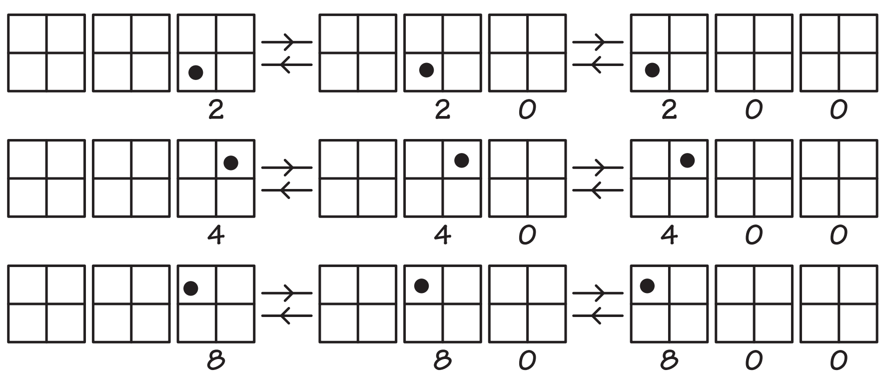
Description of Lesson

Exercise 1

Display three Minicomputer boards. Move a checker from the 1-square to the 10-square, to the 100-square, and vice-versa. Lead the class in saying "one–ten–one hundred–ten–one," and so on as you do this.



Continue this activity starting with 2–20–200, 4–40–400, and 8–80–800.

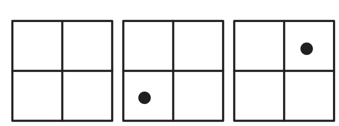


Move the checker around to various squares. Each time, ask the class which number is on the Minicomputer.

Exercise 2

You may like to let students follow the class activity on individual Minicomputers. To begin, ask the class to count the number of students in class today. (The following dialogue assumes a class of 24 students.)

T: ***There are 24 students in our class today. Who can put 24 on the Minicomputer? If we have 24 students, how many hands do we have altogether?***



Be sure the students understand that you are asking for the total number of hands in the group.You may wish to ask all of the students to raise their hands.

F88

T: ***How many hands does each student have?*** (Two)
Everyone raise your right hand. How many right hands are there? How do you know?

S: ***24, because we each have a right hand, and there are 24 of us.***

T: ***Everyone raise your left hand. How many left hands are there?***

S: ***24.***

T: ***How many hands do you have altogether?***

Record some students' guesses on the chalkboard.

T: ***Could we use the Minicomputer to find the answer?***

Perhaps someone will suggest calculating 24 + 24 or 2 x 24. If students suggest either calculation, write it on the chalkboard.

If necessary, ask the students again how many right hands there are and write 24 on the board. Ask how many left hands there are and write +24 on the board.

T: ***There are 24 right hands and 24 left hands.***
Does anyone know another calculation we can write?

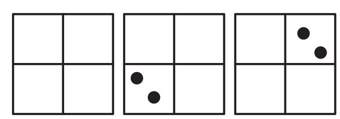
24 + 24

If necessary, suggest the multiplication calculation yourself and write it on the board. 2 x 24

Remind the class that 24 is already on the Minicomputer. Someone should suggest putting another 24 on the Minicomputer. Send a student to do this.

T: ***Is it easy to read this number?***
What could we do to make it easier to read?

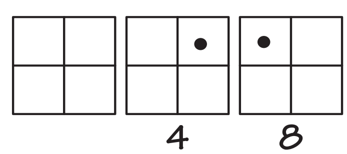
S: ***Make some trades.***



Invite students to make trades until the standard configuration for 48 is on the Minicomputer.

T: ***Now, do you know how many hands you have altogether?***

S: ***48.***



Ask a student to complete the calculation on the chalkboard. Determine which guess was the best. If some students predicted exactly, you may wish to ask them to explain their methods to the class.

Capsule Lesson Summary

Inside a string, draw dots for some cookies; inside another string, draw dots for two children. Use arrows to show how to divide the cookies fairly between the children.

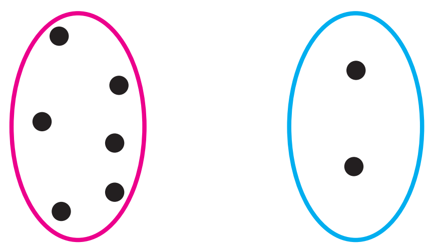
Materials

Teacher	• Colored chalk	**Student**	• Counters (or checkers)

Description of Lesson

Assign each student a partner and give each pair of students six counters (or checkers). Tell the student pairs to pretend the counters are cookies and to share them equally.

While the students complete the sharing, draw this picture on the chalkboard.



T: ***In the red string, I've drawn dots for some cookies. How many are there?***

S: ***Six.***

T: ***In the blue string are children; how many children are there?***

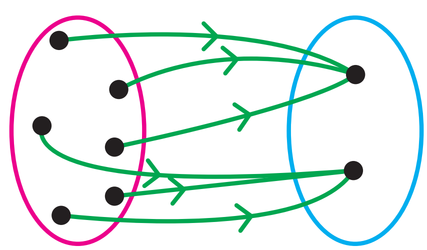
S: ***Two.***

T: ***Who can draw an arrow to show giving one of the cookies to one of the children?***

Choose a volunteer to draw one of the arrows.

T: ***We want to share the cookies equally; each child should receive the same number of cookies.***

Call on students to distribute the remaining cookies. Check with the class to see if both children receive the same number of cookies.



Point to one of the dots in the blue string and ask a volunteer to count the cookies this child receives. Repeat this for the other dot in the blue string.

T: ***Did both children receive the same number of cookies?***
Is this like what you did with the counters?

T: ***You shared six cookies between two children. Each child received how many cookies?***

S: ***Three.***

T: ***One-half of 6 is …?***

S: ***3.***

Write this number sentence on the board.

$$\frac{1}{2} \times 6 = 3$$

Repeat the activity giving ten counters to each pair of students, and using dots for ten candies in the red string and dots for two children in the blue string. Conclude with the following number sentence.

$$\frac{1}{2} \times 10 = 5$$

If time remains, repeat the activity for ½ x 12 = 6.

Center Activity

Put containers with an even number of objects in them in a center. Direct students to work in pairs to share the objects equally and write number sentences such as ½ x 8 = 4.

Writing Activity

Suggest to students that they write a story about two people sharing something and draw an arrow picture or another type of picture, to illustrate the story.

F89.1 SUBTRACTION ON THE MINICOMPUTER #1

Capsule Lesson Summary

Present several subtraction calculations in a story situation. Do the calculations on the Minicomputer.

Materials

Teacher • Minicomputer set
Student • Minicomputer set (optional)

Description of Lesson

If you like, provide individual Minicomputers for students to follow the class activity.

T: ***Last night, I walked to the store to buy some soda pop. I like to keep enough pop in my house for friends when they visit, so I bought 19 cans. On the way home the bag broke, some of the pop cans fell out, and eight cans exploded. What problem can we write to find out how many cans were left unbroken?***

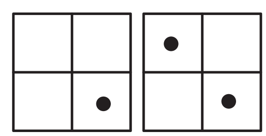
S: ***19 – 8 = ?***

Write this calculation on the chalkboard.

$$\begin{array}{r} 19 \\ -\ 8 \\ \hline \end{array} \qquad 19 - 8 =$$

T: ***Let's see how we can use the Minicomputer to solve the problem. Who can put 19 on the Minicomputer for the cans I bought?***

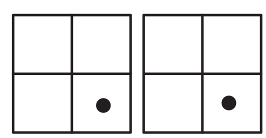
Call on a student to do this. Encourage the student to use the standard configuration for 19 by making trades if necessary.



T: ***Now, what does the problem suggest we do?***

S: ***Take away 8 for the cans that exploded.***

Ask a student to do this. When the student has removed the checker from the 8-square, continue.



T: ***Good. We took away 8, so what number is on the Minicomputer now?***

S: ***11.***

Complete the calculation on the chalkboard.

$$\begin{array}{r} 19 \\ -\ 8 \\ \hline 11 \end{array} \qquad 19 - 8 = 11$$

F89

T: ***When I returned home from the store, I decided to read a book. The book was 57 pages long, but I read only 44 pages before falling asleep! What problem can we write to find the number of pages I have left to read?***

S: ***57 – 44 = ?***

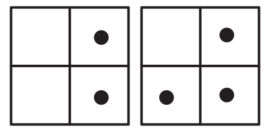
Write this new calculation on the chalkboard.

$$\begin{array}{r} 57 \\ -\ 44 \\ \hline \end{array}$$

57 – 44 =

T: ***Let's use the Minicomputer again.***
What should we put on the Minicomputer to start?

S: ***57, the number of pages in the book.***



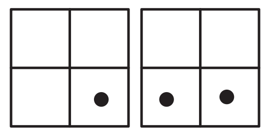
T: ***Now, what does the problem suggest we do?***

S: ***Take away 44, the number of pages you read.***

When a student has removed a checker from the 40-square and from the 4-square, continue.

T: ***How many pages do I have left to read?***

S: ***13.***



Complete the calculation on the chalkboard.

$$\begin{array}{r} 57 \\ -\ 44 \\ \hline 13 \end{array}$$

57 – 44 = 13

Invite students to make up subtraction problems like the following for the class to solve. Help students choose appropriate numbers in their stories.

- Everyone in class today (26 students) needs a drink for lunch.
  14 students brought a drink from home.
  How many children will need to buy a drink
  at school?
- There are 67 windows in our school. The window washers have washed 45 windows.
  How many more windows do they need to wash?

F89.2 –2 ARROW ROAD

Capsule Lesson Summary

In a –2 arrow picture, use +2 return arrows to help label the dots.

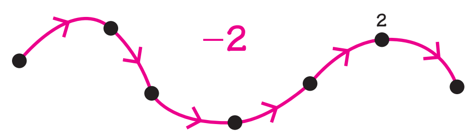
Materials

Teacher • Colored chlk

Student • Worksheets F89.2* , **, ***, and ****

Description of Lesson

Draw this arrow picture on the chalkboard.



T: ***The arrows are for –2.***
Who can label this dot (point to the dot at the extreme right)***?***

Call on a student to label the dot.When the dot has been labeled 0, continue as follows.

T: ***2*** (point to the dot labeled 2) ***minus 2*** (trace the arrow) ***is 0. Is that correct?***

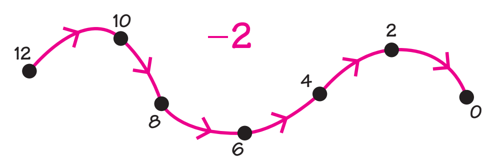
S: ***Yes.***

Demonstrate this by starting at 2 on the number line and jumping two spaces to the left. A similar procedure can be used to show that a number other than 0 is incorrect. You may want to write the fact 2 – 2 = 0 on the chalkboard.

T (pointing to the dot preceding 2): ***What number is here?***

S: ***4.***

To check the answer, repeat the procedure above. Continue until all of the dots have been labeled.



In blue, write +2 next to your picture.

T: ***Who can draw a blue arrow for +2?***

Call on students to draw +2 arrows. Each time an arrow is drawn, ask the students to explain why a +2 arrow can be drawn there. For example, a student might offer an explanation like this one.

S: ***Because 0 plus 2 equals 2.***

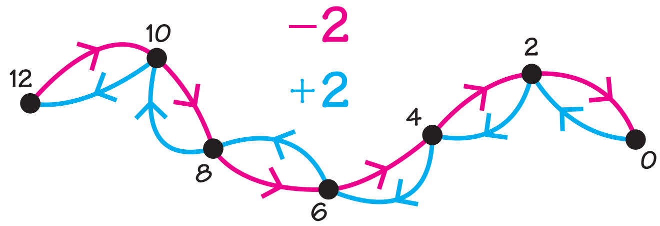
While not very likely, a student might also explain in this way:

S: ***I can draw a blue +2 arrow here because there is a red -2 arrow going the other way.***

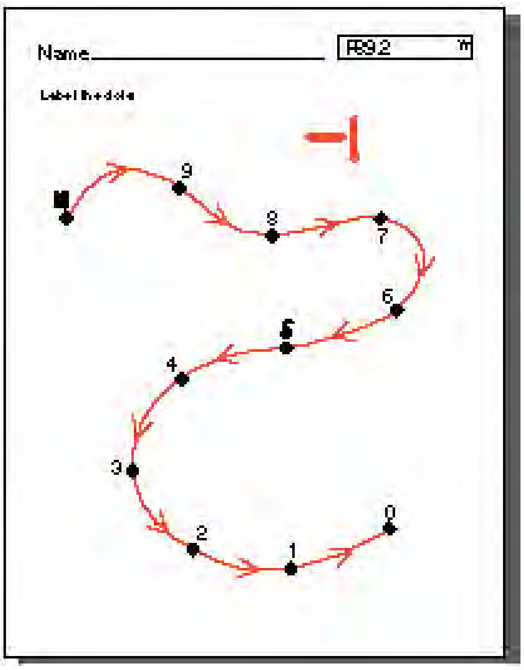
Note: You may like to relate the drawing of blue arrows to what students did last semester in Lesson 6.1 *Walks on One-Way Roads*. They may have suggested making a new road going the opposite direction to get to the hamburger stand.

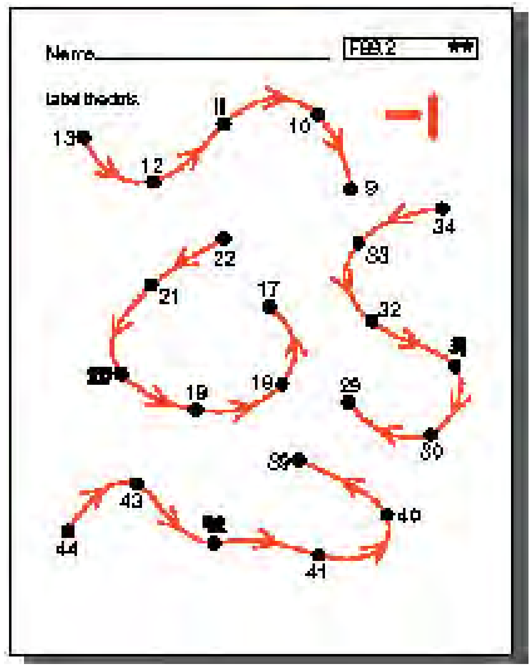
F89

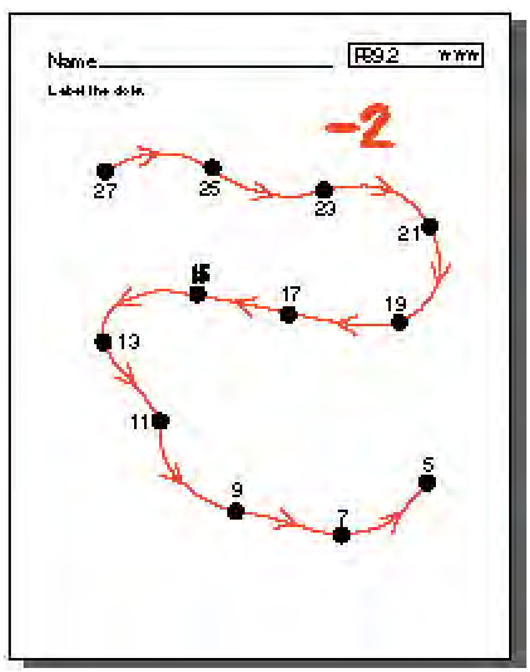
The completed picture will look like this.

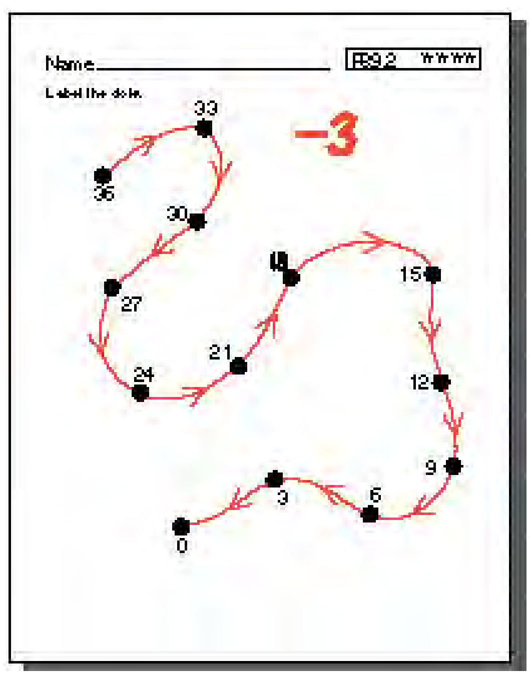


Worksheets F89.2*, **, ***, and **** are available for individual work. If some students finish all the worksheets, ask them to add +2 and +3 arrows to the pictures on F89.2*** and ****.









F90 ADJUSTMENT/ASSESSMENT DAY #8

Note: See Section One, page 1-9, for a full explanation of the purpose of scheduled adjustment/ assessment days. Worksheet F90 is available for a short, written assessment.

On this day you may wish to repeat an earlier lesson either for a small group of students or for the entire class. Many of the lessons can be made to appear completely different by changing the story or the numbers in the lesson. If you omitted exercises or worksheets from an earlier lesson, you may like to include these. This is also a good time to allow students to work in centers or on a project of your choice.

The following activities may be appropriate for students who need additional practice.

I Have..., Who Has?

Distribute number cards with the numerals 1 to 10 on the front and facts involving the numbers on the back, one card per student. For example, a set of cards might look like this:

Front:	1	2	3	4	5	6	7	8	9	10
Back:	1 + 2	2 x 2	3 – 1	2 x 4	5 + 4	6 – 5	7 – 1	8 + 2	9 – 2	½ x 10

Choose a number at random and the student with that number on the front of her card starts the game by reading the fact on the back of the card. For example, suppose the student with $\boxed{2}$ starts the game.

S: ***I have 2, who has 2 x 2?***

The student with 4 on the front of his card should reply.

S: ***I have 4, who has 2 x 4?***

S: ***I have 8, who has 2 x 8?***

Continue until you return to the student who started the game.

Could Be?

Write a number on the board or on a piece of paper for the students to see. For example,

$\boxed{345}$

Then give students questions such as the following to discuss.

- Could this be the number of students in our class today?
- Could this be the number of students in our school today?
- Could this be the number of players on a basketball team?
- Could this be the number of peanuts in an individual packet?
- Could this be the number of peanuts in a can?
- Is this number closer to 0 or to 500?
- Is this number closer to 300 or to 400?

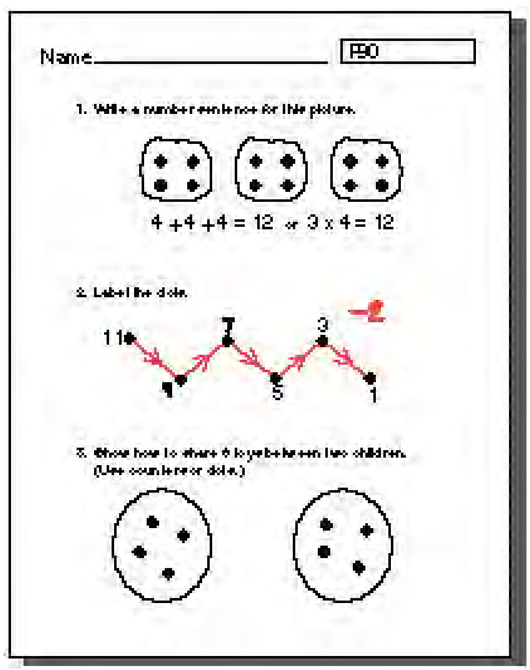
F90

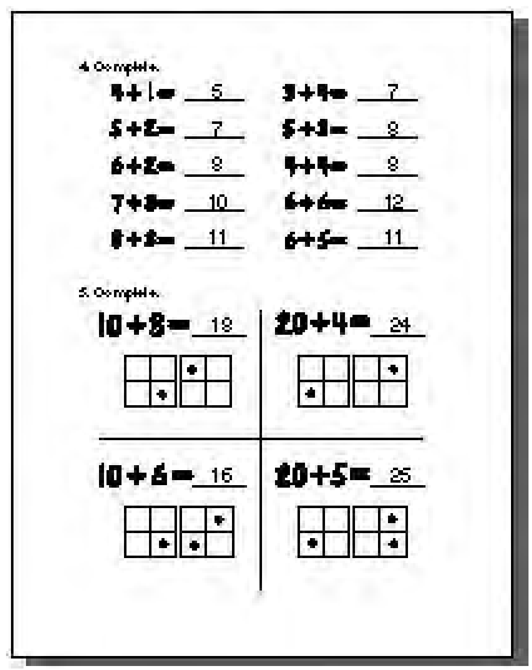
If your class is experiencing little difficulty with the *CSMP* curriculum, you may prefer to omit this adjustment day and continue immediately with F91 *Estimation #2*.

Early Warning

A few of the next nine classroom lesson require extra preparation time, or involve materials not included with the *CSMP* Classroom Set. The lessons are listed here for your convenience in preparing for them. A more detailed description of the necessary materials can be found on the first page of each lesson. (Special materials are listed here only once, even if they are needed more than once during the nine-day period.)

F91 *Estimation #2*: Transparent jar containing 250–300 objects; calculator; slips of paper
F92.1 *Subtraction Story #3*: Transportation graph
F93.1 *Transforming a Number #1*: Index cards
F95.1 *Multiplication on the Minicomputer #2*: Five bags; counters
F96 *Geoboard Exploration:* Geoboards and bands





F91 ESTIMATION #2

Capsule Lesson Summary

Estimate how many beans in a jar. Count the beans by grouping tens and compare the actual count with the estimate.

Materials

Teacher
- Transparent jar containing 250–300 dried beans
- Number line
- Calculator

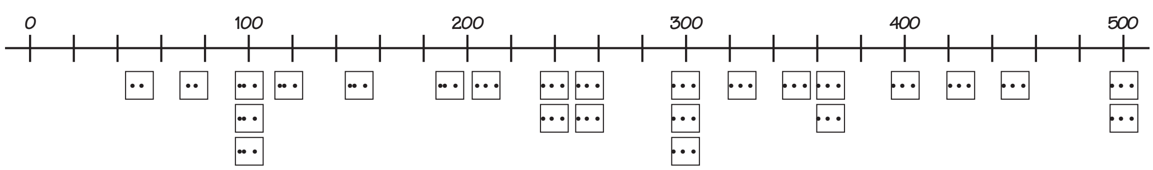
Student
- Slip of paper (Post-it™ note)

Advance Preparation: Draw or make a 0–500 number line to put on the board accessible to students. Also, you can use materials other than beans to fill your jar, such as candies, beads, counters, or cubes.

Description of Lesson

Show the class your jar of beans. Take out one loose bean and describe it to the students as one bean. Ask students to estimate the number of beans in the jar.

After a few guesses, instruct the students to write their estimates on their slips of paper. Then invite them to place their papers on the number line approximating their guesses. For example,



Assist students in placing their estimates as necessary. Don't worry about perfect placement. Adjust the range of the number line to accommodate all estimates.

Discuss the estimates by asking about the greatest, least, most common, and so on.

T: ***Now, let's try to find how many beans are in this jar. How can we do that?***

S: ***Count them.***

Take out a big handful of beans and place it on a mat on the floor. Invite students to help count. Let one student count out ten beans and push them aside in a pile; let other students do the same until all the beans are in piles of ten with possibly a few left over. Together, count the piles and the leftovers (for example, 3 tens and 4 ones).

T: ***How many beans in this handful?***

S: ***34.***

Suggest students compare the handful just counted to what is left in the jar. Allow students to change their estimates by removing their slips of paper, changing the estimate, and replacing them.

F91

Organize the class in groups of three or four, and give each group a big handful of beans to count. Distribute all the beans in this way. Suggest that groups share the counting job and check their counts. Then collect the counts on an overhead or classroom calculator. For example, start with the number in first handful (34) and invite a member of each group to enter their count by pressing the number (for example, 28) . You may also like to write the addition calculation on the board as it is being done on the calculator: 34 + 28 + 32 + 41 + 26 + 35 + 32 + 29 + 37 = 294.

T: ***How many beans?***

S: ***294.***

Locate the actual number of beans on your number line and compare the estimates to the actual number. Answer the following questions.

- Were most of the estimates more or less than the actual number?
- Did anyone guess the exact number?
- Were there some estimates that were off by less than ten?

Extension Activity

This lesson may be repeated later in the year. You can use the same jar filled with smaller or larger objects; for example, large valentine candy hearts or small conversation hearts. Discuss what happens when the same container is filled with larger or smaller objects.

Home Activity

Suggest to parents/guardians that they find opportunities to estimate with their child. For example, estimate how many paper clips there are in a small box. If they then do an actual count, suggest comparing the count to the estimate. Also recommend that they group by tens to organize counting.

F92.1 SUBTRACTION STORY #3

Capsule Lesson Summary

Discuss a graph showing how your students get to school. Present a subtraction calculation in a related story. Reinforce logical thinking by drawing a string picture.

Materials

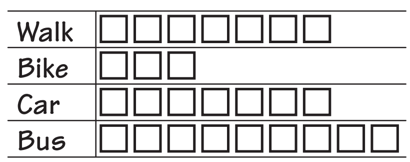
Teacher
- Colored chalk
- Transportation graph
- Number line or 0–109 numeral chart

Student
- Paper
- Colored pencils
- Red and blue checkers

Advance Preparation: Make the school transportation graph before starting the lesson.

Description of Lesson

Before beginning this lesson, make a graph of the various ways your students got to school today. Include at least four choices; for example, walking, riding a bike, the bus, or a car. Instruct students to write their names on slips of paper and attach these to the graph. There are many ways to organize your graph; one possibility is shown below.



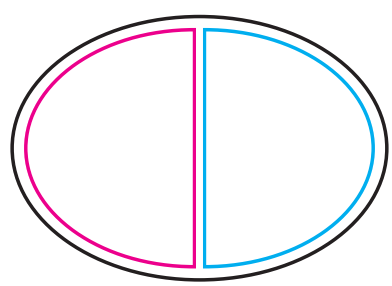
Begin the lesson with a brief discussion of the information found in your graph.

Tell the following story or one similar to it.

T: ***At another school they made a graph like ours and discovered that 13 students came to school by car or bus. Exactly four of these students came to school by car. How many students came to school by bus?***

Suggest students whisper their answers to a neighbor or write them on a paper. It may be necessary to repeat the story.

Draw this string picture on the board. Ask students to copy the picture on their papers and add information to the picture just as you do on the board.



T: ***The black string is for all of the students who came to school by car or bus. How many students was that?***

S: ***13.***

Write 13 in black near the string picture.

T: ***This red string is for all the students who came to school by car.***

How many students was that?

S: ***Four.***

In red, write 4 near the red string. Ask students to put four red checkers in the red string.

T: ***What is the blue string for?***

S: ***The students who came to school by bus.***

T: ***How many students took the bus to school? Put blue checkers in the blue string to show these students.***

Suppose, for example, that a student suggests seven.

T: ***Let's check to see if seven students came to school by bus.***
4 + 7 = … ?

Display seven blue checkers for the students who came by bus. Say, "4"; and then point to each blue checker in turn as you continue counting, "5, 6, 7, 8, 9, 10, 11."

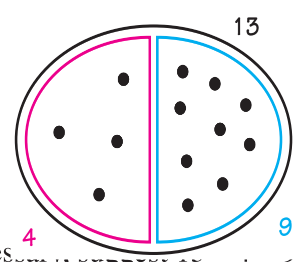
T: ***4 + 7 = 11. But we know that 13 students came to school by car or bus. We will have to try again.***

Accept another suggestion and check it as a possibility. You may also use the classroom number line or the 0–109 numeral chart for checking. Continue until your class concludes that nine students came to school by bus. In blue, write 9 near the blue string and check that students have nine blue checkers in the blue string.

T: ***Who can draw dots in our string picture for the 13 students?***

Call on volunteers to draw the dots.
Count all of the dots to confirm that 4 + 9 = 13.

T: ***What number sentences could we write about this string picture?***



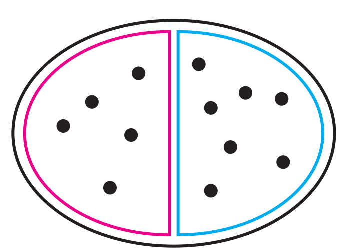
4 + 9 = 13
13 – 4 = 9
13 – 9 = 4
9 + 4 = 13

Accept any appropriate number sentences. If necessary, suggest 13 – 4 = 9 and 13 – 9 = 4 yourself. It may help to cover the four or the nine dots as in Lesson F19.1 *Hidden Checkers #1*.

Suggest students write the number sentences on their papers.

Home Activity

Send home a picture similar to the one generated in this lesson. For example, suggest students work with family members to make up a story to go with the picture and write number sentences.



F92.2 LOCATING NUMBERS ON THE NUMBER LINE

Capsule Lesson Summary

Given the location of some numbers on the number line, ask students which numbers are at other points.

Materials

Teacher • Number line

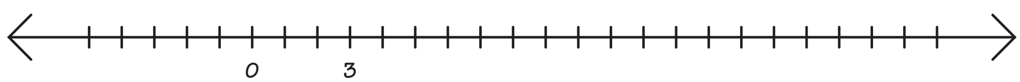
Student • Worksheets F92.2* and **

Advance Preparation: As pictured below, draw a number line on the board before the lesson begins.

Description of Lesson

Draw a number line on the chalkboard. The graduations should be equally spaced, at least six centimeters apart. You may wish to draw your number line somewhat shorter than the one shown here; the following description, however, is based on this illustration.

T: ***I positioned 0 and 3 on this number line.***



T: ***Who knows where we should locate 1?***

When a student points to the correct mark label it 1 and then point to the mark for 5.

T: ***What number goes here?*** (5)

Label this mark 5. Continue this activity until many numbers have been located and their positions labeled. Alternately, ask a student to identify the mark you indicate and to locate the mark for a number you give.

Label the marks for 12 or 13; then point to the last mark on the right (in this example, 22).

T: ***What number goes here?***

Suggest students whisper their answers to a neighbor or write them on a scratch paper; then send a student to the board to label the mark. Indicate the next mark to the left (21).

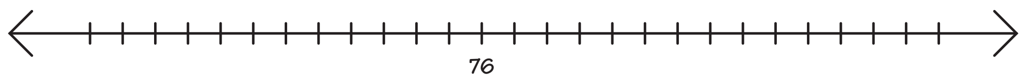
T: ***What number goes here?*** (21) ***How do you know?***

Students might suggest counting backward; encourage this idea. Send several students to the board to label marks of their choice, continuing until all of the marks to the right of 0 have been labeled.

F92

One of your students may ask you to erase the marks to the left of 0, claiming that there are no numbers less than 0. Simply say, "There are many numbers less than 0, but perhaps you don't know any of them yet." (If some students are aware of negative numbers, you may wish to let them label the marks to the left of 0.)

Erase all of the labels, but not the number line itself, nor the graduation marks. Select a point near the center of the number line, and label it 76.



Point to the mark to the right of 76.

T: ***What number goes here?***

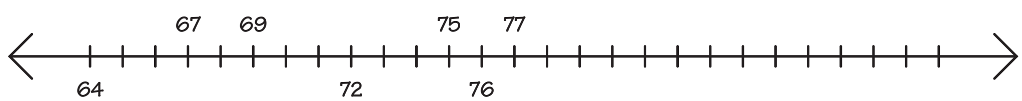
S: ***77.***

Label this mark 77, then indicate the mark just to the left of 76.

T: ***What number goes here?***

S: ***75.***

Label this mark 75. Point to a mark several spaces to the left of 75, and ask a volunteer how this mark should be labeled. Continue this process until the mark furthest to the left has been identified and labeled.



T: ***This is the last number we can put on our number line, but this arrow means that the line goes on forever. What (whole) number comes just before 64 on the number line?*** (63) ***What are some other numbers we would meet if we traveled to the left along this number line?***

Accept any numbers less than 64. Then, point to the mark furthest to the right.

T: ***What number goes here?***

This can be a difficult question especially if the students find it hard to count the marks accurately from their seats. Allow students to express their opinions; then send a student to the board to count forward from 77.

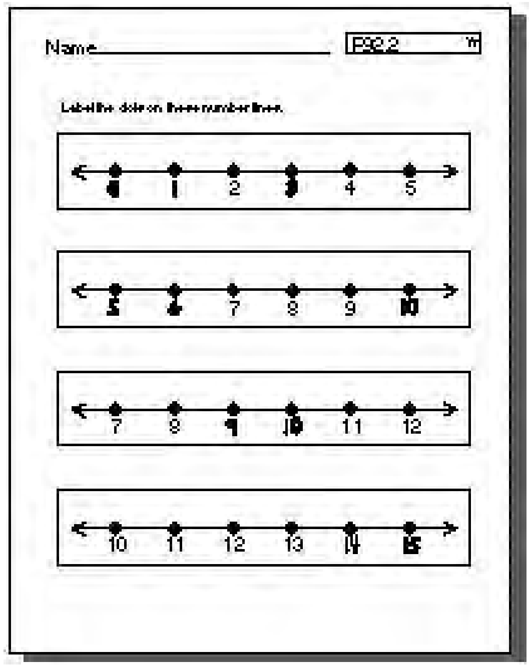
Worksheets F92.2* and ** are available for the remainder of the period.

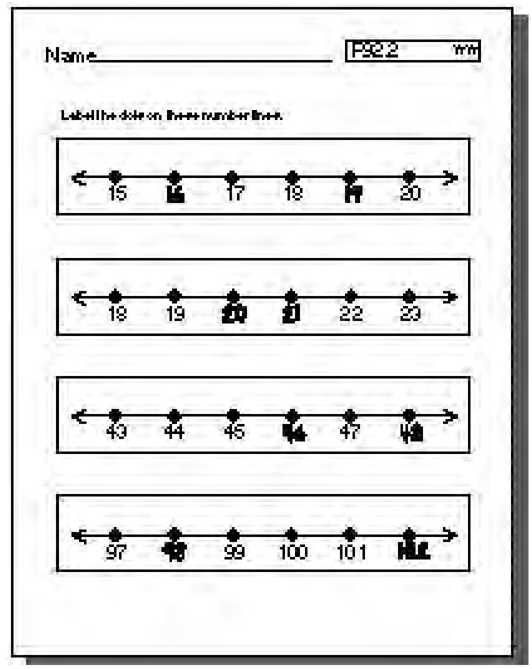
Center Activity

Laminate pages with problems like those on the worksheets to put in centers. Use Blackline F92.2 to prepare such problems.

Home Activity

Send a page of number lines home with students. Use Blackline F92.2 to make copies. Suggest to parents/guardians that they choose a number between 0 and 100 to put on a number line and then work with their child to label other marks.





F93.1 TRANSFORMING A NUMBER #1

Capsule Lesson Summary

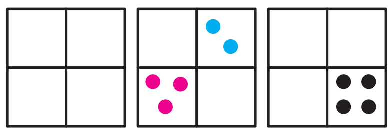
Estimate a number that has been put on the Minicomputer with many checkers. Move checkers in various ways, each time observing whether the move increases or decreases the number or leaves it the same. Make trades to decide which number is on the Minicomputer and compare this to the estimates.

Materials

Teacher	• Minicomputer set	Student	• Three index cards

Description of Lesson

Using the three different colors of checkers, put this configuration on the Minicomputer.



T: ***What number is on the Minicomputer?***

Students will probably suggest making some trades before telling you what this number is.

T: ***Yes, trades would make the number easier to read, but can we estimate it without making trades? Is this number more than 20? How do you know?***

S (pointing to a checker on the 20-square)**:** ***Yes, here is 20 and there are more checkers.***

T: ***Is this number more than 50? How do you know?***

S (pointing to the checkers on the 40-square)**:** ***Yes, because here is 40 plus 40 or 80, and 80 is more than 50.***

T: ***Is the number more than 100?*** (Yes)
How do you know?

S (pointing to two checkers on the 40-square and one checker on the 20-square)**:** ***Here is 100 and there are still more checkers.***

If students do not make this or another appropriate observation, simply say that they are not certain whether or not the number is more than 100.

T: ***Watch very carefully; I am going to do something with the checkers. You must tell me if I change the number, or if the number remains the same.***

Very obviously, move a checker from the 1-square to the 10-square.

T: ***Did I change the number?***

S: ***Yes.***

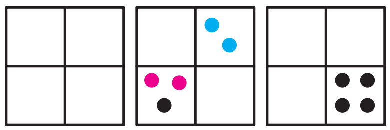
T: ***Is the new number more or less than before? Why?***

S: ***More, because you moved a checker from 1 to 10.***

T: ***Very good. Let's return to the original number. What should I do?***

S: ***Move the checker on the 10-square back to the 1-square.***

After returning the checker to its original position, ask the students to watch carefully again. Replace one of the checkers on the 20-square with a checker of another color.



T: ***Did I change the number?*** (No) ***Why not?***

S: ***You only changed the color of the checker.***

T: ***Yes; I can change the color of a checker without changing the number.***

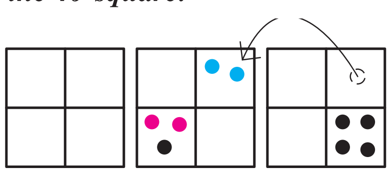
Write these three words on the chalkboard and instruct students to write them on their cards—one word on each card.

MORE SAME LESS

Tell the students that this time, instead of saying aloud whether you change the number, they should simply hold up the card that describes the number after your move.

Very obviously, move a checker from the 40-square to the 4-square. Point to each of the three words on the board and ask the students to hold up the correct card. If necessary, repeat the move very slowly and deliberately to give students another opportunity to tell you about the number. Ask a student who realizes that the new number is less to explain why.

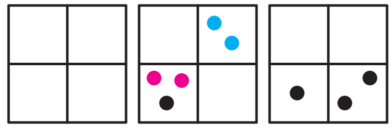
T: ***When I move a checker from the 40-square to the 4-square, I change the number; so I'll move this checker back to the 40-square.***



Make a 1 + 1 = 2 trade as obviously as possible and then point to each word, as before. If many students think you changed the number, return the checkers to the 1-square and repeat the trade, giving them another opportunity to tell you about the "new" number.

Ask a student who realizes that the number is the same to explain why.

T: ***The trade I made didn't change the number, so I will just leave the checkers as they are.***



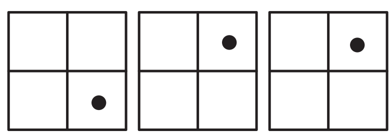
Continue this activity using the following suggested moves. Whenever a movement changes the number, be sure to return the checkers to their previous position before continuing.

- Move a checker from the 20-square to the 10-square. (Less)
- Make a 40 + 40 = 80 trade. (Same)
- Move both checkers on the 1-square to the 4-square. (More)
- Move the checker on the 2-square to another position on the 2-square. (Same)
- Make a 20 = 10 + 10 backward trade. (Same)

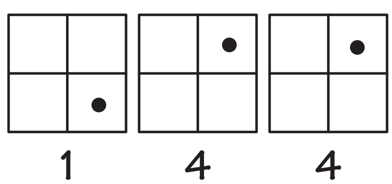
T: ***Do we still have the number we started with ?*** (Yes)
We've moved some of the checkers, but we haven't changed the number. What did we estimate this number to be?

Your class may have estimated the number to be more than 100 or they may have been uncertain. Allow the students to again estimate the number on the Minicomputer and record their estimates on the chalkboard.

Students should be able to make the trades fairly easily, but it may be necessary to suggest the 80 + 20 = 100 trade yourself. This is the standard configuration for the number on the Minicomputer.



Invite a student to read the number and another to write the numerals below (above) the Minicomputer.



Review the estimates you have recorded on the chalkboard and determine which was the closest.

F93.2 ADDITION PROBLEMS #4

Capsule Lesson Summary

Practice putting numbers on the Minicomputer and reading them. Use the Minicomputer to calculate the cost of the ingredients in a birthday cake.

Materials

Teacher
- Minicomputer set

Student
- Paper
- Calculator
- Minicomputer set

Description of Lesson

Exercise 1

Begin this lesson with a few minutes of putting numbers on the demonstration Minicomputer and reading them.

T: ***Who would like to put my secret number on the Minicomputer?***

Whisper your number to a volunteer, choosing a number of appropriate difficulty for the student. When the number has been put on the Minicomputer, continue.

T: ***Who knows the secret number?***

Ask a student to write the appropriate numerals below (above) the Minicomputer boards; then, ask the first student if this, indeed, is the secret number. Repeat several times with other secret numbers.

Exercise 2

Organize the class in groups of two or three students. Give each group an individual Minicomputer and a calculator.

T: ***Ivan*** (substitute the name of a student in your class) ***has decided to bake a cake for his mother's birthday, so he needs to buy some things at the store. Here is a list of what he needs to buy:***

Cake Mix 69¢ Milk 85¢ Eggs 41¢

T: ***Ivan wants to know the total cost of these items. What calculation should he write?***

Choose a volunteer to write the calculation on the board in either format.

$$\begin{array}{r} 69 \\ 85 \\ +\ 41 \\ \hline \end{array} \quad \text{or} \quad 69 + 85 + 41 =$$

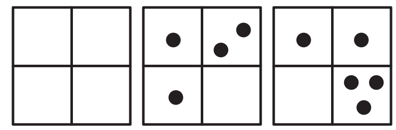
T: ***What will be the total cost of these items?*** ($1.95)

F93

Who has an estimate?

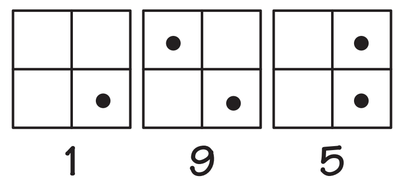
Record several estimates on the chalkboard. If students guess exactly, ask later how they found the answer.

T: ***Let's do this calculation on the Minicomputer.***



Suggest groups do the calculation at their places as you do it on the chalkboard. Ask students to progressively put the three numbers on the Minicomputer. If standard configurations are used, the Minicomputer will look like this.

Ask various students to make trades. When the number on the Minicomputer is in its standard configuration, ask a student to write the appropriate numerals below (above) the Minicomputer. One person in each group can check the calculation on the calculator.



T: ***What will be the total cost of the cake ingredients?***

S: ***195¢***

S: ***$1.95.***

T: ***Who knows how to write* $1.95*, as is done in stores?***

Choose a volunteer to write this on the chalkboard.

$1.95

T: ***If Ivan has $2.00 will that be enough to pay for everything?***

S: ***Yes.***

T: ***Will he get change back?***

S: ***Yes.***

T: ***How much ?***

S: ***5¢.***

T: ***What coins could the clerk give him for the change?***

S: ***A nickel.***

S: ***5 pennies.***

Instruct the groups to make a shopping list for the ingredients to make cookies. Suggest they agree on the cost of each item and then calculate the total cost.

F94.1 GUESS MY RULE WITH NUMBERS

Capsule Lesson Summary

Choose a secret rule such as "subtract 1" and program a calculator to use the rule. Put a number on the calculator and observe the result. Continue until the rule is discovered. Repeat this activity using several other rules.

Materials

Teacher • Overhead calculator **Student** • None

Description of Lesson

T: ***I'm going to teach our calculator a secret rule. You will give me a number to put on the calculator and the calculator will use the secret rule on your number. When I press ≠, you will see the result.***

To program the calculator with "subtract 1" as the secret rule, press 1 − 1 =. Do not let the students see you program the calculator. When you first show them the calculator, 0 should be on the display.

T: ***Tammy, give the calculator a number.***

S: ***20.***

Press 2 0 = and observe 19 on the display.

T: ***Gordon, suggest a number.***

S: ***43.***

Press 4 3 = and observe 42 on the display.

T: ***Chris, give us a number.***†

S: ***61.***

Press 6 1 = and observe 60 on the display.

T: ***If you think you know the rule, try to predict what number will be on the calculator display next time. Mae, give us a number.***

S: ***250.***

Press 2 5 0. Suggest students whisper their answer to a neighbor or write it on a paper. Ask someone to answer aloud while you press = on the calculator. Repeat this a couple times; then call on students to describe the rule.

S: ***Take away one.***

†If a student suggests 0, read the calculator display after pressing 0 = as "negative 1." If you would rather not include this possibility, simply say the rule is for numbers greater than 0.

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S: ***Subtract one.***

S: ***The calculator shows the number that comes before the number we say.***

Repeat this activity using several other rules. Before asking students to guess a rule, be sure to give enough examples to establish a pattern.

This game may be played whenever you have a few spare minutes. The rules can be made more challenging as the school year goes on. You may want to let a student act like a calculator once the game has been played several times. Be sure you are clear what rule the student is using so that you can check the responses.

- Add 2 (press $\boxed{-}$ $\boxed{2}$ $\boxed{+}$ $\boxed{2}$ $\boxed{=}$ to prepare calculator)
- Subtract 2 (press $\boxed{2}$ $\boxed{-}$ $\boxed{2}$ $\boxed{=}$ to prepare calculator)
- Double (press $\boxed{2}$ $\boxed{\times}$ $\boxed{0}$ $\boxed{=}$ to prepare calculator)
- Add 10 (press $\boxed{-}$ $\boxed{1}$ $\boxed{0}$ $\boxed{+}$ $\boxed{1}$ $\boxed{0}$ $\boxed{=}$ to prepare calculator)

Home Activity

This would be a good time to send home a letter about the use of calculators in *CSMP*. Your letter can suggest to parents/guardians that they, too, can use calculators with their child at home. Blackline F94.1 has such a sample letter.

F94.2 THE FUNCTIONS +3 AND –3 #2

Capsule Lesson Summary

Label the dots in a +3 arrow picture and draw return –3 arrows. Write a number fact about each arrow.

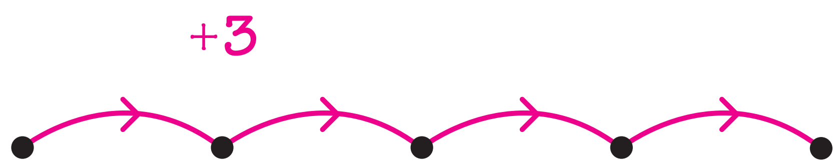
Materials

Teacher	• Colored chalk	**Student**	• Colored pencils • Unlined paper • Counters

Description of Lesson

Assign each student a partner for this lesson.

Draw the following arrow picture on the chalkboard and ask the students to copy it on their papers.



When all of the students have at least two arrows drawn, point to the second dot from the left and label it 5. Then, point to the third dot from the left.

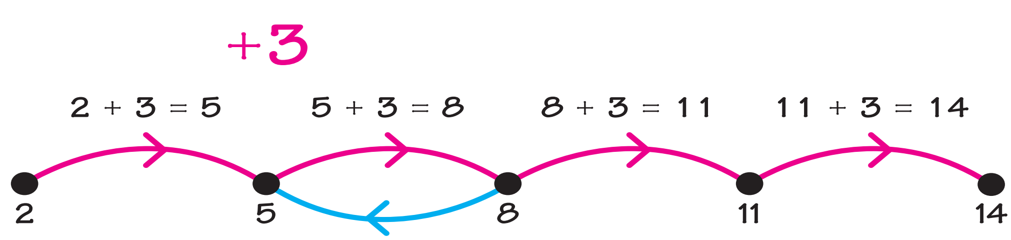
T: ***What number goes here? How do you know?***

S: ***8; because 5 + 3 = 8.***

Let a student explain how to calculate 5 + 3. Suggest that students can use counters to model the calculation. Place five counters and add 3 more as you trace the red arrow. Then count to find 8. Label the dot 8 and invite someone to write the number fact on the board. Encourage the students to write this number fact on their papers. Follow this same procedure for the next dot to the right.

Ask the students to label the two remaining dots and to write the appropriate number facts on their papers. In pairs, suggest one student model the calculation with counters while the other labels the dot and writes the addition fact. When most groups are finished, send a student to the board to complete the arrow picture and to write the appropriate number facts.

T: ***I will draw a blue arrow in the opposite direction of a red arrow in this arrow picture. What could this blue arrow be for?***



Encourage the class to offer suggestions and consider each suggestion carefully. Someone may suggest "take away 3" or "minus 3." If someone suggests "is more than," reply that the blue arrow could be for "is more than," but that you have something else in mind.

T: ***8 – 3 = 5. The blue arrow is for –3.***

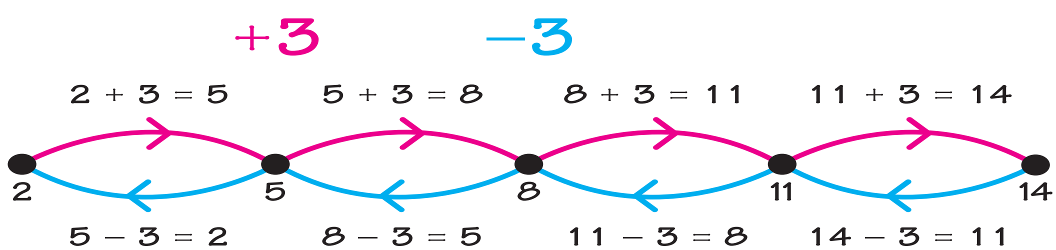
On the number line, using fingers or counters, or some similar method, demonstrate that 8 – 3 = 5. In blue, write –3 near the arrow picture and ask the students to do the same on their papers.

T: ***Could we write a number fact about this blue arrow?***

If students suggest 5 + 3 = 8, remind them that they already wrote this number fact about one of the red arrows. If no one suggests 8 – 3 = 5, suggest it yourself and ask a volunteer to write this number fact on the board.

T: ***Where could we draw another blue arrow?***

As correct blue arrows are suggested, draw them in the picture on the board and ask the students to copy them in their pictures. Let volunteers write the appropriate number facts on the board. Continue until the arrow picture is complete.



F95.1 MULTIPLICATION ON THE MINICOMPUTER #2

Capsule Lesson Summary

Using the Minicomputer, decide how many bananas a monkey trainer needs to put 17 bananas in each of five bags.

Materials

Teacher
- Minicomputer set
- Five bags
- Counters
- Calculator

Student
- None

Advance Preparation: You will need approximately 100 counters.

Description of Lesson

Tell the following story, or one similar to it, to your class.

T: ***Mr. Moore is the monkey trainer for a circus. He has 17 lively monkeys that can do many tricks. What kind of monkeys could Mr. Moore have?***

Allow the students to discuss this for a few minutes. Some of them may also want to describe tricks monkeys can do.

T: ***Mr. Moore's monkeys love children. Often, Mr. Moore invites children to feed them. What do you think is the favorite food of Mr. Moore's monkeys?***

Allow the students to offer some suggestions.

T: ***The favorite food of Mr. Moore's monkeys is bananas. He takes a bag for each child and very carefully counts out 17 bananas for each bag. Why does Mr. Moore put exactly 17 bananas in each bag?***

S: ***Because there are 17 monkeys. Each monkey will get one banana from each child's bag.***

T: ***Mr. Moore has invited five students from our class to feed his monkeys. Who would like to feed Mr. Moore's monkeys?***

Choose five volunteers and give each a bag.

T: ***Mr. Moore is preparing a bag of bananas for each of you. How many bananas does Mr. Moore need in all to put 17 bananas in each bag?***

Allow students to make predictions and record some of these predictions on the chalkboard.

T: ***How can we find out exactly how many bananas Mr. Moore needs?***

Someone may suggest using the Minicomputer or a calculator.

T: ***What calculation should we do?***

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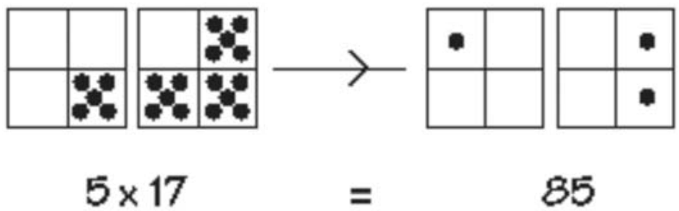
If someone suggests 17 + 17 + 17 + 17 + 17, accept this as correct and record it on the board. Ask if there is a shorter way to write the calculation. If no one suggests 5 x 17 suggest it yourself.

Instruct the five volunteers to each count out 17 counters and put them in their bags. You may want them to give their bags to other students to check. Call on five other volunteers to each put 17 on the Minicomputer. Invite other students to make trades on the Minicomputer until the standard configuration for the solution (85) is obtained. Complete the calculations on the board and conclude that Mr. Moore needs 85 bananas in all.



Suggest that students check the result in one or more of the following ways:

- Do the calculation 5 x 17 on a calculator.
- Do the calculation 17 + 17 + 17 + 17 + 17 on a calculator.
- Put all the counters from the five bags in a pile and count them.

Capsule Lesson Summary

Count by tens having students each hold up ten fingers. Repeat the activity, but begin counting at 4. Record these numbers in a +10 arrow picture.

Materials

Teacher	• 0–109 numeral chart • Colored chalk	Student	• Unifix® cubes (optional)

Description of Lesson

Note: You may prefer to conduct this activity with each student having ten Unifix® cubes fastened together to hold up rather than fingers. Of course, other manipulatives could be used as well.

Ask all the students in one row or at a table to raise both hands with fingers extended. Explain that you will use their fingers to count by tens. Proceed down the row or around the table holding up each student's hands, while the class counts in unison by tens.

Ask a student to stand in front of the room and hold up four fingers.

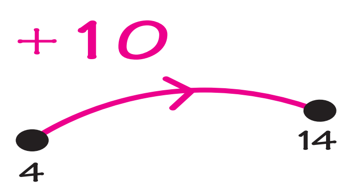
T: ***We have four fingers here. Who else would like to come up to the front and hold up all ten fingers?***

Choose a volunteer to join the first student.

T: ***How many fingers did we have at first?*** (Four)
How many fingers did we add to these? (Ten)
How many fingers are raised altogether?

S: ***14.***

Begin this arrow picture on the board.



T: ***We started with four fingers*** (point to the dot labeled 4)***. We added ten fingers*** (trace the arrow)***, and now have 14 fingers*** (point to the dot labeled 14)***. 14 is one ten*** (point to the student holding up 10 fingers) ***and four ones*** (point to the student holding up 4 fingers)***.***

Ask a third student to join the other two at the front of the class and to hold up all ten fingers.

T: ***We had 14 fingers and we added 10. How many fingers are raised now?***

S: ***24.***

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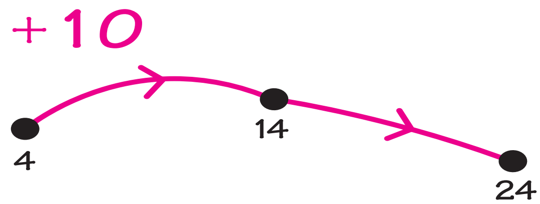
Add a second red arrow to your drawing.



T: ***We had 14 fingers*** (point to the dot labeled 14)***. We added 10 fingers*** (trace the arrow) ***and got 24 fingers*** (point to the dot labeled 24). ***24 is two tens and four ones.***

Ask someone to find 4, 14, and 24 on the 0–109 numeral chart.

Continue until the arrow picture includes dots for 54 or 64. If time remains and the students are still interested, you may wish to repeat the activity, beginning with seven fingers.

F96 GEOBOARD EXPLORATION

Capsule Lesson Summary

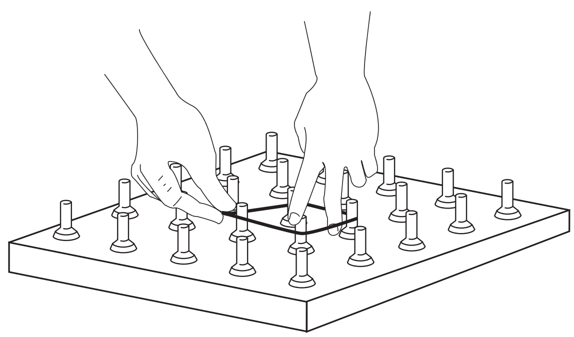
Explore using a geoboard to make shapes, designs, and pictures. Put triangles on the geoboard and investigate questions about pegs along the border and inside the triangles. Put on triangles that satisfy some given conditions. Repeat these activities for squares or rectangles on the geoboard.

Materials

Teacher		Student	
	• Overhead geoboard (optional)		• Geoboard and bands.

Description of Lesson

Depending on the number of geoboards you have available, distribute them to individuals or groups of students. Teach the students how to safely put geobands on the boards, and how to take them off without snapping their fingers or letting a band fly off. While putting a band on or removing a band, always keep a finger on top of one of the pegs on which the band is held.



Allow 10-15 minutes for students to freely explore with the geoboards. As you observe shapes, pictures, or designs students make, comment on those that are interesting in some way. For example, you may like to comment on symmetry, or designs made of several shapes, or pictures that look like letters or numerals. You may also invite some students to show their designs or pictures to the class and describe them.

Do one or two of the following exercises as class time allows. You may prefer to have students working with a partner and checking each other during these exercises. If you have an overhead geoboard, you may want to model the exercises, especially how to count pegs.

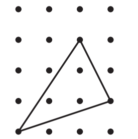
Exercise 1

Instruct students to use just one geoband for this activity. For each task there are many solutions.

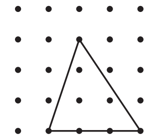
T: ***Make a triangle on your geoboard using just one band.***

When students complete the task ask them to count how many pegs the band is touching. By checking with several students, collect data about how many pegs the band could be touching.

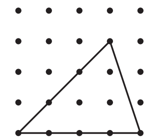
T: ***Make a triangle on your geoboard so that the band touches as few pegs as possible. How many?*** (Three)



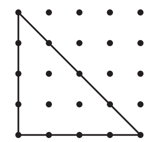
Make a triangle on your geoboard so that the band touches five pegs.



Make a triangle on your geoboard so that the band touches eight pegs.



Make a triangle on your geoboard so that the band touches as many pegs as possible. How many? (Twelve)



For each task, share some of the solutions and observe when triangles look the same (perhaps just by turning the geoboard).

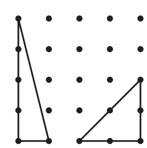
Exercise 2

Instruct students to use just one geoband for this activity. For each task there are many solutions.

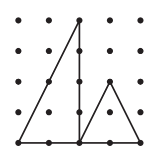
T: ***Make a triangle on your geoboard using just one band.***

When students have their triangle ready ask that they count the pegs completely inside the triangle. By checking with several students, collect data about how many pegs could be inside.

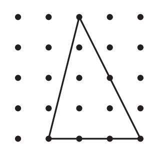
T: ***Make a triangle on your geoboard with as few pegs as possible inside the triangle. How many?*** (Zero)



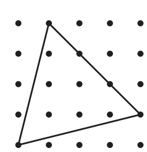
Make a triangle on your geoboard with one peg inside.



Make a triangle on your geoboard with four pegs inside.



Make a triangle on your geoboard with as many pegs as possible inside. How many? (Six)



(This last task is very difficult and you may like to pose it as a challenge project.)

Exercises 3 and 4

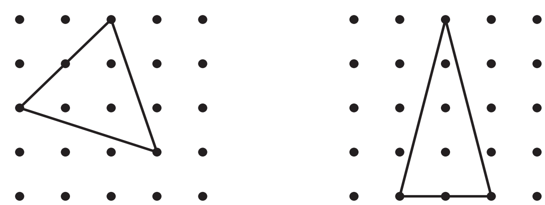
Repeat Exercises 1 and 2 using squares and rectangles rather than triangles.

Center Activity

Prepare some geoboard task cards for students to work on in a center. A sample task might be like the following:

- Use one geoboard. Make a triangle that touches 4 pegs and has 3 pegs inside.

Possible Solutions



F97.1 HIDDEN CHECKERS #2

Capsule Lesson Summary

Record number facts about an array of dots. Cover some of the dots and determine how many are hidden.

Materials

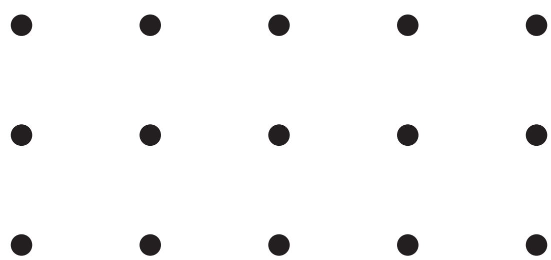
Teacher
- Large piece of paper or cardboard
- Ruler
- Checkers (optional)

Student
- None

Note: You may prefer to use an overhead projector to display the array of dots. If so, use pens or strips of paper to help show number facts.

Description of Lesson

Put this pattern of dots (or checkers) on the board. The dots should be clearly visible, but you must be able to cover several dots at a time with a sheet of paper.

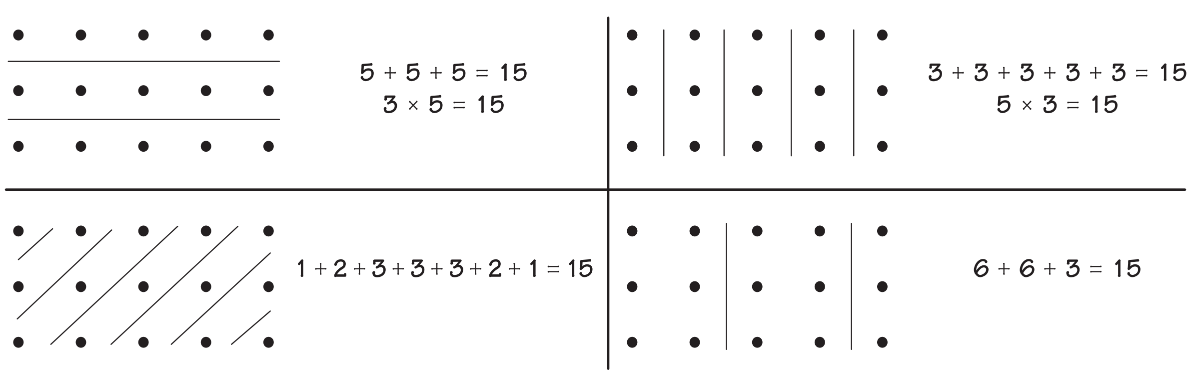


T: ***Look at this pattern of dots. What can you say about it?***

Let the students express themselves freely. You may wish to ask how many rows and columns of dots there are.

T: ***Who can tell me a number sentence about these dots?***

Accept and record any number sentence that can reasonably be associated with this pattern of dots. Use a ruler to help show the different number facts in this dot picture. Several examples are provided in the next illustration.



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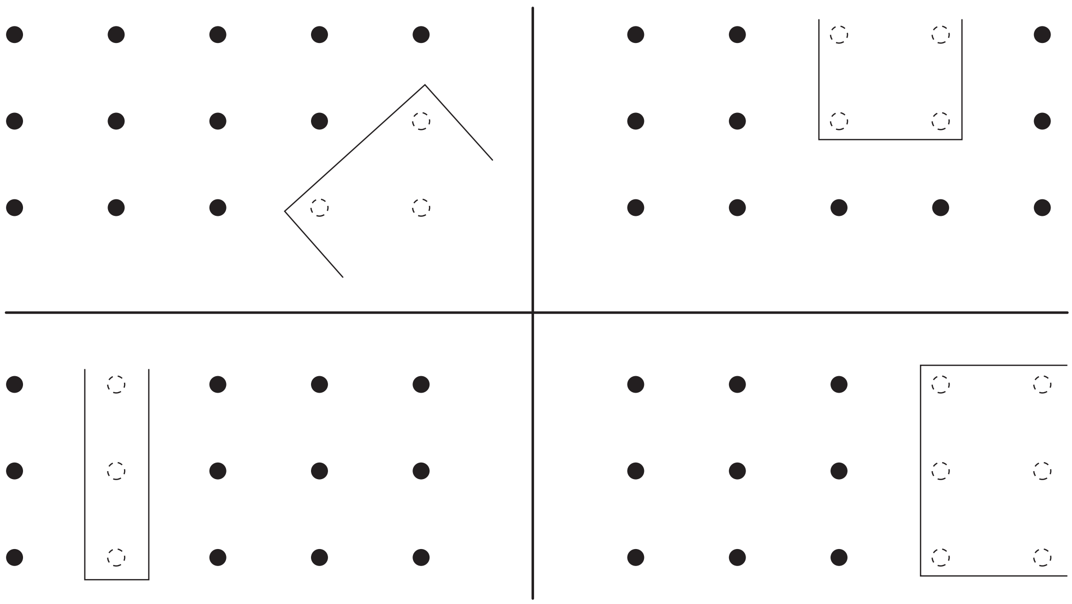
If no one suggests a multiplication fact, suggest one yourself. Continue accepting number sentences for as long as you feel is appropriate, but keep the pace of the lesson brisk.

With a sheet of paper, hide some of the dots and ask the students how many dots are hidden. Some examples are show in the next illustration.



You can continue this activity by covering other parts of this dot pattern or by using another dot pattern.

Home Activity

Send home a 3 x 4 array of dots. Suggest parents/guardians cover some of the dots with a piece of paper and ask, “How many dots can you see? How many are hidden?”

You may also suggest that they write some number sentences about the array of dots.

F97.2 COIN PROBLEM #2

Capsule Lesson Summary

Count the amount of a collection of coins and put together a collection of coins to make a given amount. Given two clues, discover how much money is in a container.

Materials

Teacher	• Six nickels • A small, opaque container • Collection of various coins	**Student**	• Paper

Description of Lesson

Before the lesson begins, put six nickels into a small container in which they are not visible, but may be heard clearly when the container is shaken. Also, if your class is not familiar with what detectives are and what they do, begin the lesson with a short discussion about them.

T: ***Today you will be detectives. You must discover how much money is in this container.***

Hold up the container and shake it. Allow a few students to shake the container, also.

T: ***What coins could be in this container?***

Accept a suggestion from a student and invite another student to select these coins from your collection. Suppose the first suggestion is three dimes.

T: ***There could be three dimes in this container. Three dimes are how many cents?***

S: ***30¢.***

Suppose another student suggests 100 pennies. Shake the container and ask this student to shake the container, also.

T: ***Do you still think there are 100 pennies in this container?*** (No)
Why not? (Because there aren't enough coins.)

Suppose a student suggests 27¢.

T: ***What coins could you use to make 27¢?***

Invite the student or another to choose coins from your collection to make 27¢. Accept any correct combination of coins. Try to keep this part of the lesson moving briskly. If your class gets stuck on one particular problem (such as a combination of coins that makes 27¢), allow the problem to remain unresolved and accept another student's suggestion for the coins' identity.

When specific combinations of coins are suggested, ask how many cents there are. When a certain number of cents is suggested, ask what combination of coins could equal that many cents. Do not record these suggestions on the chalkboard.

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Clue 1

T: ***Here is a clue: All of the coins in the container are nickels. How much money could be in this container?***

Accept some new suggestions. Continue as before, but emphasize that all of the coins are nickels. Suppose a student suggests 27¢.

T: ***Could we have 27¢ with only nickels?*** (No) ***Remember, all of the coins in this container are nickels.***

Suppose a student suggests eight nickels. Invite another student to select eight nickels from your collection.

T: ***Eight nickels are how many cents? How do you know?***

S: ***40¢; I counted by fives.***

How many cents are there in one nickel?

S: ***5¢.***

Ask the student holding eight nickels to place them, one at a time, on the table while the class counts by fives.

T: ***And eight nickels are how many cents?***

S: ***40¢.***

Continue accepting suggestions for as long as you think it is appropriate.

Clue 2

T: ***Here is another clue: There are six coins in this container. When you know how much money is in this container, whisper it to your neighbor*** (or write it on your paper).

Listen to or look at several responses. You may need to remind the class that all of the coins are nickels. Ask a student to answer aloud (30¢) and then reveal the coins in your container.

Center Activity

Put coins in "purses" and instruct students to record the amount of money in each purse. Or, write the amount of money to go into a purse and instruct students to place coins in the purse to make that amount.

F98.1 THE NUMBERS SPEAK #4

Capsule Lesson Summary

Review the relations *less than* and *more than*. Name some friends 14 might play with in an *is less than* arrow picture and label the dots accordingly. After all the dots have been labeled, decide where to draw other *is less than* arrows.

Materials

Teacher		Student	
	• Colored chalk		• None

Description of Lesson

Exercise 1

Tell your class that you are going to play a game and that they should not answer unless you point to them. Below is a sample dialogue.

T:	***3 is less than…?***	**S:**	***5.***
	5 is less than…?	**S:**	***9.***
	9 is less than . . .?	**S:**	***10.***
	10 is less than…?	**S:**	***11.***
	11 is less than…?	**S:**	***12.***
	12 is less than 19, and 19 is less than…?	**S:**	***50.***
	50 is less than…?	**S:**	***100.***
	100 is less than…?	**S:**	***200.***
	200 is less than…?	**S:**	***1,000,000.***
	1,000,000 is less than…?	**S:**	***1,000?***

T: ***No, 1,000,000 is not less than 1,000. 1,000,000 is less than…?***

S: ***2,000,000.***

If your students begin to give consecutive numbers, suggest a skip to encourage them to feel unrestricted. You may want to ask a student to write one of the larger numbers on the board, or you may prefer to write it yourself. As your students begin to tire of this activity, change to an *is more than* game.

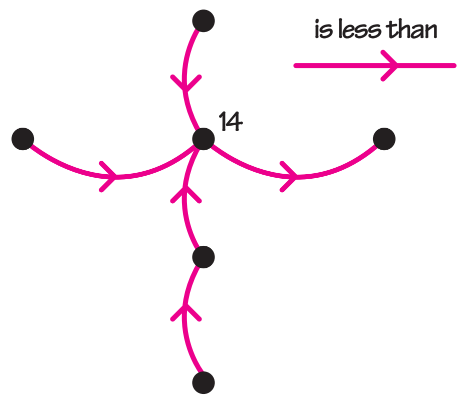
T:	***Now listen carefully.***		
	2,000,000 is more than…?	**S:**	***1,000.***
	1,000 is more than…?	**S:**	***500.***
	500 is more than…?	**S:**	***400.***
	400 is more than…?	**S:**	***200.***
	200 is more than…?	**S:**	***199.***
	199 is more than…?	**S:**	***0.***
	0 is more than…?		

If your part of the country has experienced some sub-zero weather this winter, one of your students may answer "two below zero" or "negative two." In this case, you might respond, "Very good; 0 is more than negative two ." If no one suggests any numbers like these, simply say,

T: ***Maybe now you don't know any numbers less than 0, but someday you will.***

Exercise 2

Draw this arrow picture on the chalkboard.



T: ***These numbers are speaking to each other. What are they saying?***

S: ***"I am less than you ."***

T: ***Who can show us a number that says "I am less than you" to another number?***

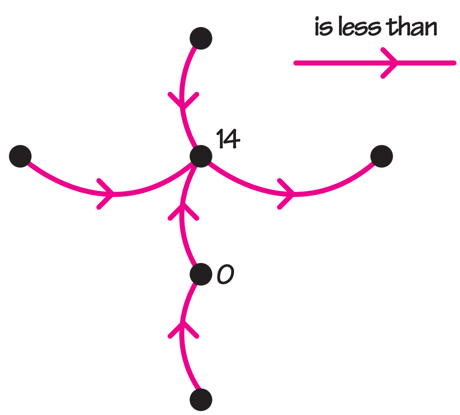
If, for example, a student points to the dot on the left, trace the arrow that begins at this dot and say, "This number is less than 14."

T: ***Today, you may choose some numbers to play this game with 14. Who would like to come up and label a dot?***

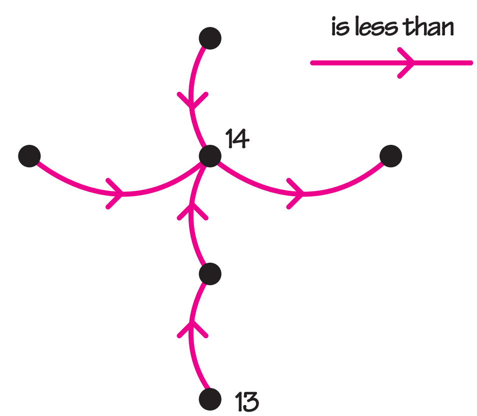
Be sure the students understand that there is more than one correct label for each dot. When a correct label is offered, ask the student to read that portion of the arrow picture. If, for example, the dot on the right is labeled 27, the student reads, "14 is less than 27."

Continue asking students to label dots until all of the dots have been labeled. You may need to remind students that the dots are for different numbers.

Note: It is possible for situations to develop that require the use of numbers other than whole numbers, as in the following examples.



First graders may not be aware of numbers less than 0, and might conclude that there are no such numbers. In this case, say, "You don't yet know numbers that are less than 0." If a student does suggest such a number, for example, one below zero or negative 1, accept this as correct and label the dot $\widehat{1}$, but do not emphasize it.



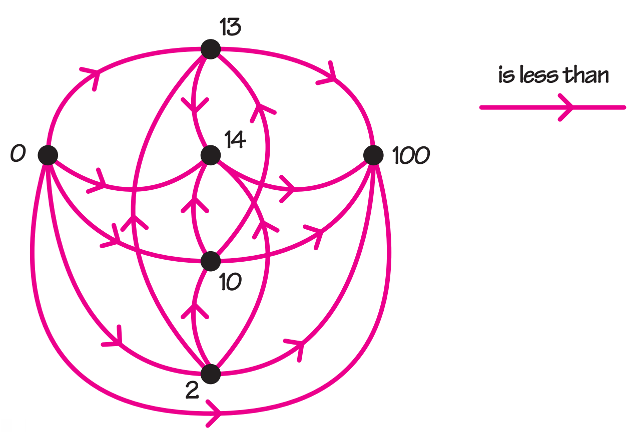
First graders may not be aware of numbers that are both more than 13 and less than 14, and might conclude that there is no such number. In this case, say, "You don't yet know numbers that are between 13 and 14." If a student does suggest such a number, for instance $13\frac{1}{2}$, accept this as correct and label the dot $13\frac{1}{2}$, but do not emphasize it.

Continue until all of the dots have been labeled.

T: ***Can we draw any more red arrows?***

Invite volunteers to do so. As each arrow is drawn, let a student read it to the class. The picture will become complicated very quickly .

Do not expect the students to find all of the possible arrows. For your information, a completed picture is shown below.



Center Activity

Place task cards with pictures similar to the one in this lesson in a center. Direct students to label the dots.

F98.2 STRING GAME WITH A-BLOCKS #2

Capsule Lesson Summary

Use logical reasoning to place A-blocks in a string and to decide on the correct string label.

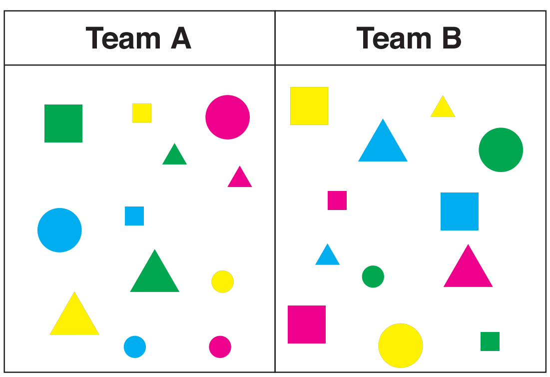
Materials

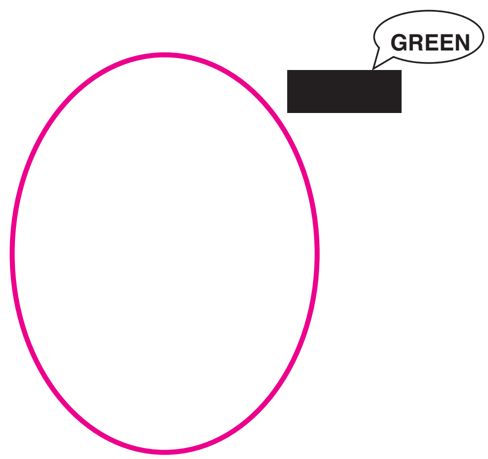
Teacher	• A-Block String Game kit	Student	• None

Description of Lesson

Before the lesson begins, prepare the team board and divide the class into two or more teams. With colored chalk, draw a string on the board and place the card **GREEN** next to the string, face down.

RED	YELLOW	GREEN	BLUE
NOT RED	NOT YELLOW	NOT GREEN	NOT BLUE
○	△	□	BIG
NOT ○	NOT △	NOT □	LITTLE





T: ***Do you remember the game we played a few weeks ago? This card tells what the string is for, but for now, it is a secret. You must guess where each of the pieces go.***

The string can have any of these labels (point to the list of possible string labels above the team board)***. Let's read them together.***

When one of the teams has placed all of its pieces correctly, the last player can tell me what the string is for and can win.

Before we begin, I will give you some clues. Each team can choose one piece that I will place correctly.

Proceed to play the game. If a piece is correctly placed, say "yes" and allow the piece to remain in the picture. If the piece is placed incorrectly, say "no" and return it to the team board. To assist you in judging, the correct placement of all pieces is shown on the next page.

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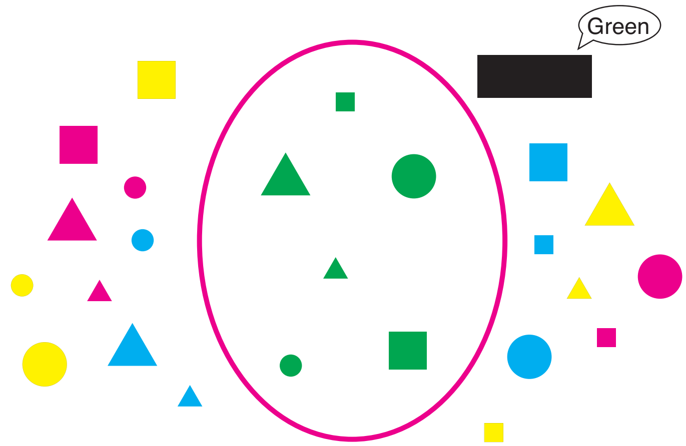
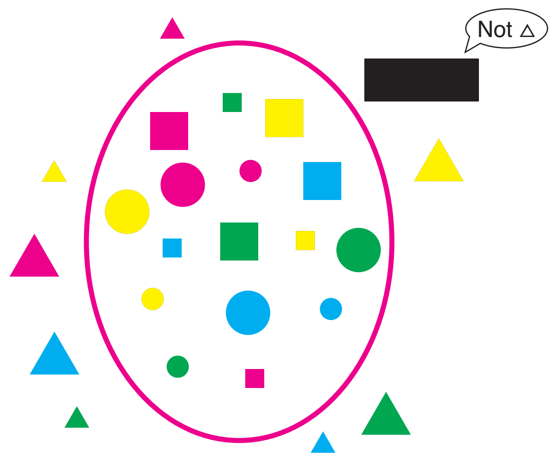


If your class enjoys this game and some time remains, play a second game using **NOT** △ for the string. From among the two teams' pieces, take a big piece and a little piece and place these two pieces appropriately.

The correct placement for all of the pieces is shown below.



If this game is too easy for most of your class, play a more difficult version. This time, place the string label card face down, but do not place any pieces as clues. Tell the class you are going to count how many pieces they try to put into the picture (correctly or incorrectly) before everyone is sure how the string is labeled.

Note: You may have students who guess the correct label before there is enough information. In this case, point out that the string could still have other labels.

F99 A SNAKE WITH 2x AND +3

Capsule Lesson Summary

Practice putting numbers on the Minicomputer and reading them. Write appropriate numerals below (above) the Minicomputer boards. Label the dots in an arrow picture which has 2x and +3 arrows.

Materials

Teacher	• Minicomputer set • Colored chalk	Student	• Colored pencils • Unlined paper • Minicomputer set (optional)

Description of Lesson

Exercise 1

Begin this lesson with five to ten minutes of putting numbers on the Minicomputer and reading them.

T: ***Who would like to put my secret number on the Minicomputer?***

Whisper a number to a volunteer, choosing a number of appropriate difficulty for that student. When the student has put the number on the Minicomputer, continue.

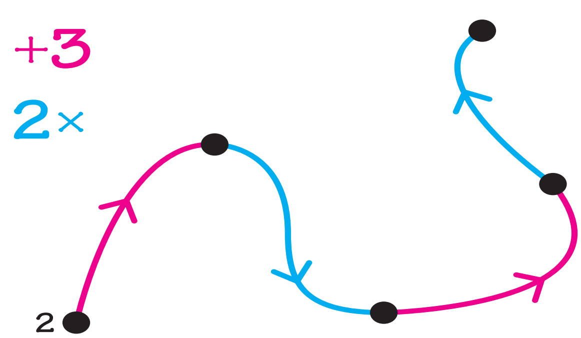
T: ***Who can write this number below (above) the Minicomputer?***

When this has been done, ask the first student if that, indeed, is the secret number.

Repeat this activity several times before continuing with the next exercise.

Exercise 2

Draw the following on the chalkboard and ask the students to copy it on their papers.

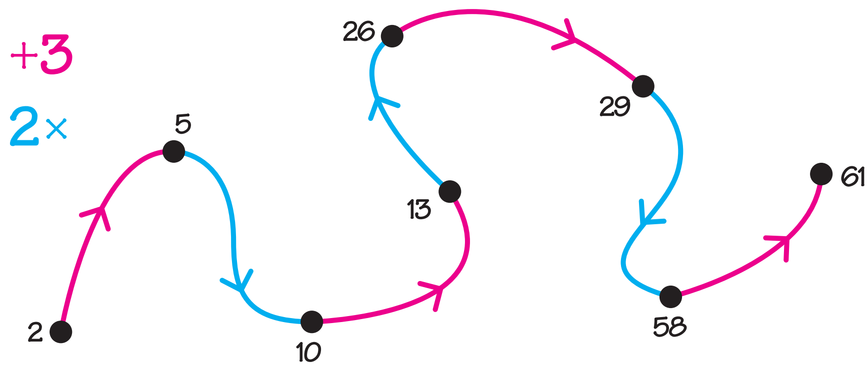


Label the dots in this arrow picture with student assistance. Instruct students to follow along by labeling the dots in their pictures. If no student suggests using the Minicomputer to calculate 2 x 13, suggest it yourself.

F99

When the dot for 26 has been labeled, extend the snake by adding another red arrow. You may wish to hold up three fingers and count “27, 28, 29” to calculate the number at the ending dot. Other methods include counting three to the right on the classroom number line or the 0–109 numeral chart.

Continue to draw alternating red and blue arrows until the dot for 61 is reached.



If your class remains interested, you may like to extend this arrow picture with a few more arrows. Or, if some of the students wish to continue on their own, encourage them to do so during free time; suggest that they use individual Minicomputers to calculate the numbers. (Students may either continue to draw alternating red and blue arrows or invent their own combinations of red and blue arrows.)

F100 ADJUSTMENT/ASSESSMENT DAY #9

Note: See Section One, page 1-9, for a full explanation of the purpose of scheduled adjustment days. Worksheet F100 provides a short, written assessment.

On this day you may wish to repeat an earlier lesson either for a group of students or for the entire class. Many of the lessons can be made to appear completely different by changing the story and/or the numbers in the lesson. If you omitted exercises or worksheets from an earlier lesson, you may like to include these. This is also a good time to allow students to work in centers or on a project of your choice.

The following activities may be appropriate for students who need additional practice.

Frogs on Lilypads

Distribute a workmat and between five and ten green counters to pairs of students. Tell students to pretend that the green counters are frogs. The workmat should have two circles or lilypads drawn on it. Tell the students a story about how the frogs are sitting on the lilypads with, for example, one frog on one lilypad and six on the other. Ask the students to place frogs on the lilypads to model your story.

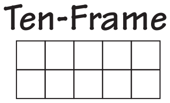
> How many frogs are there altogether? (Seven)
> Write a number fact for this story. (1 + 6 = 7 or 6 + 1 =7)
> Can you put the seven frogs on the lilypads another way?
> How many different arrangements can you find?
> Write number facts for all the different ways you find.

As you visit with students, you can ask questions such as:

> When five frogs are on one lilypad, how many are on the other?
> Can you predict how many different arrangements there will be?
> If you have five frogs on this lilypad and two on the other, how many more frogs are on the second lilypad?

Ten-Frames

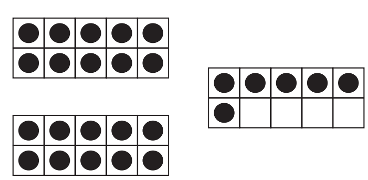
Ten-Frame



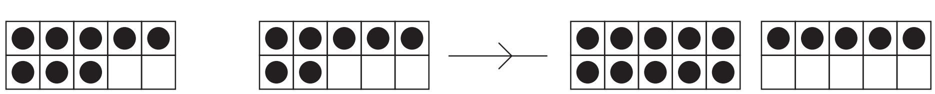
Make ten-frames on 3" x 5" index cards and use counters in the boxes to display numbers.

Introduce students to ten-frames and use ten-frames to display one- and two-digit numbers. For example,

26



Let students use ten-frames as an aid in practicing addition facts. For example,



8 + 7 = 15

F100

Dominoes

Give each student or pair of students a collection of dominoes with every sum between 0 and 12 represented in their collection. Hold up a domino and ask the students to tell you the total number of dots on your domino. Then, ask them to find a domino in their collection that has the same number of dots, another that has more dots, and still another that has less dots.

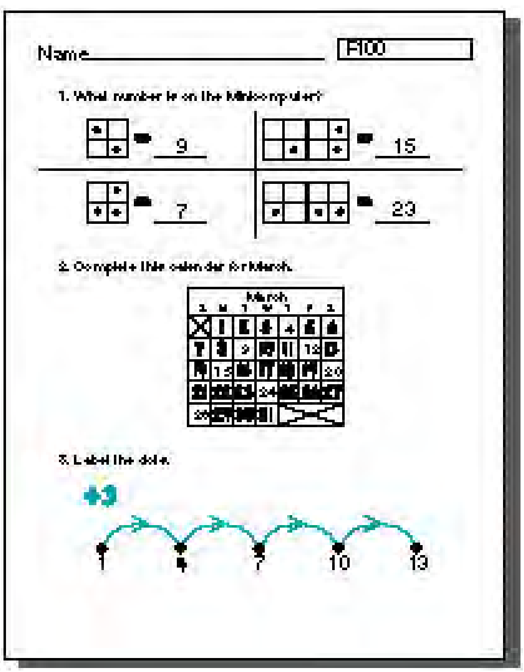
Ask students questions like the following: Did all of you find the same domino with the same number of dots? How are they the same? How are they different? Ask similar questions for dominoes with more or less dots.

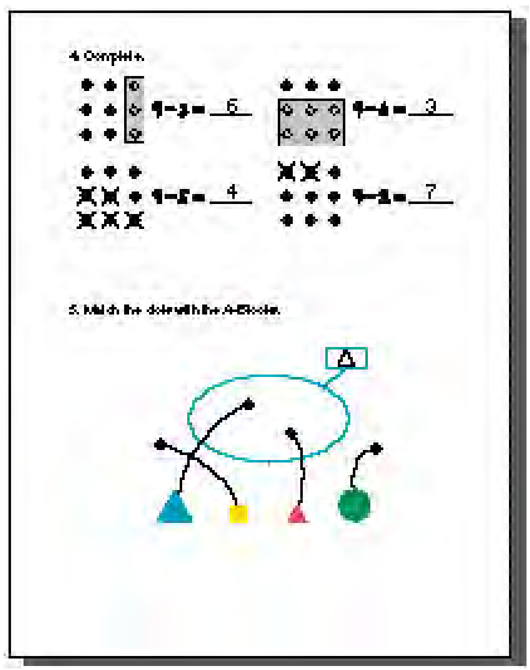
If your class is experiencing little difficulty with the *CSMP* curriculum, you may wish to omit this adjustment day and continue immediately with F101 *Trades on the Minicomputer #8*.

Early Warning

A few of the next nine classroom lessons require extra preparation time or make use of materials not included in the *CSMP* Classroom Set. These lessons are listed here for your convenience in preparing for them. A more detailed description of the necessary materials can be found on the first page of each lesson. (Special materials are listed here only once, even if they are needed more than once during the nine-day period.)

F102.2 *Taxi-Geometry*: Grid board
F104.1 *Counting by Tens #2*: Calculators; dimes and pennies
F105.1 *Fair Distribution #2*: Counters
F106.1 *Multiplication Story #3*: Egg cartons





F101 TRADES ON THE MINICOMPUTER #8

Capsule Lesson Summary

On the Minicomputer, show that calculating 40 + 20 and calculating 400 + 200 is similar to calculating 4 + 2. Review square values and making trades on the hundreds' board. Use the 800 + 200 = 1,000 trade to introduce a thousands board and read several numbers on this board.

Materials

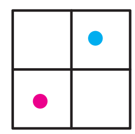
Teacher	• Minicomputer set	**Student**	• Minicomputer set

Description of Lesson

During this lesson ask students to follow the class activity on their individual Minicomputers. In Exercise 1, students will move checkers over a board when you add a board to the right.

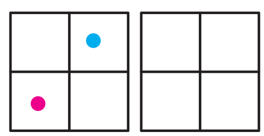
Exercise 1

Display one Minicomputer with this configuration of checkers.



T: ***What number is on the Minicomputer?*** (6)
What number is shown in blue? (4)
What number is shown in red? (2)
Yes; 4 + 2 = 6.

Write 4 + 2 = 6 on the board. Without removing the checkers, add a second Minicomputer board to the right.



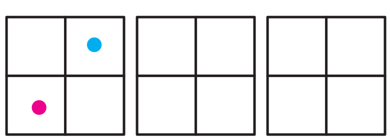
4 + 2 = 6

T: ***What number is on the Minicomputer now? How do you know?***

S: ***60, 6 tens is 60.***

T: ***What number is shown in blue?*** (40)
What number is shown in red? (20)

Write 40 + 20 = 60 below 4 + 2 = 6 on the chalkboard. Add a third Minicomputer board to the right of the other two.



4 + 2 = 6
40 + 20 = 60

T: ***What number is on the Minicomputer now? How do you know?***

S: ***600, because 400 + 200 = 600.***

Write 400 + 200 = 600 on the chalkboard.

F101

Note: If you feel your students are not ready to consider the thousands place, you may omit the following extension.

T: ***What number would we have if I put up another Minicomputer board?***

S: ***6,000.***

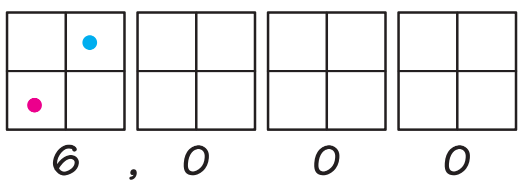
T: ***What number sentence could we write?***

S: ***4,000 + 2,000 = 6,000.***

Add a fourth Minicomputer board on the right.

T: ***Who can write this number below the Minicomputer?***

If necessary, insert the comma yourself.

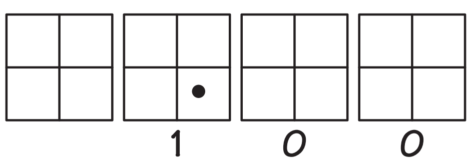


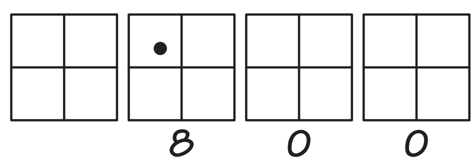
4	+	2	=	6
40	+	20	=	60
400	+	200	=	600
4,000	+	2,000	=	6,000

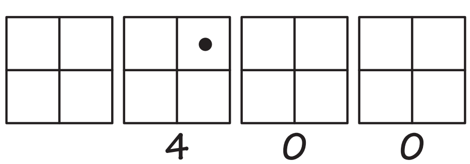
Repeat the exercise using 5 (as 4 + 1), 50 (as 40 + 10), 500 (as 400 + 100), and 5000 (as 4000 + 1000).

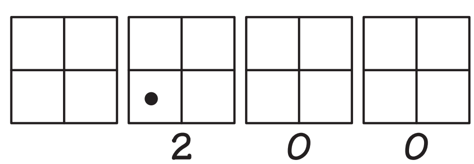
Exercise 2

Put the following numbers on the Minicomputer, one at a time, and ask students to read them. Also, occasionally ask a student to write the number below (above) the Minicomputer.



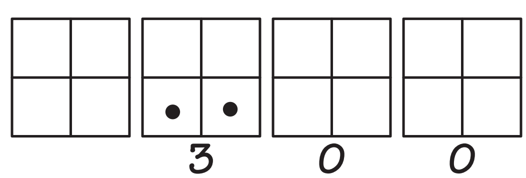




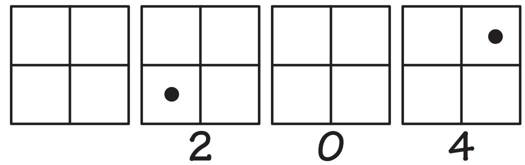


T: ***Who can put 300 on the Minicomputer?***

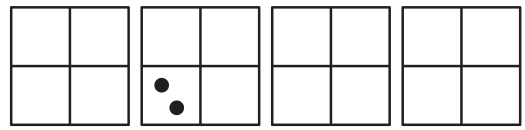
If a student suggests a non-standard configuration, accept it and ask who can make a trade to make the number easier to read.



T: ***Who can put 204 on the Minicomputer?***



Remove the checkers and put this new number on the Minicomputer.



T: ***What number is this?***

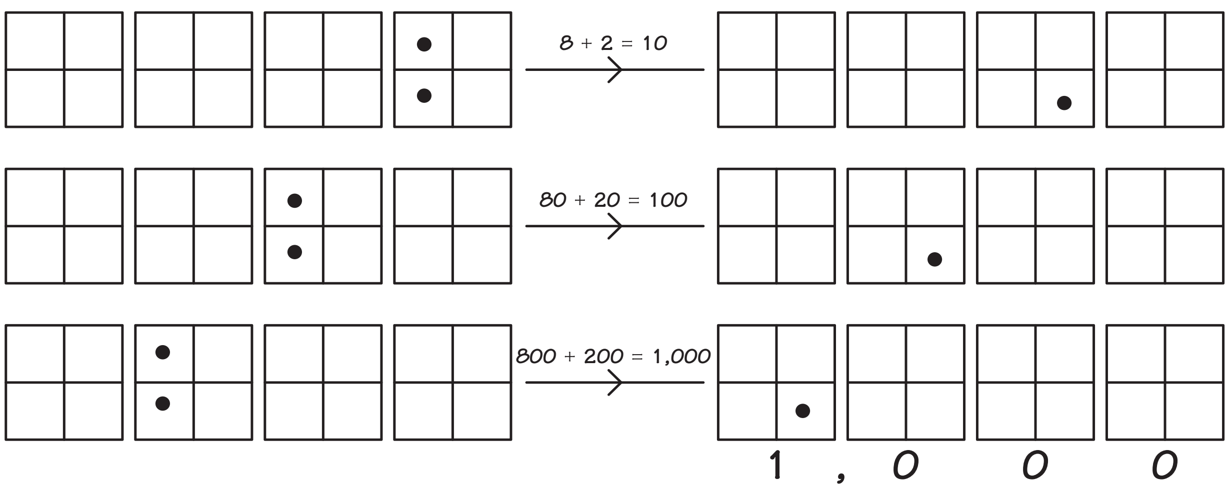
S: ***400.***

T: ***Who can put 400 on with just one checker?***

S (making the trade)**:** ***200 + 200 = 400.***

Emphasize using both hands to make a trade. Remove the checkers and then repeat the questions for 100 + 100 = 200 and 400 + 400 = 800.

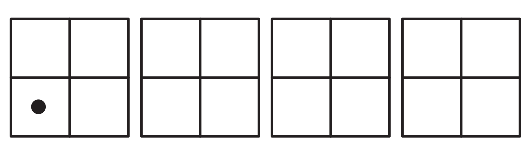
Review trades that move a checker to the next board in a similar way. Start with 8 + 2 = 10 and end with 800 + 200 = 1,000. Each time, put the number on with two checkers, ask what the number is, and then ask for the same number with just one checker. You may like to write the corresponding number sentences as in Exercise 1.



The students may not have seen the 800 + 200 = 1,000 trade but can probably guess how to make it. When they do, instruct them to make it using both hands and saying "800 + 200 = 1,000" while you write 1,000 below (above) the Minicomputer.

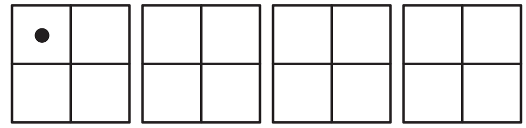
If students are unable to make this trade, put a checker on the 1-square and ask the class what number this is. Repeat for the 10-square, the 100-square, and finally for the 1,000-square.

T: ***Who can put 2,000 on the Minicomputer?***

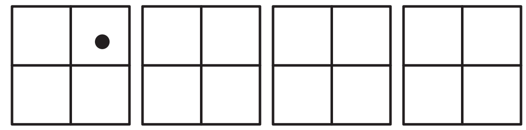


F101

T: *8,000?*



T: *4,000?*



Continue this activity by asking the student to put these numbers on the Minicomputer:

3,000 5,000 6,000 7,000 9,000

If the lesson has gone well and the class remains interested, continue with some other four digit numbers; for example,

4,008	4,200	9,401
2,010	6,024	3,428

F102.1 COMPOSITION OF FUNCTIONS #2

Capsule Lesson Summary

Label the dots in an arrow picture with +1 and +2 arrows. Draw a new arrow in the picture and decide that it could be for +3. Find where other +3 arrows can be drawn.

Materials

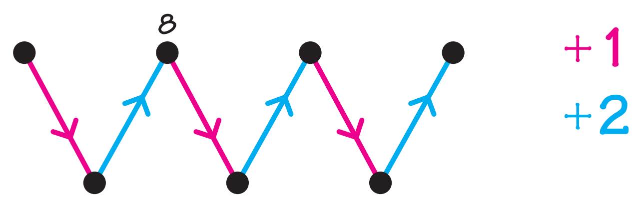
Teacher
- Colored chalk
- Counters (optional)

Student
- Worksheet F102.1

Advance Preparation: Draw the worksheet arrow picture on the chalkboard before the lesson begins.

Description of Lesson

Distribute copies of Worksheet F102.1 and call the students' attention to the same picture on the board. Students can follow along on the worksheet as the class adds information to the picture.

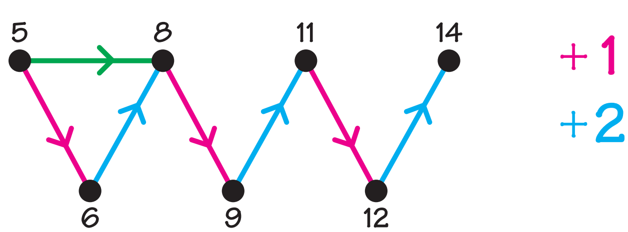


T: ***Who can label a dot for us?***

Choose a volunteer to label a dot. If the student labels a dot immediately preceding or following the dot labeled 8, check by saying the number fact as you trace the appropriate arrow. For example,

T (tracing the red arrow starting at 8)**:** ***8 plus 1 is 9.***

If the student labels a dot other than these two, suggest checking after some other dots have been labeled. Each time you read the number fact for an arrow, use a manipulative such as the number line, counters, or your fingers to verify the fact. Call attention to the fact on the worksheet. Continue until all the dots are labeled; then add this green arrow to your picture.



T: ***What could this green arrow be for?***

F102

There are many correct answers including “is less than.” If such an answer is given, state the corresponding number sentence. Then ask what else the arrow could be for. The most likely answer (and the one you are looking for) is +3.

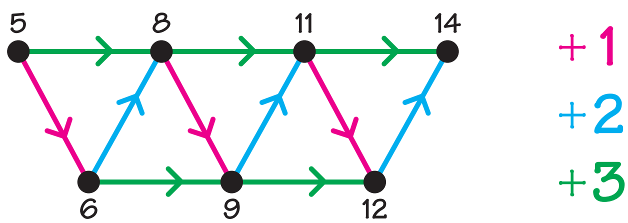
S: ***+3.***

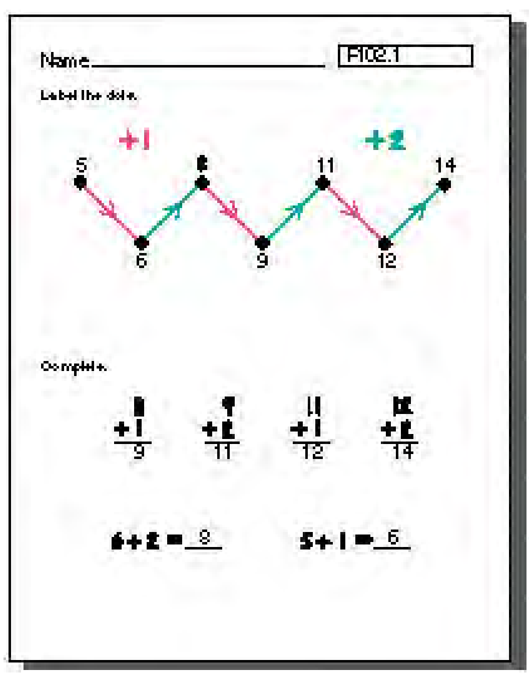
T: ***Good. 5*** (Point to the dot labeled 5) ***plus 3*** (trace the green arrow) ***is 8*** (point to the dot labeled 8)***.***

In green, write +3 near the picture and continue.

T: ***Where else could we draw green arrows?***

Call on students to draw green arrows. Each time an arrow is drawn, say the corresponding number fact as your trace the arrow, for example, “eight plus three is eleven,” and use the number line or counters to verify it. Continue until all possible green arrows have been drawn.




Name ____________ F102.1

Label the dots.

+1 +2

5 8 11 14

6 9 12

Complete.

8	9	11	12
+1	+2	+1	+2
9	11	12	14

6 + 2 = 8   5 + 1 = 6

F102.2 TAXI-GEOMETRY

Capsule Lesson Summary

Draw two different taxi-geometry paths between two points on a grid board and then compare their lengths. Measure by counting the number of blocks in each path.

Materials

Teacher
- Grid board†
- Colored chalk

Student
- Colored pencils
- Worksheet F102.2

Description of Lesson

On a grid board, draw and label two dots as on Worksheet F102.2.

T: ***This is a map of the city where Tina lives. Who can show me where Tina lives?***

S: ***At* T.**

T: ***Who remembers what* L *is for?***

S: ***The library.***

Moving your finger along any lines, remind the class that the lines on the grid are the streets of Tina's city. Point out that Tina always follows the streets when she walks to the library because she knows it is impolite to walk across people's yards.

Invite a student to trace a path from **T** to **L**, using a pointer or finger. Accept any suggested path that follows the grid lines. If necessary, repeat your explanation that the lines of the grid are the streets of the city.

Invite other students to trace paths from **T** to **L** on the grid board. If the paths are correctly traced and not especially long, use different colors of chalk (or markers) to draw them. Continue until two paths of different lengths are drawn on the board.

T: ***Here we have two different paths to the library that Tina could take. Which path do you think is longer?***

Allow the students to express their opinions.

T: ***Why do you think this path is longer?***

If no one suggests counting the blocks, suggest it yourself. In a top corner of your grid board, indicate the length of one block.

Let students measure the two paths on your grid board to determine which path is longer. Pay close attention to each student's counting technique and make corrections when necessary.

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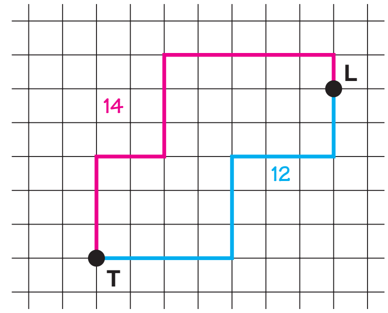
†Newsprint grid posters or an overhead tranparency are included with *CSMP* classroom materials and may be used for the grid on the board.

F102

Note: See the note on common mistakes students may make counting the blocks in a path in Lesson F76 *Tina Visits the Library*.

Record the number of blocks in each path in the color of that path, as shown in this illustration.



T: ***How much longer is the red path?***

S: ***Two blocks.***

T: ***Do you think Tina could take a path to the library that is longer than the red path? …shorter than the blue path?***

Allow a few minutes for discussion of these questions. If a student suggests and traces a path longer than the red path, compare its length to both the red and blue paths. There are other 12-block paths but no path from **T** to **L** is shorter than 12 blocks. Some students may observe this fact, but do not expect an explanation.

Distribute copies of Worksheet F102.2 and ask the students to draw two or three paths from **T** to **L** in different colors. Ask the students to count the number of blocks in each path and record this number next to the path on their worksheet. The back of the worksheet may be used by students who work quickly and want to draw still more paths. As the students work individually, circulate around the room, offering assistance where necessary. Some counting errors may be easily spotted because all paths from **T** to**L** will be an even number of blocks in length.

Extension Activity

Direct students to use the back of the worksheet to do the following:

- Locate a point for their house.
- Locate points for several friends' houses.
- Draw paths from their house to each friend's house.
- Find the lengths of the paths.

Writing Activity

Write a story about Tina's trip to the library. Which path did she take? How long was her trip? What did she see? Which path did she take home?

Home Activity

Send home a page like the worksheet and suggest students tell their families about Tina's paths from home(**T**) to the library (**L**). Students can work with family members to find several different paths and compare their lengths.

F103.1 SUBTRACTION ON THE MINICOMPUTER #2

Capsule Lesson Summary

Using the Minicomputer, decide how many pennies are left in each of three children's piggy banks after the children make purchases.

Materials

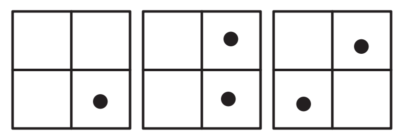
Teacher	• Minicomputer set	Student	• Minicomputer set

Description of Lesson

During this lesson students can work in pairs with a desk Minicomputer and follow the collective discussion.

T: ***I have three little friends with piggy banks in which they save pennies. When they are good, their parents let them take some of the pennies to buy something. One of the children, Jody, has 156 pennies in her bank. Let's put 156 on the Minicomputer.***

Choose a volunteer to put 156 on the demonstration Minicomputer while others put it on their desk Minicomputers.



T: ***She decides to spend 42 of her pennies. How many will she have left?***

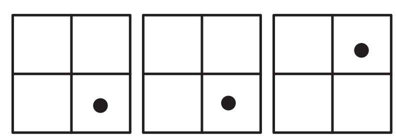
If you like, allow students to make estimates.

T: ***What problem should I write?***

S: ***156 – 42 = ?***

T: ***Let's take away 42 from the number on the Minicomputer.***

Select someone to take away checkers for 42 and someone else to write the result below (above) the Minicomputer.



1 1 4

T: ***114 pennies. Does anyone know another way to write 114¢?***

S: ***One dollar and 14 cents.***

Ask the student to write this on the chalkboard.

$1.14

Encourage students who guessed correctly to explain how they found the answer, but do not be concerned if they are unable to explain.

T: ***Jody's brother Brad has 114 pennies*** (note that this number is on the Minicomputer) ***but he likes to save money, so he only spends 12 pennies. How many will he have left? What calculation should we write?***

F103

Ask a student to write this calculation on the chalkboard. However the student writes the calculation, put both vertical and horizontal formats on the chalkboard.

$$\begin{array}{r} 114 \\ -\ \ 12 \\ \hline \end{array} \qquad\qquad 114 - 12 =$$

T: ***How many pennies are left?***

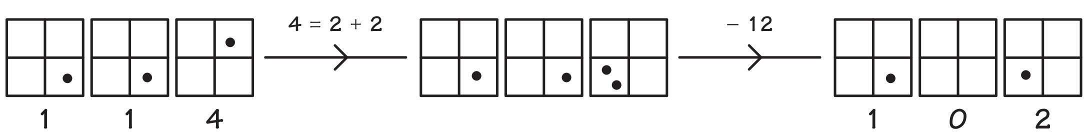
If you like, allow several students to make estimates and record them on the chalkboard.

T: ***Let's take away 12¢.***

S: ***I can take away 10, but there is no checker on the 2-square for me to take away.***

S: ***We need a backward trade.***

Invite a student to make the 4 = 2 + 2 backward trade and another to take away 12. Write the result below (above) the boards and complete the calculation.



$$\begin{array}{r} 114 \\ -\ \ 12 \\ \hline 102 \end{array} \qquad\qquad 114 - 12 = 102$$

Encourage students who guessed correctly to explain how they found the answer, but do not be concerned if students do not offer good explanations.

Invite a student to write the solution (102 pennies) in dollars and cents: \$1.02. Then remove the checkers from the Minicomputer.

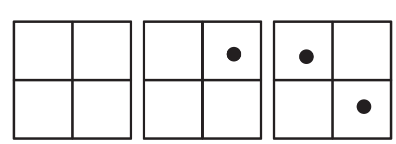
T: ***Jody and Brad have a little sister named Ruthie. Ruthie has only 49 pennies and she decides to spend 24 of them. How many will she have left? What calculation should we do?***

Ask a student to write this calculation on the chalkboard (again, use both formats).

$$\begin{array}{r} 49 \\ -\ 24 \\ \hline \end{array} \qquad\qquad 49 - 24 =$$

If you like, allow several students to make estimates and record them on the chalkboard.

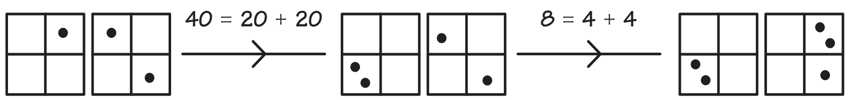
Choose a volunteer to put 49 on the Minicomputer while students put the number on their desk Minicomputers.



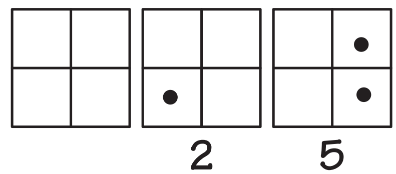
T: ***Let's take away 24.***

S: ***We need to make backward trades first.***

In this case, two backward trades are needed. The class may observe this or you may need to ask where they need to get checkers. Invite students to make the trades (the order is not important).



Call on a student to take away checkers for 24 and another student to write the result below (above) the Minicomputer boards.



Complete the calculation at the chalkboard.

$$\begin{array}{r} 49 \\ -\ 24 \\ \hline 25 \end{array}$$

$$49 - 24 = 25$$

Encourage students who gave an exact estimate to explain how they found the answer, but do not be concerned if no one offers an explanation.

Center Activity

Place individual Minicomputers and similar subtraction problems in centers for students to solve.

Writing Activity

Instruct students to write a story about how many pennies they (or a friend) have in a piggy bank. Ask them to tell how many they will spend, what they will buy, and how many they will have left.

F103.2 THE NUMBER LINE GAME

Capsule Lesson Summary

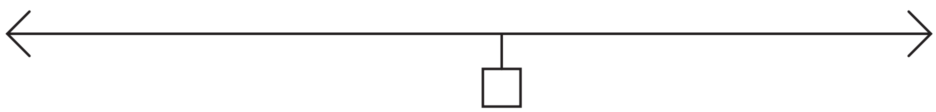
Introduce the Number Line Game in which students discover a secret number by determining its location on the number line relative to the location of other numbers they guess.

Materials

Teacher • None **Student** • None

Description of Lesson

Draw a number line on the chalkboard. Choose a point near the center of the line and label it with an empty box.



T: ***Let's play a game with the number line. I am thinking of a number between 0 and 50.***

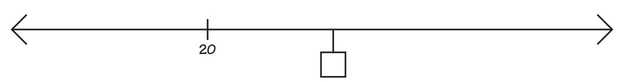
On this number line, my secret number goes right here (point to the box)***, but it is hidden in this box. You must guess my secret number.***

Ask a student to make a guess. If the number suggested is not between 0 and 50, remind the class of the parameters, and ask for another guess. The following sample dialogue assumes that your secret number is 37.

S: ***Is your number 20?***

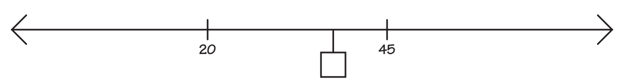
T: ***No, 20 is less than my number. I'll show you where 20 is on the number line. This might not be exactly the right place, but I'll try to be as accurate as I can.***

T: ***20 is less than my number. Another guess?***



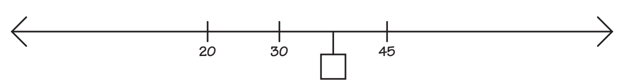
S: ***45.***

T: ***45 is more than my number.***



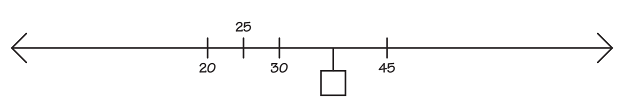
S: ***30.***

T: ***30 is less than my number.***



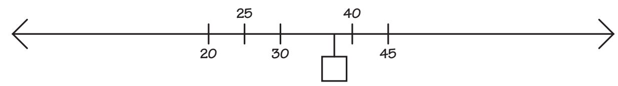
S: ***25.***

T: ***25 is less than my number.***



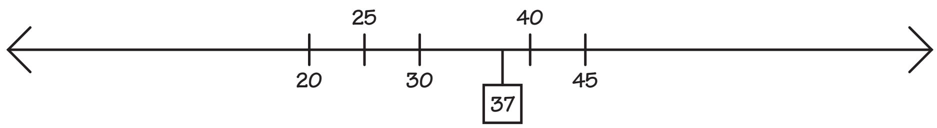
S: ***40.***

T: ***40 is more than my number.***



S: ***37.***

T: ***Correct!***
37 is my secret number.



Play the game a few more times, choosing other secret numbers between 0 and 50. You may wish to let the student who guessed correctly choose the next secret number, whispering it to you.

Home Activity

This would be a good time to send home a letter about mental arithmetic. Suggest in the letter that parents/guardians practice mental arithmetic with their child. Blackline F103.2 has a sample letter.

F104.1 COUNTING BY TENS #2

Capsule Lesson Summary

Use the 0–109 numeral chart to practice reading numerals and looking at patterns in columns. Count the fingers of students in each row (or at each table) by tens. Do an addition problem to find how many fingers there are in the room. Use counting by tens to find how much is in a collection of dimes or a collection of pennies and dimes.

Materials

Teacher
- 0–109 numeral chart
- Calculator
- Minicomputer set
- Dimes and pennies

Student
- 0–109 numeral chart
- Calculator

Description of Lesson

Exercise 1

Instruct the class to read together down the first column of the 0–109 numeral chart. Ask students to read aloud other columns of the numeral chart. Continue until several columns of the chart have been read. Observe patterns and counting by tens.

Exercise 2

T: ***How many students do we need to show 100 fingers?***

S: ***Ten.***

Call on ten students to hold up their hands and instruct the class to count these fingers, by tens, collectively.

T: ***Ten students have 100 fingers. How many fingers do the students in this classroom have altogether?***

Allow the students to discuss this question briefly. A few students may be able to count by tens well enough to determine the answer by counting.

T: ***Let's count how many fingers there are in this row (or at this table) alone.***

Altogether, count the fingers in this group of students by tens and record the number on the board. Continue in this manner until the number of fingers for each row (or table) has been recorded.

T: ***Now we know how many fingers are in each row (or at each table). How can we calculate how many fingers there are altogether?***

Perhaps a student will suggest using the Minicomputer or a calculator. Do the calculation with one of these tools. For example, using the Minicomputer invite a representative from each group of students to put the group's number (of fingers) on the Minicomputer. Ask volunteers to make trades, being prepared to suggest backward trades when necessary. If you use a calculator, let each group add its number. Compare the number of students in the class today with the total number of fingers.

F104

You may like to observe how the class could use a counting calculator (counting by 10s) to count all the fingers. That is, start with 0 on the display and press [+] [1] [0]. Then each student in turn presses [=].

Exercise 3

Discuss what other uses there are for counting by tens. Suggest, or encourage students to suggest, counting the amount (cents) of money in a collection of dimes. Use a collection of dimes and let students count by tens to find the amount. Repeat this activity for a collection of a few pennies (for example, 3) and several dimes. This time you can count by tens starting at 3.

Home Activity

Suggest to parents/guardians that they find opportunities to count by tens with their child such as to calculate an amount of money with dimes.

F104.2 COMPOSITION OF FUNCTIONS #3

Capsule Lesson Summary

Label the dots in an arrow picture with –1, –2, and –3 arrows. Draw missing –3 arrows.

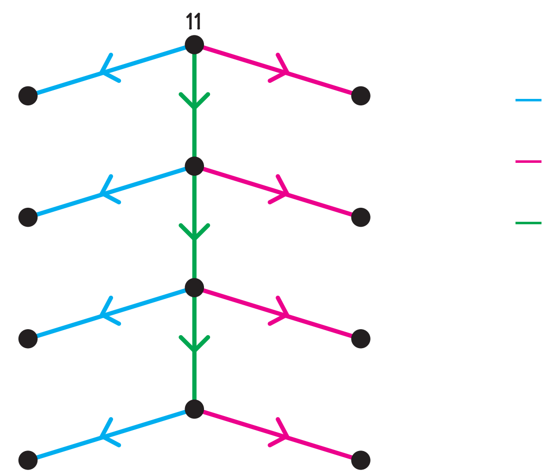
Materials

Teacher • Colored chalk

Student • Worksheets F104.2* and **

Description of Lesson

Draw this arrow picture on the chalkboard.



T: ***What are the blue arrows for?***

S: ***–1.***

Start at the top dot and trace the blue arrow.

T: ***11 minus 1 is…?***

S: ***10.***

Invite a student to write 10 next to the dot at the end of this blue arrow.

T: ***What are the red arrows for ?***

S: ***–2.***

Start at the top dot and trace the red arrow.

T: ***11 minus 2 is…?***

S: ***9.***

Invite a student to write 9 next to the dot at the end of this red arrow.

T: ***What are the green arrows for?***

S: ***–3.***

Start at the top dot and trace the green arrow.

T: ***11 minus 3 is…?***

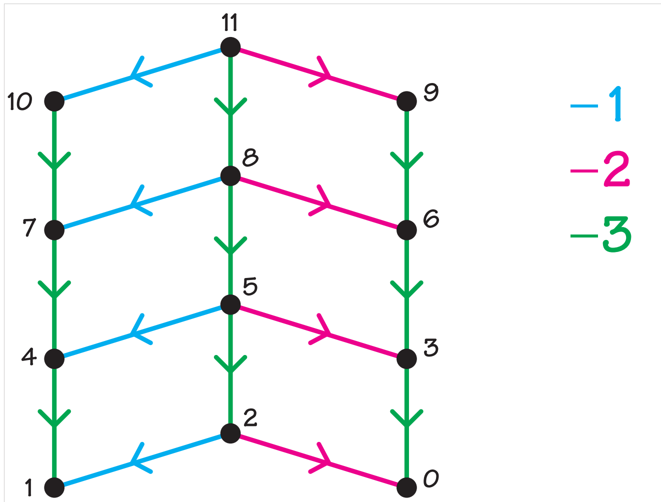
S: ***8.***

Invite a student to write 8, next to the dot at the end of this green arrow.

Call on students to label the other dots; each time, say the appropriate number fact yourself. When all the dots are labeled, ask students to look for any missing green arrows. Each time a green arrow is drawn, say the appropriate number sentence and ask if that fact is a true one.

F104

The completed picture (including the additional green arrows) is shown below.

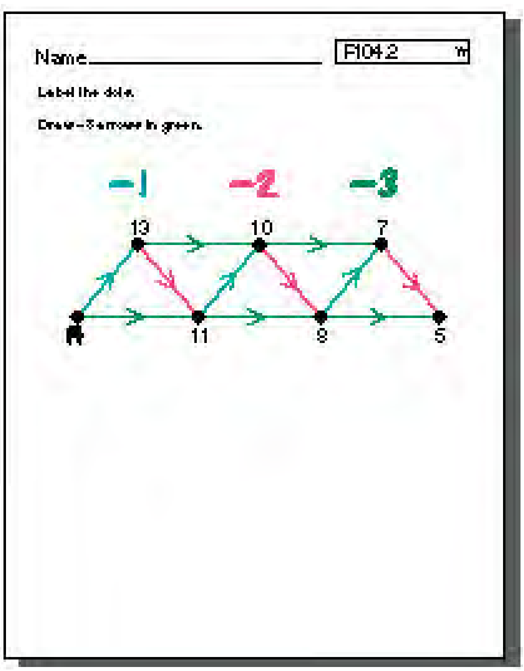


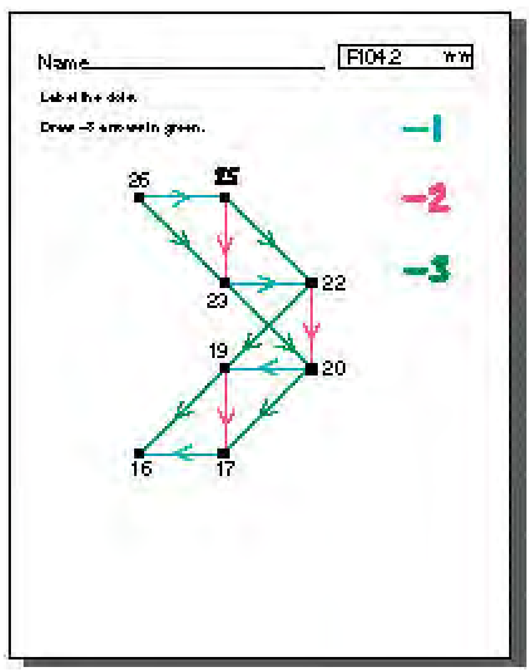
It is, of course, possible to include more –1 arrows (10 to 9, 9 to 8, 7 to 6, 6 to 5, 4 to 3, 3 to 2, and 1 to 0); and more –2 arrows (10 to 8, 9 to 7, 7 to 5, 6 to 4, 4 to 2, and 3 to 1). Do some of these if the class wants to continue, but do not insist that all possible –1 arrows and –2 arrows be drawn.

Distribute Worksheet F104.2* and **. Direct the students to label dots and then to draw as many –3 arrows as they can.

Center Activity

Prepare task cards with pictures similar to the one in this lesson or in Lesson F102.1. Instruct students to label dots and/or draw additional labels.





F105.1 FAIR DISTRIBUTION #2

Capsule Lesson Summary

Start with 16 checkers. Put one half of them into one pile and the other half of them into another pile. Write number stories related to the situation.

Materials

Teacher • None

Student • Counters

Description of Lesson

Distribute counters to student pairs. Ask the partners to take out 16 counters and place them on the desk or table in front of both of them. You may like to suggest that the counters represent cookies, toys, pennies, and so on.

T: ***Put one-half of the counters into one pile and the other half into a second pile. Share the counters equally between the two of you.***

Do not provide hints on how this might be done. Observe the students' various methods and, when most of the students are finished, compliment those whose methods demonstrate some organization. For example,

T: ***Mark and Andrea had a good way of putting the counters into two piles. They put one counter in Mark's pile and then one counter in Andrea's pile. Then they put another counter in Mark's pile and another in Andrea's pile, and so on until they had put all of the counters into two piles. Both piles have the same number of counters.***

Isaac and Danielle had a different method of sharing the counters. First they each took five counters. Then they divided the remaining six counters, each taking three counters.

How many counters are there in each pile? (Eight)
Who can tell me a number fact about these piles of counters?

S: ***8 + 8 = 16.***

S: ***2 x 8 = 16.***

S: ***$^1/_2$ x 16 = 8.***

If no one mentions this last number fact, ask, "What is one-half of 16 counters?" and then ask for the number fact.

As the various facts are suggested, write them on the chalkboard.

$$8 + 8 = 16$$

$$2 \times 8 = 16$$

$$^1/_2 \times 16 = 8$$

F105

Repeat this sharing activity with 12 counters.

Reading Activity

If you did not read the book *The Doorbell Rang* by Pat Hutchins with an earlier lesson, you might like to use it here.

Read the first pages where two children share. Continue the story and act out the pages with one group of counters and more children joining each time. Write number sentences to go with each page. Discuss the changes.

$$\frac{1}{2} \times 12 = 6$$

$$\frac{1}{4} \times 12 = 3$$

$$\frac{1}{6} \times 12 = 2$$

$$\frac{1}{12} \times 12 = 1$$

Capsule Lesson Summary

Provide individual practice with the Minicomputer, arrow pictures, counting problems, string pictures, and so on in the workbook.

Materials

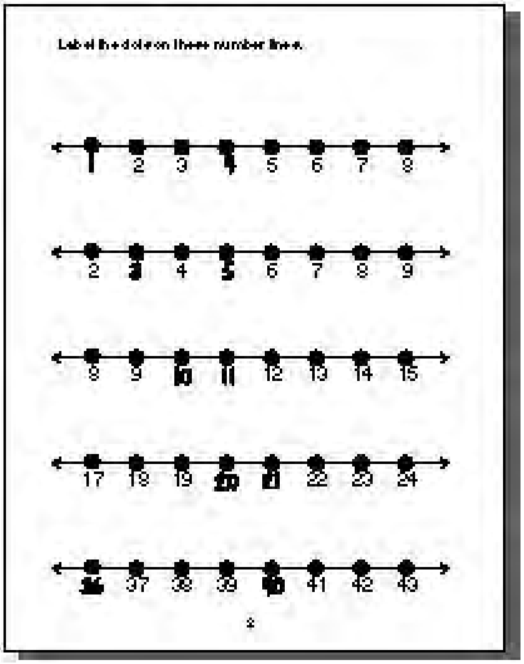
Teacher	• None	**Student**	• *Parade of Problems #2* Workbook • Colored pencils

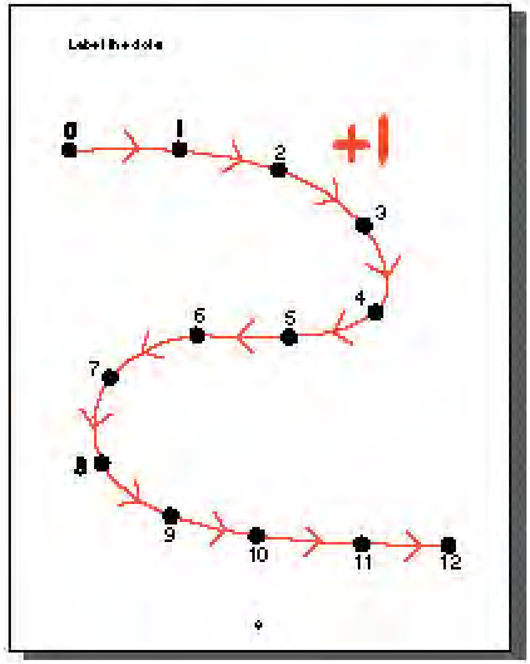
Description of Lesson

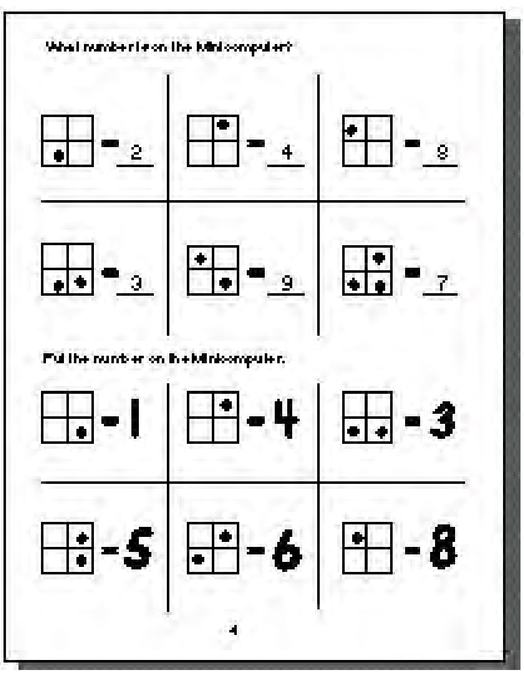
Distribute copies of the workbook *Parade of Problems #2* and allow students to work at their own rates. Circulate among the class to give individual help where it is needed. Encourage the students to work carefully and to check their work.

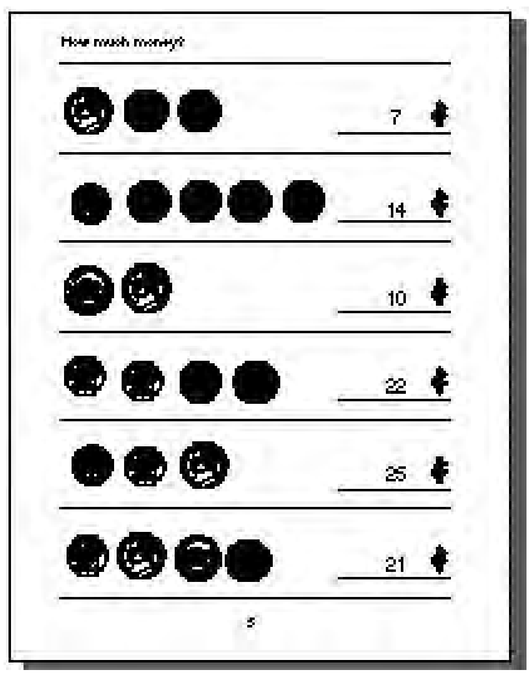
Allow about twenty minutes for this independent work. Because the pages of the workbook increase in difficulty as the students progress through them, some students will naturally complete more pages than others. Still there should be enough exercises that even you brightest students will remain challenged.

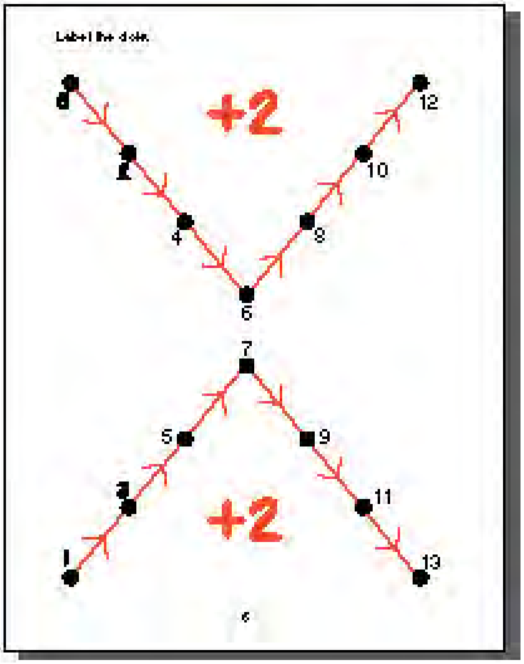
A second lesson is scheduled for this workbook so when the period is over, collect the workbooks for your review. On the workbook cover, you may like to indicate which pages are complete and which pages need some corrections by students when the workbooks are used again (Lesson F115.2).

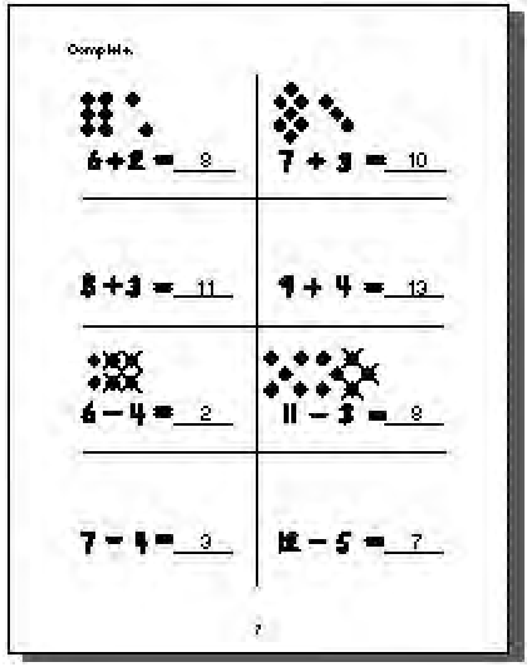

Label the dots on these number lines.


Label the dots.
+1


What number is on the Minicomputer?
Put the number on the Minicomputer.

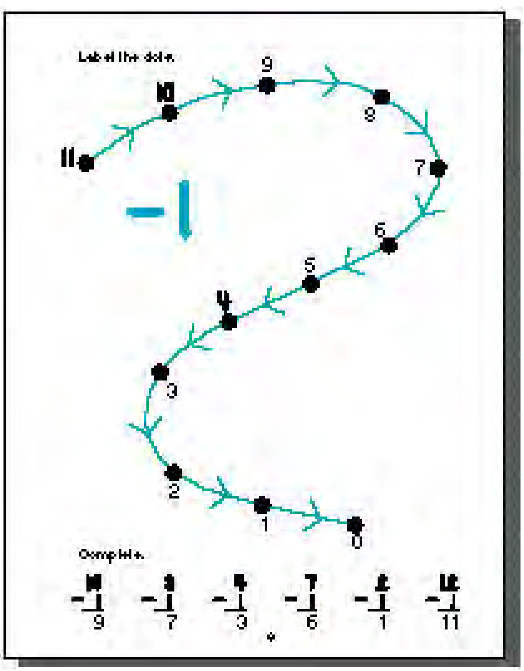

How much money?




Complete.

6 + 2 = 8
7 + 3 = 10
8 + 3 = 11
9 + 4 = 13
6 − 4 = 2
11 − 3 = 8
7 − 4 = 3
12 − 5 = 7

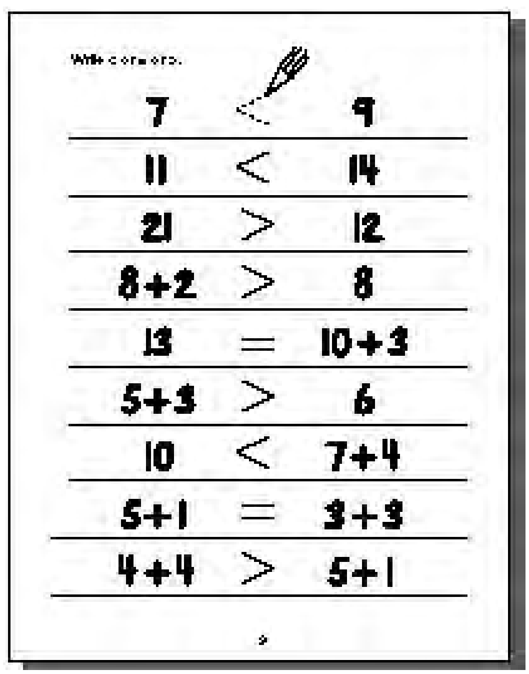
7



Complete.

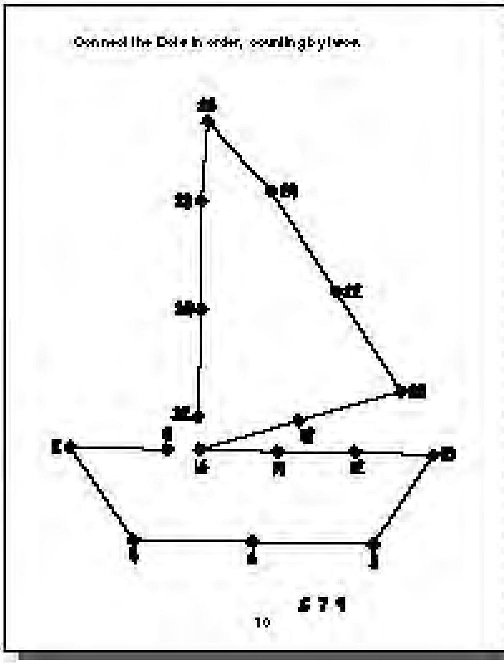
10	8	4	7	2	12
− 1	− 1	− 1	− 1	− 1	− 1
9	7	3	6	1	11

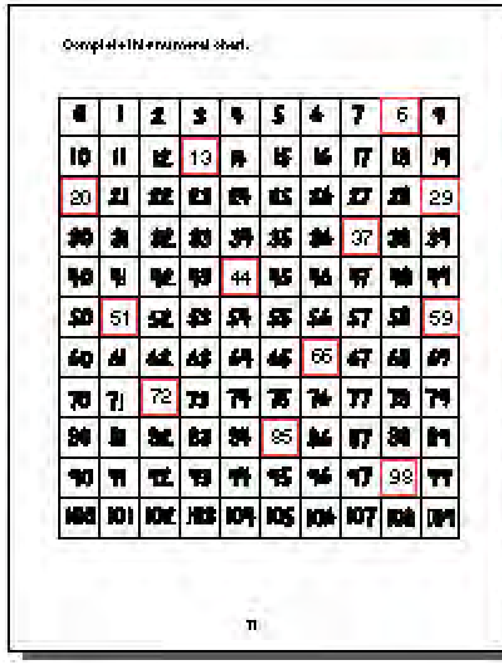
8


Write > or <.

7	<	9
11	<	14
21	>	12
8+2	>	8
13	=	10+3
5+3	>	6
10	<	7+4
5+1	=	3+3
4+4	>	5+1

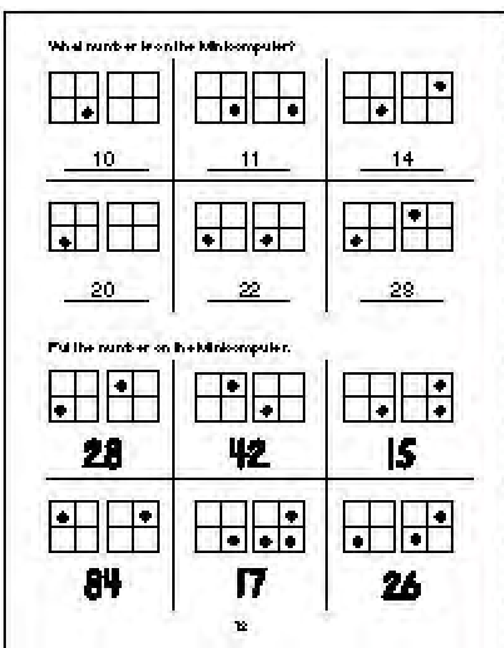
9

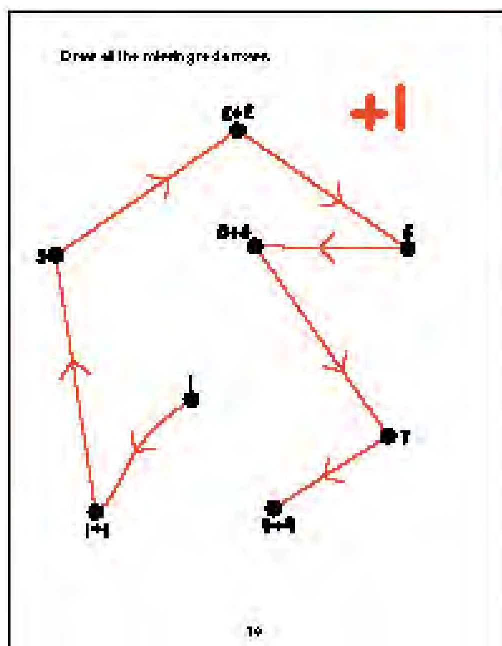


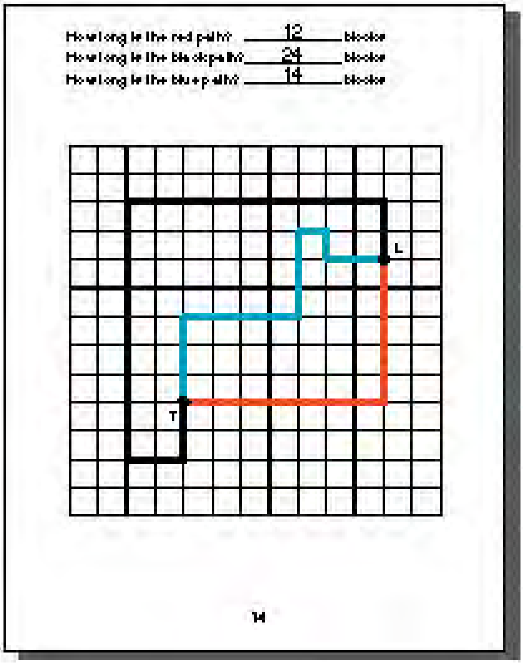


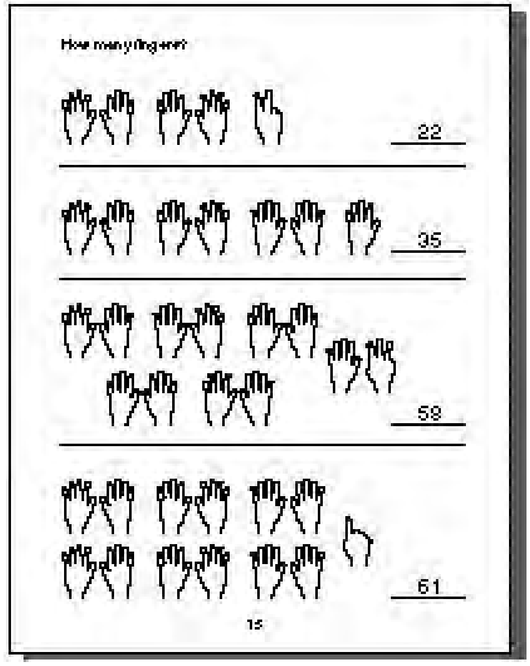
0	1	2	3	4	5	6	7	6	9
10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29
30	31	32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47	48	49
50	51	52	53	54	55	56	57	58	59
60	61	62	63	64	65	66	67	68	69
70	71	72	73	74	75	76	77	78	79
80	81	82	83	84	85	86	87	88	89
90	91	92	93	94	95	96	97	98	99
100	101	102	103	104	105	106	107	108	109

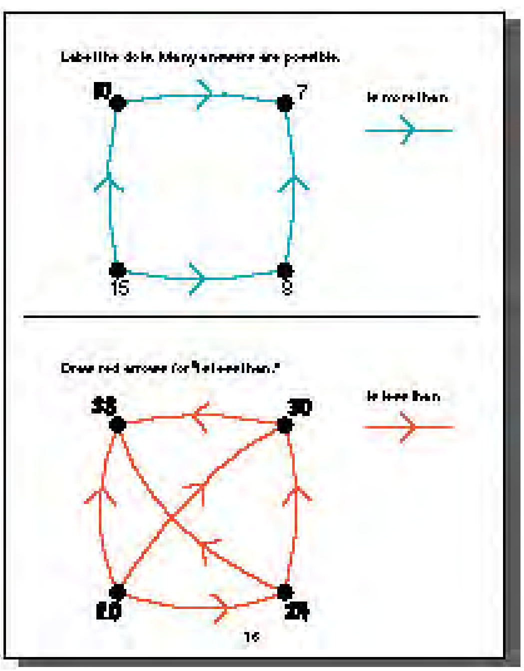
11

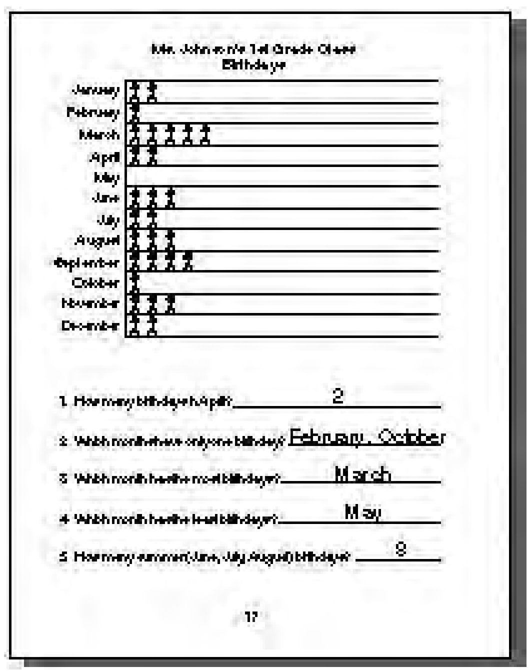


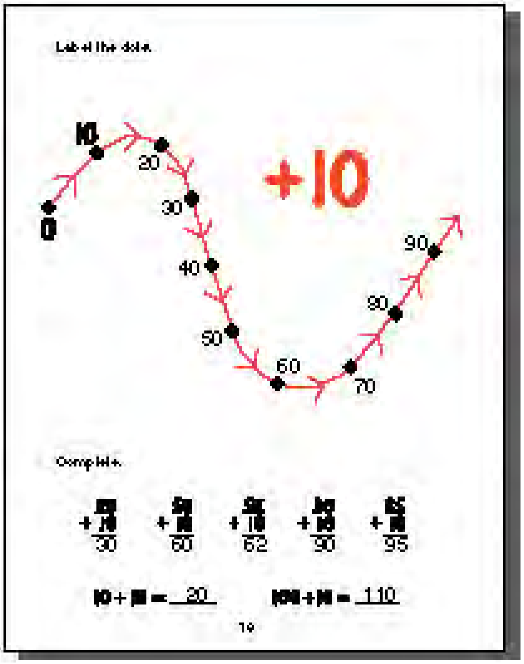


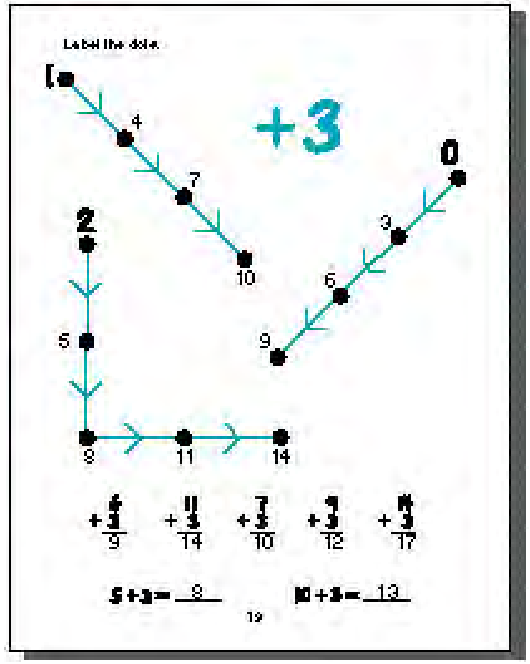

12
24
14
L
T
14

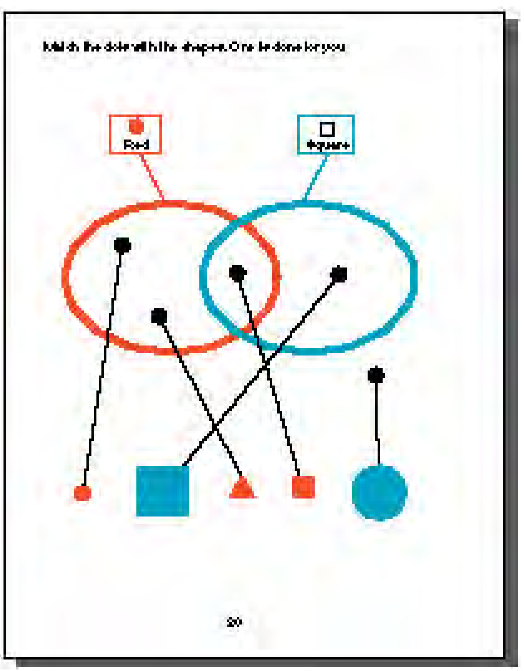

22
35
58
61
15

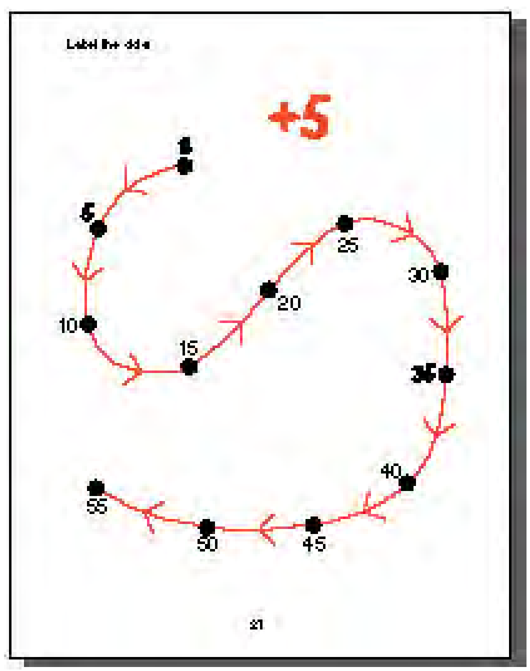

7
15
16

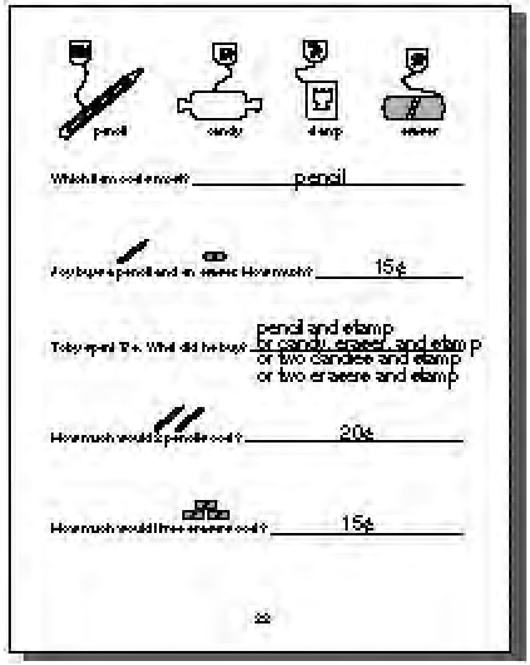

2
February, October
March
May
17

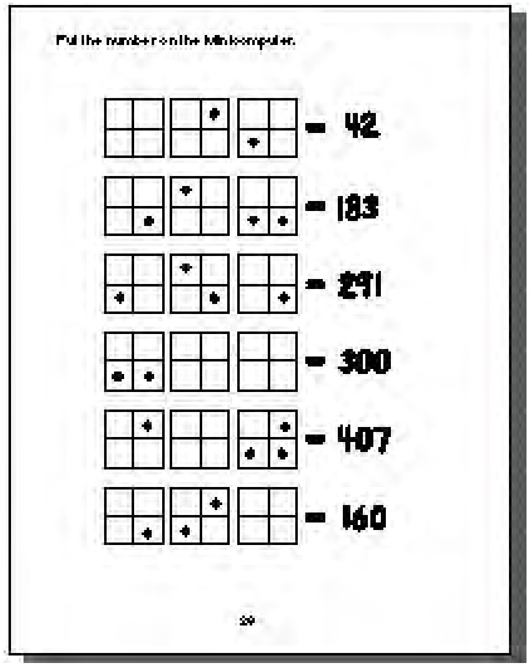

Label the dots.
+10
0
20
30
40
50
60
70
90
90
Complete.
30
60
62
90
95
20
110
19

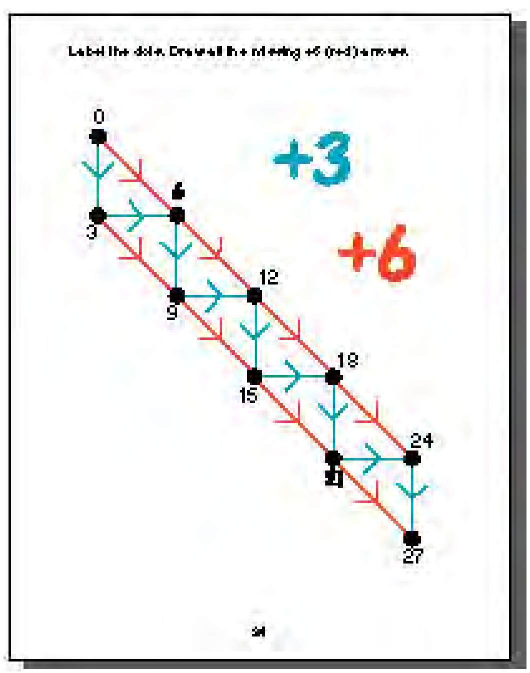

Label the dots.
+3
4
7
10
0
3
6
9
2
5
8
11
14
9
14
10
12
17
8
13
19

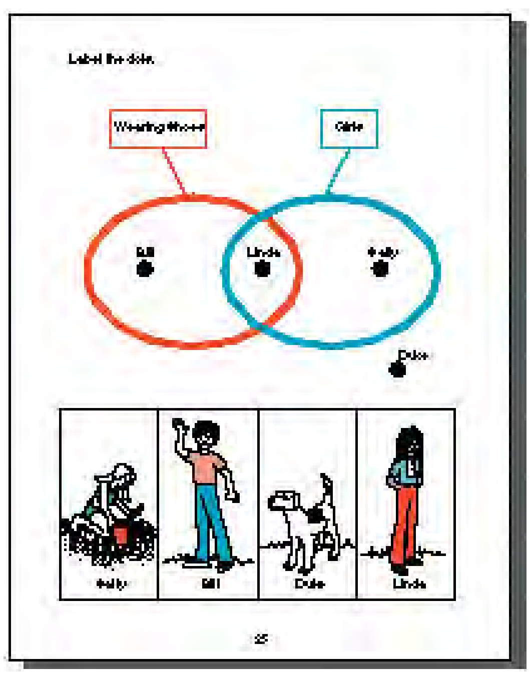

Match the dots with the shapes. One is done for you.
Red
Square
20

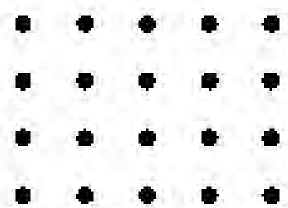

Label the dots.
+5
5
10
15
20
25
30
35
40
45
50
55
21


pencil
15¢
pencil and stamp
or two candies and stamp
or two erasers and stamp
20¢
15¢


= 42
= 183
= 291
= 300
= 407
= 160


0
3
6
9
12
15
18
21
24
27
+3
+6


Label the dots.
Wearing Shoes
Girls
Linda
Duke



Write number sentences about the dot picture. One is done for you.

$4+4+4+4+4=20$

$5+5+5+5=20$

$10+10=20$

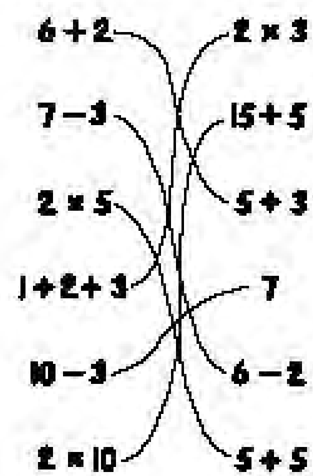
$4 \times 5=20$

$5 \times 4=20$

Many other solutions are possible.

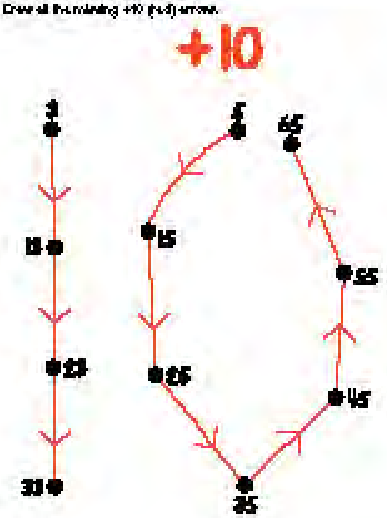
26

Match



27

Draw all the missing +10 (red) arrows.



28

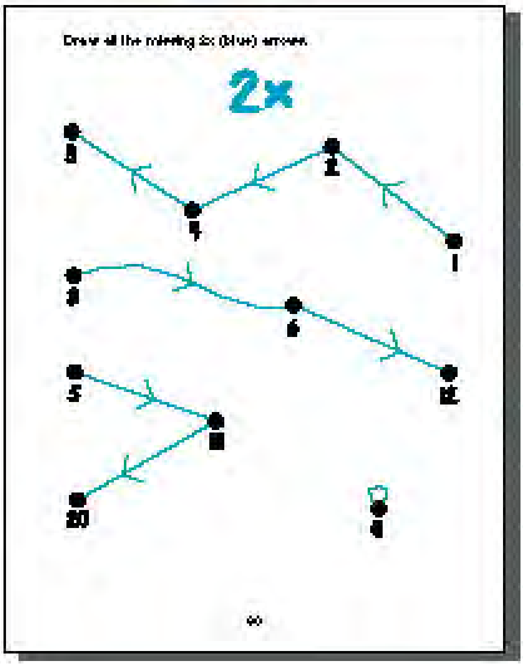
Solve these problems. You may draw pictures or use the Minicomputer.

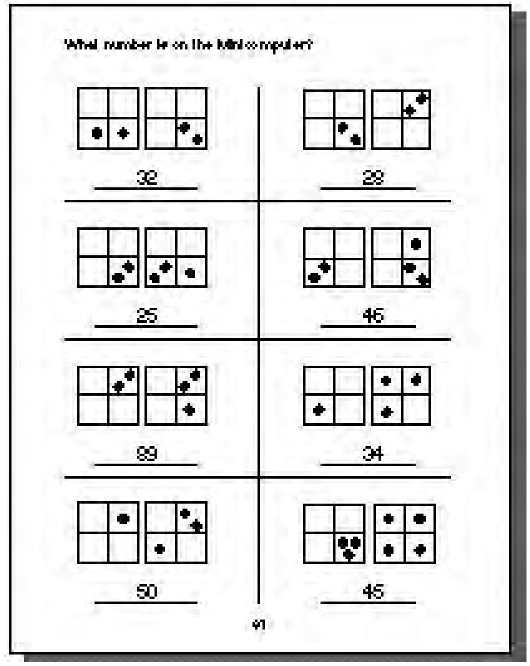
Kendi has 12 cards. She gives 1 to a friend. How many does she have left? 11 cards

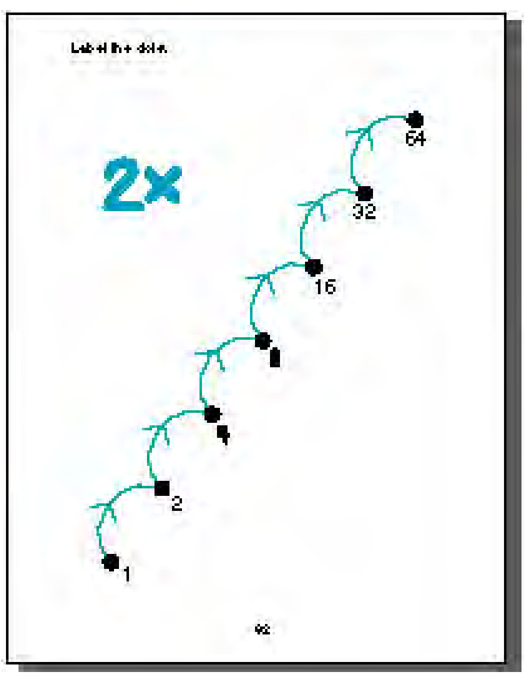
There are 22 buttons in one box and 15 buttons in another box. How many buttons in all? 37 buttons

Mother shares 26 pennies equally between Cody and Andy.
How many pennies does Cody get? 13 pennies
How many pennies does Andy get? 13 pennies

29


Draw all the missing 2x (blue) arrows.
2x
5
20
90


What number is on the Minicomputer?
32
28
25
46
99
34
50
45
91


Label the dots.
2x
64
32
16
2
1
92

F106.1 MULTIPLICATION STORY #3

Capsule Lesson Summary

Tell a story about a boy who accidentally breaks four dozen eggs. Use the Minicomputer to calculate 4 x 12—the number of extra minutes the boy must work because he agrees to work one extra minute for each broken egg.

Materials

Teacher
- Egg cartons
- Minicomputer set
- Calculator (optional)

Student
- None

Description of Lesson

Hold up an egg carton that will hold exactly one dozen eggs.

T: ***What comes in a carton like this?***

Allow the students to express themselves freely. Encourage answers expressing the fact that there are 12 eggs in a dozen, and emphasize the word *dozen*. Ask a student to check this fact by counting the number of places for eggs in the carton.

Use egg cartons as props as you tell the following story.

T: ***Now, I would like to tell you a story about a boy named Herman. Herman works in a grocery store. What do you think Herman does in his job at the grocery store?***

Again, encourage an open discussion. During this discussion mention that one of Herman's job is to keep the shelves stocked, and another job is to carry the customers' groceries out to their cars.

T: ***One day, Herman was busy stacking cartons of eggs in the dairy case at the store. But he was so busy that he wasn't very careful. Suddenly he dropped a carton of eggs onto the floor—splat!—and all of the eggs in the carton broke. Herman cleaned up the mess as quickly as he could and then continued to fill the dairy case. He was very worried about what Mr. Vitale, the store manager, would say when he discovered Herman had broken a dozen eggs. Mr. Vitale had a very loud voice and frightened Herman!***

Just then, Mr. Vitale began looking for Herman to carry out some groceries for Mr. Salas, who had bought so many groceries he couldn't carry them all to his car. "Herman!" yelled Mr. Vitale. When Mr. Vitale shouted Herman's name, it frightened Herman so much that he dropped another carton of eggs—splat! Every one of them broke. Herman didn't have time to clean up the mess; he rushed to the front of the store to see what Mr. Vitale wanted.

When Herman returned from carrying Mr. Salas's groceries, he was even more worried. He had broken two dozen eggs! "Two dozen eggs," thought Herman, holding a full carton in each hand, and staring at them sadly. He was about to put the two cartons on the shelf when suddenly he slipped and fell! What do you think caused Herman to slip?

S: ***The broken eggs on the floor. When Mr. Vitale called him, Herman didn't have time to clean them up.***

T: ***That's right. So Herman slipped and fell, and dropped both of the cartons he was holding—splat! splat! He broke them all! Poor Herman…. How many dozen eggs in all has he broken?***

S: ***Four dozen.***

Take a moment to discuss this if some of the students have lost count.

T: ***Herman cleaned up the mess and went straight to Mr. Vitale to tell him what had happened. Herman told Mr. Vitale that he was very sorry about the accidents and offered to work an extra minute for every egg he had broken. Mr. Vitale was pleased that Herman was honest about the mistake and agreed to let him work one extra minute for each broken egg. How many extra minutes must Herman work that day to make up for the broken eggs?***

Encourage several students to estimate the answer and record some of their estimates on the chalkboard.

T: ***How can we find the number of extra minutes Herman must work?***

Follow an appropriate method suggested by the students. A student might suggest calculating 4 x 12 on the Minicomputer. You may like to suggest this yourself and then check the calculation, either on a calculator or by letting students count the empty egg cups in four egg cartons. When the calculation is finished, congratulate the student(s) with the closest estimate. Ask students with the correct answer to explain how they obtained it.

T: ***Let's write a number sentence for this problem.***

If a student suggests 12 + 12 + 12 + 12 = 48, write this sentence but then ask for a shorter number sentence: 4 x 12 = 48. With the class, conclude that Herman must work 48 extra minutes to make up for the broken eggs. You may like to use a clock to check how long 48 minutes is.

F106.2 THE FUNCTION –3

Capsule Lesson Summary

Label the dots in a +1 arrow picture, and then draw all possible –3 arrows. Check each –3 arrow by counting backward three from the arrow's starting number. Draw a new arrow from the last dot in the picture (32) to the first dot (23) and decide that this arrow is for –9.

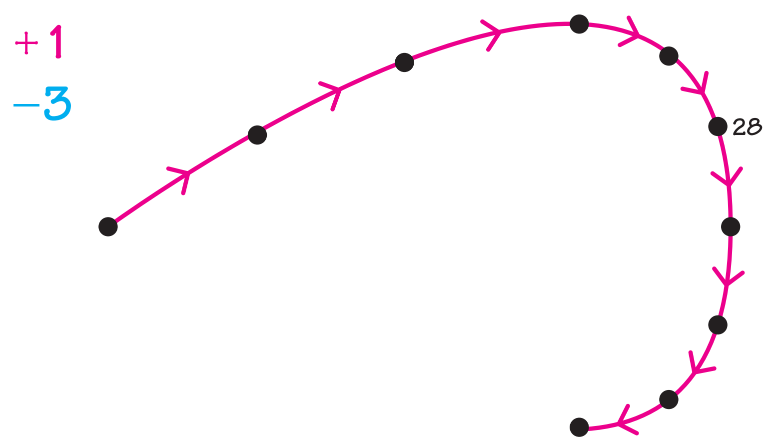
Materials

Teacher
- Colored chalk

Student
- Worksheets F106.2* and **
- Colored pencils

Description of Lesson

Draw this arrow picture on the chalkboard.



Ask volunteers to label the dots. Each time a dot is labeled, ask one of the students to read the corresponding number fact to the class (or do so yourself). For example, when the dot for 29 is labeled, the number fact would be 28 + 1 = 29. Continue this activity until all the dots are labeled.

T: ***Where could we draw a blue –3 arrow?***

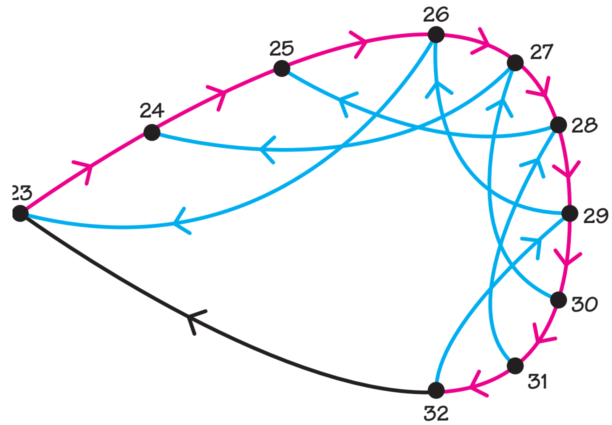
Ask a student to trace an arrow at the board. If it is correct, draw the arrow yourself. The following dialogue assumes that a –3 arrow has been drawn from 32 to 29.

T: ***32*** (point to 32) ***take away 1*** (point to 31)… ***take away 2*** (point to 30)… ***take away 3*** (point to 29).
32 take away 3 equals 29 (trace the –3 arrow from 32 to 29).
Who can show us where to draw another –3 arrow?

F106

Continue until many of the –3 arrows are drawn (see the illustration below). Using a third color of chalk, draw an arrow from 32 to 23.

T: ***What could this new arrow be for?***

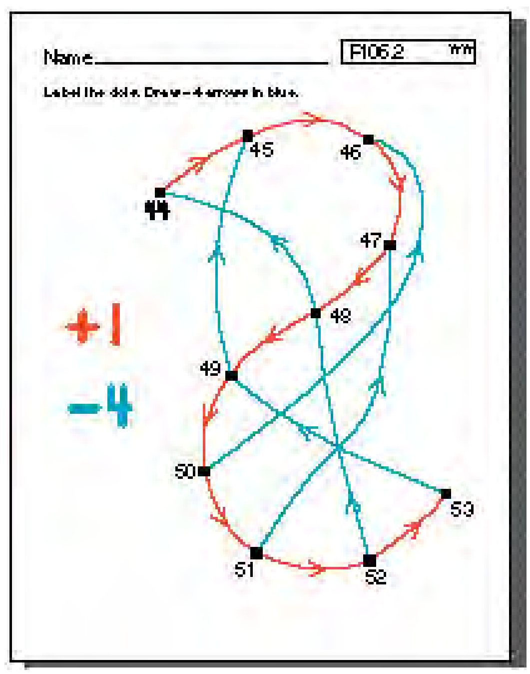


Compliment any student who suggests –9, and then point to 32.

T: ***32 take away 1*** (point to 31)***…***
take away 2 (point to 30)***…***
take away 3 (point to 29)
:
take away 9 (point to 23)***.***
32 take away 9 equals 23.
What is this new arrow for? (–9)

Label the new arrow –9.

Worksheets F106.2* and ** are available for the remainder of the period. Explain to the students that they are to label the dots and then draw arrows for –3 (or –4). Do not expect most students to draw all the possible –3 (or –4) arrows.



F107 I AM A VERY HAPPY BOY

Capsule Lesson Summary

Read the storybook *I Am a Very Happy Boy* and discuss the various string and arrow pictures.

Materials

Teacher	• *I Am a Very Happy Boy* Storybook	Student	• *I Am a Very Happy Boy* Storybook (one copy for each pair of students)

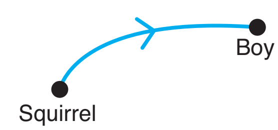
Description of Lesson

Although *I Am a Very Happy Boy* uses the mathematical languages of dots, arrows, and strings, it is a story. Read this storybook to your class as you would read any story. Let the students discuss the pictures, but avoid overemphasizing the mathematical aspects of the story.

If you like, give each pair of students a copy of the storybook to follow as you read. Be sure the students have an opportunity to look at the pictures in the storybook. For any appropriate illustration, ask the students where the boy is and who the other dots could be for. The following information is provided for your use during the lesson.

Page 12

The blue arrow is for "I am following you."



Page 13

The green arrow is for "I am talking to you." The squirrel is alone on the left.

Page 14

The blue arrow is for "I am following you."

Page 15

The dog is alone on the left. The two farmers are in the red string.

Pages 28 and 29

The blue arrow is for "I am following you. "

Center Activity

You may like to make copies of this storybook available in a reading center for students to read or look at on their own.

F108.1 FAIR DISTRIBUTION #3

Capsule Lesson Summary

Share 18 sunflower seeds between two squirrels using a string picture to describe the situation. Write number sentences about the situation and relate them in an arrow picture, using the relations 2x and $\frac{1}{2}$x.

Materials

Teacher		Student	
	• Colored chalk		• Counters • Unlined paper

Description of Lesson

Pair the students. Provide each pair with 18 counters and two pieces of paper. Then tell the following story or one similar to it.

T: ***Every morning, two squirrels come to my doorstep for their breakfast. I have 18 sunflower seeds I would like to give to the squirrels tomorrow morning, but I want to be fair and give both of them the same number of seeds. I'll make a pile of sunflower seeds for each squirrel, but I need to know how many seeds I should put in each pile.***

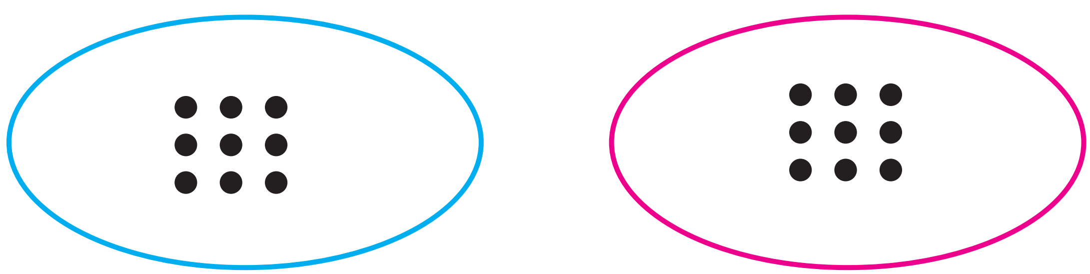
Instruct the students to share the 18 counters (as seeds) equally, creating two piles. Make the piles on the two separate pieces of paper.

While students work on sharing, draw two non-overlapping strings on the chalkboard.

T: ***Let's put the sunflower seeds for one squirrel in the blue string and the seeds for the other squirrel in the red string. How many seeds did you put in each pile (counters on each paper)?***

S: ***Nine.***

Invite students to help you draw nine dots inside each string.



T: ***What number sentences can we write about this picture?***

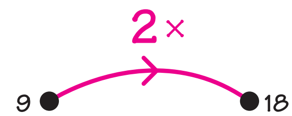
Accept all appropriate number sentences. Students might suggest $2 \times 9 = 18$ and $\frac{1}{2} \times 18 = 9$; if not, suggest them yourself.

T: ***2 x 9 = 18. How could we show this number sentence with an arrow picture?***

F108

Invite students to draw such an arrow picture on the board.

If your class finds this difficult, draw and label the dots for 9 and 18 yourself and then ask a volunteer to draw the 2x arrow.

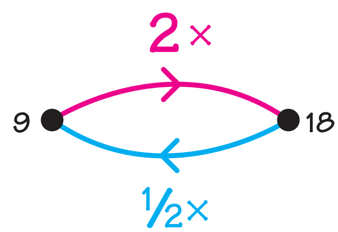


T: ***Who can read this arrow picture for us?***

S: ***2 x 9 = 18.***

T: ***We have another number sentence: $^1\!/_2$ x 18 = 9*** (read this as "one-half of eighteen equals nine")***. Can we show this fact with an arrow.***

Be prepared to help. This may be the first time your students have seen a $^1\!/_2$x arrow.



Trace the arrows with your finger as you read the two number sentences.

T: ***2 x 9 = 18 and $^1\!/_2$ x 18 = 9.***

Note: It is possible, of course, to draw arrow pictures for other number sentences the students might suggest (such as 9 + 9 = 18). To help focus the students' attention on these two relations, however, it is suggested that you start with only 2x and $^1\!/_2$x arrows.

Home Activity

Suggest to parents/guardians that they try to find opportunities to work with their children on sharing activities. For example, share 24 things equally several (two, three, or four) ways.

F108.2 MAGIC SQUARES #1

Capsule Lesson Summary

Provide addition practice with magic squares. Look at an array of numbers and discover that the sum of the numbers in any row, column, or diagonal is 30.

Materials

Teacher
- Calculator

Student
- Worksheets F108.2* and **
- Calculator

Description of Lesson

Provide each student or pair of students with a calculator. Draw this magic square on the chalkboard.

11	6	13
12	10	8
7	14	9

T: ***This is a magic square; try to figure out why it is magic.***

Allow students to work with a partner. Suggest that they look at the rows and columns of the square—you may need to explain what is meant by *row* and *column*. After a short while invite students to suggest why they think this is a magic square, but do not expect mathematical reasons. Then direct the class to look at the rows.

T: ***What numbers are in the first row?***

S: ***11, 6, and 13.***

T: ***Add these three numbers.***

Students can do the addition problem on their calculators. Ask a volunteer to do it on an overhead or class calculator.

T: ***What number sentence can we write about this calculation?***

S: ***11 + 6 + 13 = 30.***

Record this number sentence to one side of the magic square.

T: ***Now add the three numbers in the second row.***

Continue in this manner, adding the three numbers in each row and each column (and recording the appropriate number sentences on the chalkboard) until all six have been calculated. The students will probably notice very early that the sums are identical.

T: ***This square is magic in another way. Add these three numbers*** (indicate the numbers along one of the diagonals)**.**

Invite a student to add these numbers on the overhead or classroom calculator while others do it on their calculators. Repeat with the other diagonal, and conclude that the sums of the numbers in every row, column, and diagonal are the same.

11	6	13
12	10	8
7	14	9

$$\left.\begin{aligned} 11 + 6 + 13 &= 30\\ 12 + 10 + 8 &= 30\\ 7 + 14 + 9 &= 30 \end{aligned}\right\}\text{Rows}$$

$$\left.\begin{aligned} 11 + 12 + 7 &= 30\\ 6 + 10 + 14 &= 30\\ 13 + 8 + 9 &= 30 \end{aligned}\right\}\text{Columns}$$

$$\left.\begin{aligned} 11 + 10 + 9 &= 30\\ 13 + 10 + 7 &= 30 \end{aligned}\right\}\text{Diagonals}$$

Distribute Worksheets F108.2*; tell the students to see if the square on the worksheet is a magic square. (It is.)

Write out the eight addition problems to be solved. Assign one problem to each pair of students and, as the groups complete a calculation, send one student to the board to record the result. Determine with the class that this is a magic square.

8	3	4
1	5	9
6	7	2

$$\left.\begin{aligned} 8 + 3 + 4 &= 15\\ 1 + 5 + 9 &= 15\\ 6 + 7 + 2 &= 15 \end{aligned}\right\}\text{Rows}$$

$$\left.\begin{aligned} 8 + 1 + 6 &= 15\\ 3 + 5 + 7 &= 15\\ 4 + 9 + 2 &= 15 \end{aligned}\right\}\text{Columns}$$

$$\left.\begin{aligned} 8 + 5 + 2 &= 15\\ 4 + 5 + 6 &= 15 \end{aligned}\right\}\text{Diagonals}$$

Use the same procedure with Worksheet F108.2**. Decide with the class that this is not a magic square.

1	8	9
6	10	2
11	0	7

$$\left.\begin{aligned} 1 + 8 + 9 &= 18\\ 6 + 10 + 2 &= 18\\ 11 + 0 + 7 &= 18 \end{aligned}\right\}\text{Rows}$$

$$\left.\begin{aligned} 1 + 6 + 11 &= 18\\ 5 + 10 + 0 &= 18\\ 9 + 2 + 7 &= 18 \end{aligned}\right\}\text{Columns}$$

$$\left.\begin{aligned} 1 + 10 + 7 &= 18\\ 9 + 10 + 11 &= 30 \end{aligned}\right\}\text{Diagonals}$$

F109 INTRODUCTION TO EVEN AND ODD NUMBERS #1

Capsule Lesson Summary

Begin with mental arithmetic activities on doubling. Use the Minicomputer and a string simultaneously to explore even and odd numbers. Extend this activity to include larger numbers and numbers in a specified range.

Materials

Teacher	• Minicomputer set • 0–109 numeral chart (optional)	Student	• None

Description of Lesson

Exercise 1: Mental Arithmetic

Begin this lesson with five to ten minutes of mental arithmetic involving doubling. The following dialogue gives some suggestions. The pace of these activities should be brisk, and you should try to involve all of your students by varying the difficulty of your questions. If a student cannot answer, or answers incorrectly, simply ask another student to respond.

T: ***What number is 5 + 5?*** **S:** ***10.***
5 + 5 = 10. What number is 2 x 5? **S:** ***10.***
What number is 3 + 3? **S:** ***6.***
3 + 3 = 6. What number is 2 x 3? **S:** ***6.***
What number is 2 x 1? **S:** ***2.***
2 x 1 = 2. What number is 2 x 10? **S:** ***20.***
10 + 10 = 20, so 2 x 10 = 20.
What number is 2 x 100? **S:** ***200***
2 x 100 = 200. What number is 2 x 1,000? **S:** ***2,000***
1,000 + 1,000 = 2,000, so 2 x 1,000 = 2,000.
What number is 2 x 1,000,000? **S:** ***2,000,000.***

You may like to invite a student to write 2,000,000 on the chalkboard or write it yourself.

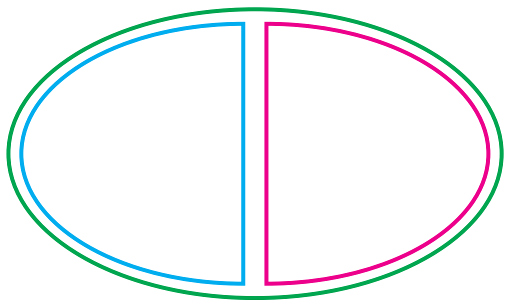
T: ***What number is 2 x 2?*** **S:** ***4.***
2 x 2 = 4. What number is 2 x 4? **S:** ***8***
What number is 2 x 3? **S:** ***6.***
2 x 3 = 6. What number is 2 x 6? **S:** ***12.***
6 + 6 = 12, so 2 x 6 = 12.
What number is 2 x 7? **S:** ***14.***
What number is 2 x 8? **S:** ***16***
2 x 8 = 16. What number is 2 x 9? **S:** ***18.***
Right; 2 x 9 = 18 because 9 + 9 = 18.
What number is 2 x 10? **S:** ***20.***
2 x 10 = 20. What number is 2 x 20? **S:** ***40.***
How do you know?

Perhaps a student will explain that one of the trades on the Minicomputer is 20 + 20 = 40.

T:	***2 x 200 = …?***	**S:**	***400.***
	2 x 2,000 = …?	**S:**	***4,000.***
	2 x 2,000,000 = …?	**S:**	***4,000,000.***
	2 x 2,000,000,000 = …?	**S:**	***4,000,000,000.***

Exercise 2

Display three Minicomputer boards and, on the chalkboard, draw a large string picture similar to the one shown below. Draw the black string first and then fit the red and blue strings snugly inside it. You will be drawing dots for the whole numbers (i.e., 0, 1, 2, 3, . . .), with odd numbers in the red string and even numbers in the blue string. Of course, there are no whole numbers that are neither odd nor even.



T: ***The black string is for whole numbers, and we are going to put some whole numbers on the Minicomputer.***

Note: It is appropriate for you to begin using the term *whole number*, so that the students will become familiar with it; however, do not expect your students to use the term. If a student asks for an explanation of whole numbers, simply reply that you are referring to the numbers 0, 1, 2, 3, and so on.

T: ***I have a secret rule for deciding which numbers go in the blue string and which go in the red string. I will give you a hint: When we put the numbers on the Minicomputer, watch the 1-square carefully.***

Point to the 1-square on the Minicomputer.

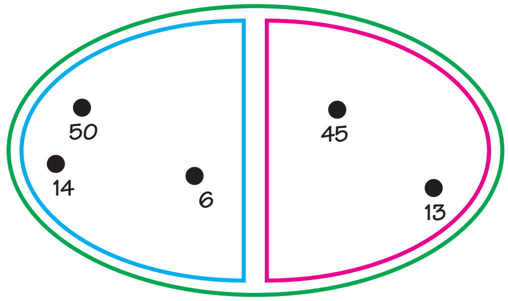
T: ***There is something special about this white square. You may choose the numbers we will use today, but only choose whole numbers between 0 and 100. Who would like to choose the first number?***

Accept any whole number between 0 and 100. If students suggest negative numbers or fractions, say simply that these are not whole numbers, and that the student must choose a number such as 0, 1, 2, 3, and so on up to 100.

Suppose a student suggests the number 45. Ask the student to put 45 on the Minicomputer. If necessary, let the class make trades until the standard configuration is given.

T: ***Are you paying attention to the 1-square? Good; 45 is in the red string.***

In the red string, draw and label a dot for 45. Continue to accept various numbers from students until at least four dots have been drawn. Be sure that at least one dot has been drawn in each of the two strings; if necessary, choose a number yourself. Your picture might look like this.



T: ***Who would like to choose the next number?***

Invite a student to put a number on the Minicomputer.

T: ***Does this number go in the red string or in the blue string?***

When students give the correct response, draw and label a dot for the number inside the string. Continue this activity—accepting numbers, inviting students to put them on the Minicomputer (in standard configuration), asking which string the numbers go in, and putting the numbers into the string picture—until many of the students have discovered your secret rule. Occasionally, you may wish to remind the students to observe the 1-square carefully.

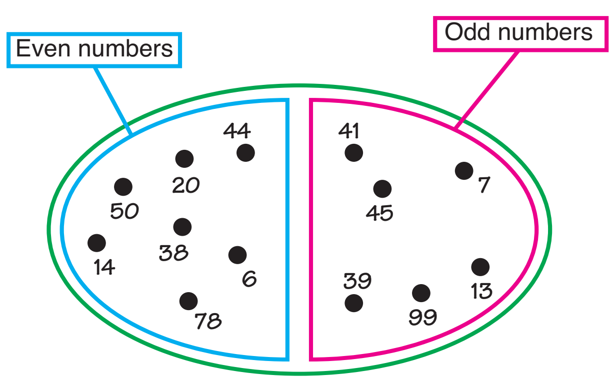
T: ***I think some of you know my secret rule now. Who would like to explain it?***

Perhaps a student will observe that numbers with a checker on the 1-square go in the red string; and numbers without a checker on the 1-square go in the blue string. Some of your students may already know about odd and even numbers and may tell you that all of the even numbers are in the blue string, and all of the odd numbers are in the red string.

If no one has discovered your rule yet, choose several consecutive numbers such as 38, 39, 40, and 41. Remind the students to observe the 1-square. If the students continue to have difficulty describing the rule, you may have to explain it yourself. In either case, express your rule as follows.

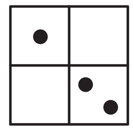
T: ***The numbers in the red string are called* odd numbers*. An odd number always has a checker on the 1-square. The numbers in the blue string are called* even numbers*. An even number can be put on the Minicomputer without using a checker on the 1-square.***

Label the strings.



F109

Note: An even number can be put on the Minicomputer with checkers on the 1-square, but not in standard configuration; for example:



= 10

However, since 10 is even, it can also be shown without checkers on the 1-square (while odd numbers cannot). If this point is not raised by the class, make no mention of it. If the question is asked during this or some future lesson, consider it briefly. Ask the class to make trades on the Minicomputer, and conclude that an even number can be put on the Minicomputer without checkers on the 1-square.

At this point, you might like to use the 0–109 numeral chart and locate both even and odd numbers. Encourage students to look for patterns.

Display a fourth Minicomputer board.

T: ***Let's play this game using some greater numbers. What number would you like to choose first?***

Accept any whole number between 0 and 10,000 and ask a student to put this number on the Minicomputer (in standard configuration). You may wish to ask someone else to write this number below (above) the Minicomputer boards. Then, choose a volunteer to put the number into the string picture. Continue in a similar manner until four or five additional numbers have been put into their appropriate string(s).

Remove all checkers from the Minicomputer.

T: ***Now I am going to choose some numbers. Tell me whether the number I choose is even or odd. Try to imagine the number on the Minicomputer.***

Choose at least four numbers (for example, 100, 43, 216, and 2,481). If the class has difficulty identifying a number as even or odd, invite a student to put it on the Minicomputer.

If your class remains interested, continue with Exercise 3.

Exercise 3

T: ***Who knows an odd number less than 10?***
Who knows an even number more than 50?
An even number less than 1,000?
An odd number more than 300?

Continue this activity for as long as you feel is appropriate. You may want to end this lesson by asking for an even number more than 1,000,000.

F110 ADJUSTMENT/ASSESSMENT DAY

Note: See Section One, page 1-9, for a full explanation of the purpose of scheduled adjustment days. A few pages from the workbook *Parade of Problems #2* can be selected for an assessment.

On this day you may wish to repeat an earlier lesson either for a group of students or for the entire class. Many of the lessons can be made to appear completely different by changing the story line and/or the numbers in the lesson. If you omitted exercises or worksheets from an earlier lesson, you may like to include these. This is also a good time to allow the students to work in centers or on a project of your choice.

The Number Line Game (F103.2) is an excellent activity for this and any future adjustment day, because it gives students practice in estimation, in reading numerals, and in ordering numbers on the number line. You can easily adjust the game to your students' expanding knowledge of numbers by choosing different intervals.

Variations of Exercise 2 from F109 *Introduction to Even and Odd Numbers #1* can be used from time to time to strengthen the students' understanding of *even* and *odd*. These can be simple five or ten minute activities.

Variation 1: Draw two strings on the chalkboard labeled "even" and "odd." Invite individual students either to locate a specific number in the strings, for example 17; or to choose a number to put in one of the strings, for example, put an odd number in the string picture.

Variation 2: Set up four Minicomputer boards and ask a student to put on any odd number, or any even number. From time to time, ask a student to put on a particular number and tell whether it is even or odd. If students have difficulty, remind the class of the way in which the 1-square helps distinguish even numbers from odd numbers.

If your class is experiencing little difficulty with the *CSMP* curriculum, you may wish to omit this adjustment day and continue immediately with F111.1 *Addition Problems #5*.

Early Warning

Some of the next nine classroom lessons require extra preparation time, or make use of materials not included with the *CSMP* Classroom Set. The lessons are listed here for your convenience in preparing for them. A more detailed description of the materials can be found on the first page of each lesson. (Special materials are listed here only once, even if they are used more often during the nine-day period.)

F111.1 *Addition Problems #5*: 100 pennies; can
F112 *Measurement #2*: Containers; measuring tools; chart paper; scissors; tape
F116 *Estimation #3:* Transparent jar containing 300-400 objects; Post-it™ notes; calculators
F117.1 *Booker's Bakery:* Ruler or meterstick; tape
F118 *Three Strings #1*: Loops of colored string

F111.1 ADDITION PROBLEMS #5

Capsule Lesson Summary

In a game situation, use the Minicomputer to add the odd numbers between 0 and 20. **Optional:** Look at the calculation again, pairing the numbers so that each pair adds to 20 (1 + 19; 3 + 17; and so on). Then add 20 five times.

Materials

Teacher
- Minicomputer set
- 100 pennies
- Can

Student
- None

Description of Lesson

Before the lesson begins, distribute pennies to ten different students or pairs of students. Arrange the students (pairs) in order from first to tenth and give the first student (pair) one penny; the second, three; the third, five;… the tenth, nineteen.

T: ***I have a big, empty can and some of you are going to put some pennies in it.***

Call on the students (pairs) in sequence to put their pennies in the can. Instruct students to drop their pennies one at a time so the class can hear and count how may pennies are put in. Each time ask the class how many pennies went into the can. For example,

T: ***How many pennies did Jamal put in the can?*** (One)
How many pennies did Tammy put in the can? (Three)
:
:
How many pennies did Linette put in the can? (Nineteen)

How many pennies are there in our can altogether?

Allow students to make estimates and record some of the estimates on the board.

T: ***How can we find out exactly how many pennies are in our can?***

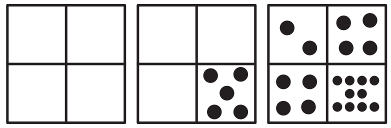
Students may suggest dumping out all the pennies and counting them one by one. Perhaps someone will suggest using the Minicomputer; if not, suggest this yourself. Display three Minicomputer boards.

T: ***Remember the number of pennies you put in the can. When I call your name, come and put that number on the Minicomputer.***

Following the sequence you used earlier, ask the ten students (pairs) to come and add their number to the Minicomputer. This will result in many checkers on the ones board, so you should watch carefully to be sure each student puts on the correct number. To avoid confusion, you may wish to push the checkers to one side of each square after a number has been added on.

F111

When all ten numbers (1, 3, 5, 7, 9, 11, 13, 15, 17,19) have been put on the Minicomputer, the configuration will look like this:



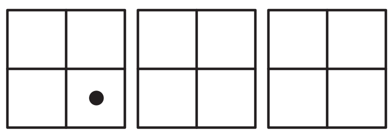
T: ***What problem can we write?***

$$1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 =$$

T: ***What do you notice about this problem?***

S: ***All of the numbers are odd; everyone put an odd number of pennies in the can.***

Call on several students to make trades on the Minicomputer, directing them to make the 8 + 2 = 10 trade whenever possible (otherwise backward trades may become necessary later). When the standard configuration is obtained, invite a student to write the numeral below (above) the Minicomputer.



1 0 0

Complete the number sentence on the chalkboard and determine which estimate was closest.

$$1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 = 100$$

T: ***How much money is 100 pennies?*** (One dollar)
Who can write* $1.00 *on the chalkboard?

If necessary, help the volunteer write *$1.00*.

Optional: If your class remains interested, continue by pointing to the number sentence on the board.

T: ***Do you see an easy way to add these numbers without using the Minicomputer?***

Allow the students to offer suggestions freely, and compliment any student who suggests pairing 1 and 19, 3 and 17, 5 and 15, etc., to get five groups of 20. If no one makes this suggestion, point to 1 and 19 and ask what number is 1 + 19. Repeat this question with 3 + 17. If this method still remains beyond the students' grasp, leave the matter unresolved. This idea will be suggested again in a later lesson.

F111.2 COMPOSITION OF FUNCTIONS #4

Capsule Summary Lesson

Draw arrows between labeled dots in an arrow picture. Discover that two dots connected by a +6 arrow may also be connected by two +3 arrows or by three +2 arrows. Explore similar relationships in a second arrow picture, drawing arrows for +1, +2, +3, and +4.

Materials

Teacher
- Colored chalk

Student
- Colored pencils
- Worksheets F111.2*, **, ***, and ****

Description of Lesson

Distribute copies of Worksheets F111.2* to the students and draw the picture from the worksheet on the board.

T: ***Who would like to draw an arrow in our picture?***

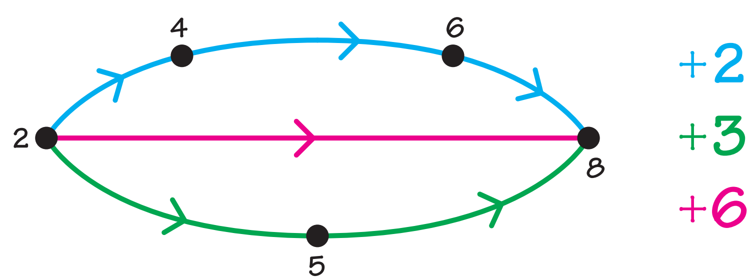
The following sample dialogue assumes that a blue arrow is drawn from 4 to 6.

T: ***What is this blue arrow for?***

S: ***+2.***

T: ***Yes; 4*** (point to the dot) ***plus 2*** (trace the arrow) ***is 6.***
Who can draw another arrow?

Encourage students to draw arrows on their worksheets as they are drawn on the chalkboard. Continue in this manner until all the red, blue, and green arrows are drawn.



You may like to solicit from students number facts corresponding to the arrows. Write some of these facts near the arrows in your picture on the board.

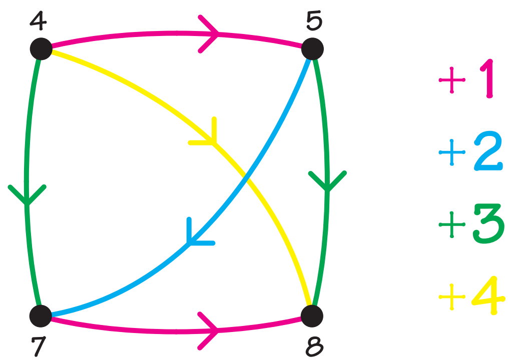
Direct the class to look at Worksheet F111.2**.

T: ***We can use four different colors of arrows on this worksheet. Try to draw as many arrows as you can, but be careful to use the correct colors.***

Allow the students to work individually while you copy the problem on to the chalkboard.

F111

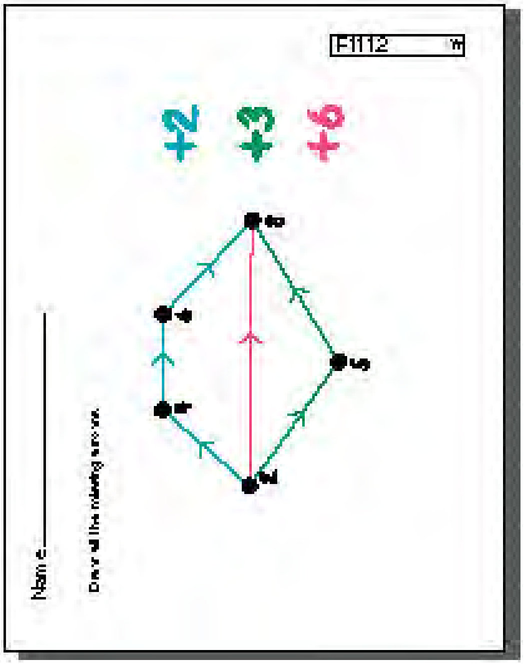
Students who complete this arrow picture quickly can write number facts corresponding to the arrows. Observe the students as they work and provide help as needed. After a while, call on several students to draw arrows in the picture on the board. Continue until the arrow picture is completed.

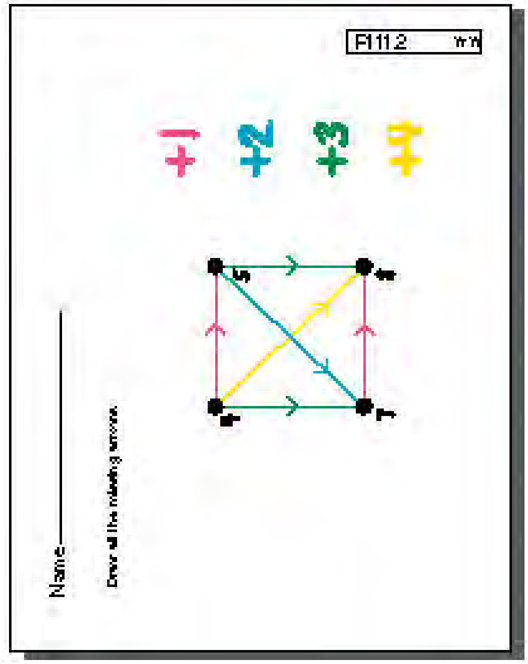


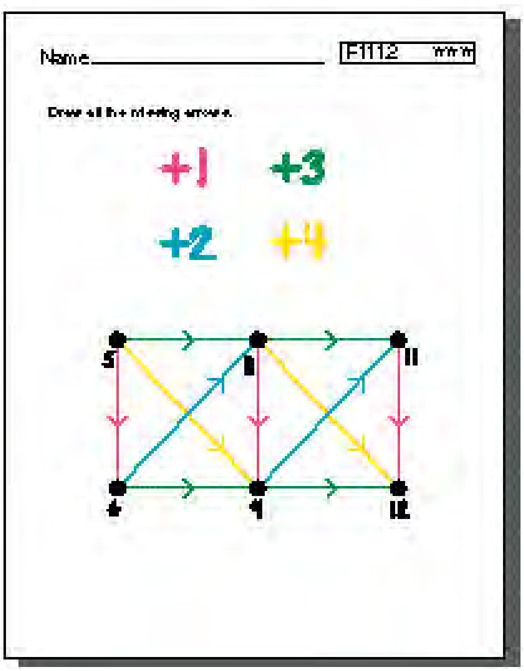
Worksheets F111.2*** and **** are available for additional practice and challenge. These worksheets will be difficult for many students to do independently. Let students work in cooperative groups; you can observe and assist groups as necessary.

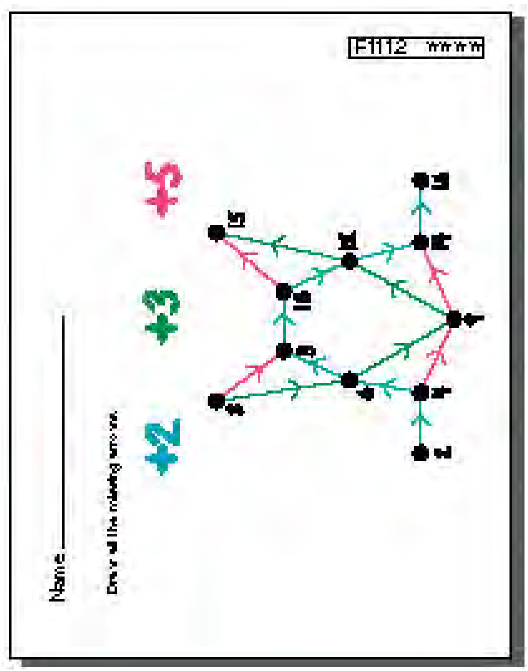
Home Activity

Send a problem like the one on the ** worksheet home for students to do with family members.






Name
F111.2
+1
+3
+2
+4



F112 MEASUREMENT #2

Capsule Lesson Summary

Explore and compare the sizes of containers according to capacity, height, and circumference. Predict an order relationship for each aspect of size. Make graphs of actual relationships and compare these to the predictions.

Materials

Teacher		Student	
	• Containers • Measuring tools • Chart paper		• Scissors • Tape • Water or other filler for containers

Advance Preparation: Find five or six containers of various sizes such as storage containers. You may want to limit the capacity of your containers to about one quart. If several of each size are available, students can work in groups to compare the containers for different aspects of size.

Description of Lesson

Repeat Lesson F46, this time using five or six different containers and comparing the sizes according to capacity, height, and circumference.

At the end of the lesson discuss why a person might choose the biggest container according to height or capacity.

Extension Activity

Select a length (for example, an orange C-rod, 5 inches, or a strip of paper) and hold a scavenger hunt looking for things that have that length (or height or circumference). Make a graph with these categories: shorter than; same length; longer than.

F113.1 MULTIPLICATION STORY #4

Capsule Lesson Summary

In a story situation, present the problem of calculating 12 x 3. Use the Minicomputer to do this calculation. Picture the situation with an array of dots (twelve rows of three dots each). Relate this problem to that of calculating 3 x 12.

Materials

Teacher
- Minicomputer set

Student
- Paper
- Counters (optional)

Description of Lesson

Tell the following story, or one similar, to your class. Choose three students to be the stars of this story.

T: ***Ariel has a job at the zoo feeding breakfast to Phil the Gorilla. What do you think Phil the Gorilla likes to have for breakfast?***

Allow the class to discuss this question. You might also ask a student to describe a gorilla.

T: ***Phil the Gorilla is always very hungry in the morning, and Ariel knows that Phil's favorite food is doughnuts. Ariel also knows that if she doesn't bring Phil the Gorilla enough doughnuts, Phil will become very upset.***

Ariel's two good friends, José and Tony, each wanted a chance to feed Phil the Gorilla. Ariel decided to let José feed Phil on Saturday and let Tony feed Phil on Sunday. Ariel told them to be sure to bring enough doughnuts or Phil will get upset.

On Saturday, José walked in with twelve boxes of doughnuts. Phil the Gorilla smiled and licked his lips. "Wow!" Ariel said, "Phil is going to love you. How many doughnuts did you bring?" José explained that there were three doughnuts in each box, but that he didn't know how many doughnuts there were altogether. How many doughnuts do you think Jose brought?

Allow the students to express their opinions. One of them may suggest using the Minicomputer to do a calculation.

T: ***José brought twelve boxes, each containing three doughnuts. What calculation should we do on the Minicomputer?***

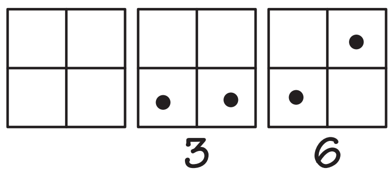
A good response is 12 x 3, but if 3 + 3 + 3 + 3 + 3 + 3 + 3 + 3 + 3 + 3 + 3 + 3 is suggested, write this calculation on the chalkboard and ask if anyone knows a shorter way to write a calculation.

T: ***How should we do this on the Minicomputer?***

Let the students tell you to put 3 on the Minicomputer twelve times. Put the checkers on the Minicomputer yourself, but ask the class to count the 3s as you put them on, to make sure that there are twelve of them.

F113

Invite students to make trades on the Minicomputer; you may wish to let each student make several trades. Encourage them to make the 8 + 2 = 10 trade whenever they can (otherwise, backward trades may become necessary). When the standard configuration is on the Minicomputer, write the numeral below (above) the Minicomputer and complete the number sentence on the chalkboard.



$12 \times 3 = 36$

Remove the checkers from the Minicomputer and erase the chalkboard before continuing.

T: ***José gave Phil all twelve boxes of doughnuts and the gorilla ate the doughnuts very quickly while José and Ariel watched. When he had eaten the very last doughnut, Phil the Gorilla sat down and smiled. Ariel heaved a sigh of relief and said, "That was exactly enough. One less doughnut and Phil would have been very upset."***

Let's draw a picture of the doughnuts José brought for Phil the Gorilla. How many boxes of doughnuts did José bring? (Twelve) And how many doughnuts were in each box? (Three)

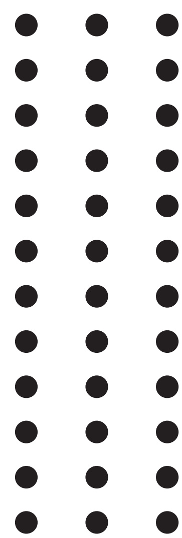
Draw three large dots on the chalkboard and suggest students do the same on their papers. Students may prefer to use counters rather than drawing the dots.

T: ***These are the doughnuts in one of the boxes Jose brought for Phil.***

Add another three dots to your drawing.

T: How many doughnuts in two boxes? (Six)

Draw three more dots.



T: ***3 x 3 = . . . ?***

S: ***9.***

Continue this activity until twelve rows of three each have been drawn.

T: ***12 x 3 = . . . ?*** (36) ***Yes; this is one way to draw a picture of 12 x 3 doughnuts.***

The next day, Tony came to feed Phil the Gorilla, but he brought only three boxes of doughnuts with him. Ariel looked worried. "How many doughnuts are in each of your boxes?" she asked. Tony told her that each box contained one dozen doughnuts.

T: ***How many doughnuts are in each of Tony's boxes?*** (Twelve) ***Do you think Tony brought enough doughnuts? How many doughnuts do you think Tony brought?***

Again, allow the students to express their opinions until someone suggests using the Minicomputer.

T: ***Tony brought three boxes each containing twelve doughnuts. What calculation should we do on the Minicomputer?"***

A good response is 3 x 12, but if 12 + 12 + 12 is suggested, write this calculation on the chalkboard and ask if anyone knows a shorter way to write a calculation.

T: ***How can we do this on the Minicomputer?***

S: ***Put 12 on the Minicomputer three times.***

Ask each of three students to put 12 on the Minicomputer, and ask other students to make the trades.

T: ***What number is on the Minicomputer?*** (36)
So, 3 x 12 = 36.

Complete the number sentence on the chalkboard.

T: ***Did Tony bring enough doughnuts for Phil the Gorilla?*** (Yes) ***Phil ate all the doughnuts greedily but when he finished the last one, he was satisfied. Who brought Phil the Gorilla more doughnuts, Tony or Jose?***

$$3 \times 12 = 36$$

Encourage the students to explain that Tony and Jose brought the same number of doughnuts. Point to the dot picture.

T: ***Could this also be a picture of the doughnuts Tony brought for Phil?*** (Yes)
How do you know?

Lead the class to observe that the dots in each column are for the doughnuts in one of Tony's boxes. Then combine the two number sentences.

$$12 \times 3 = 36 = 3 \times 12$$

F113.2 STORY PROBLEM #2

Capsule Lesson Summary

Draw pictures to help decide how many tires are needed to supply each of seven cars with four new tires.

Materials

Teacher
- None

Student
- Paper
- Colored pencils

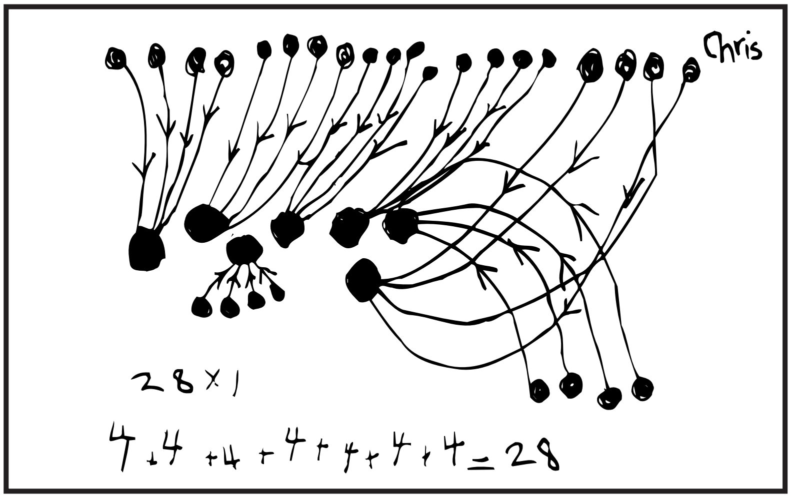
Description of Lesson

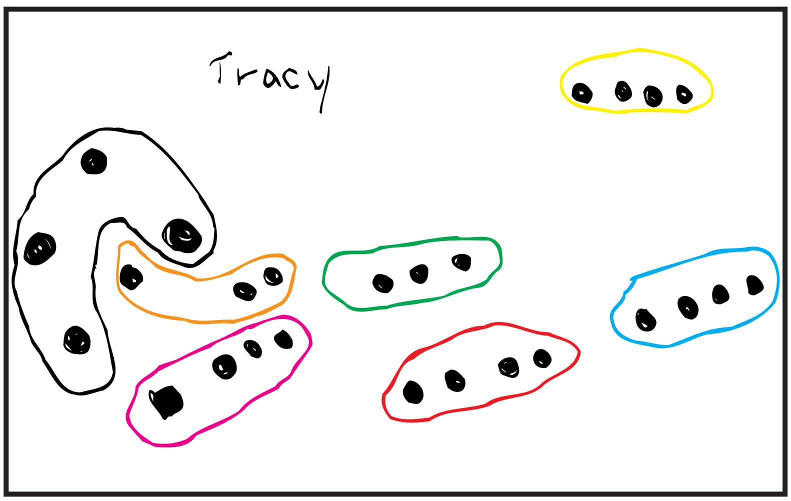
Provide unlined paper and colored pencils to the students and tell them this story.

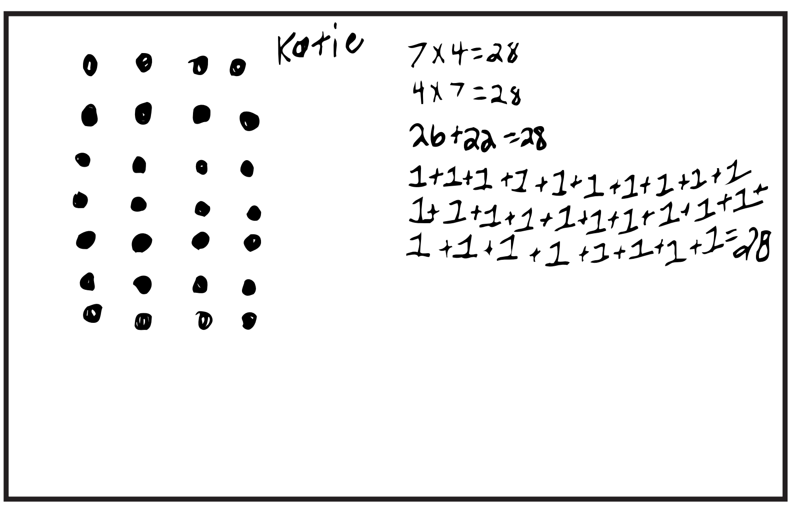
T: ***A friend of mine works at a service station near here. This morning, seven cars drove into the station. The owner of each car bought four new tires. Altogether, how many tires did my friend sell? To help my friend find out how many tires he sold, you can draw any picture you want.***

As the students work, do not provide much guidance, although you may want to repeat the details of the story. Instruct students who finish quickly to write some number sentences about their drawings. After a while, show the class several completed pictures and discuss together how each picture relates to the problem.

On the following page there are several examples of pictures drawn by *CSMP* students. (In Katie's third number story, 22 is mistakenly written instead of 2, but the organization of her picture and her other number sentences demonstrate an understanding of the problem and its solution.)


Chris
28 x 1
4+4+4+4+4+4+4=28


Tracy


Katie
7x4=28
4x7=28
26+22=28
1+1+1+1+1+1+1+1+1+1
1+1+1+1+1+1+1+1+1+1+
1+1+1+1+1+1+1+1=28

F114.1 ELI'S MAGIC PEANUTS #1 ________________ F114

Capsule Lesson Summary

Introduce negative numbers through a story about Eli the Elephant, who is confused by magic peanuts he finds. (When a magic peanut meets a regular peanut, both disappear.) Explore the situation further in number sentences such as $5 + \widehat{5} = 0$ and $7 + \widehat{4} = 3$, where the "^" notation is used to represent magic peanuts.

Materials

Teacher • Magnetic checkers (optional) **Student** • None

Description of Lesson

T: ***There is an elephant named Eli who lives in the jungle and is always very hungry. What do you think is Eli's favorite food?***

Accept suggestions from the students.

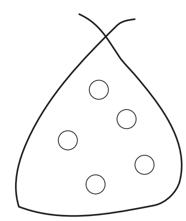
T: ***Eli's favorite food is peanuts. He likes peanuts so much that he carries a little bag of them with him wherever he goes. One day, while walking through the jungle, Eli spotted a special peanut bush he had never seen before. Eli didn't know it, but the peanuts from this bush were magic!***

Eli gathered some of the magic peanuts and put them in his bag with the other peanuts. What do you suppose is so special about magic peanuts?

Allow the students to discuss this briefly.

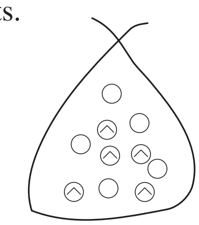
T: ***Let me show you what happens when Eli puts both regular peanuts and magic peanuts in his bag.***

Draw this picture on the board. If you prefer, use one color of magnetic checkers for the regular peanuts.



T: ***This is Eli's bag with five regular peanuts in it.***
Now Eli also put some magic peanuts into his bag;
here are the magic peanuts.

Continue your drawing. If you prefer, use the $\widehat{\bigcirc}$-checkers for magic peanuts.



T: ***How many magic peanuts did Eli put into his bag?***

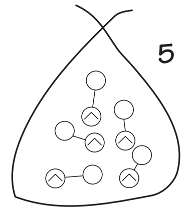
S: ***Five.***

T: ***When Eli returned home, he was hungry from walking through the jungle all day; he decided to eat some peanuts. When he opened his bag, he was very surprised. There were no (zero) peanuts in the bag. What do you think happened when Eli put both the regular and the magic peanuts in the bag?***

F114

Let students make suggestions and lead the discussion to the idea that when a regular and a magic peanut come together, they both disappear. Model this idea in the picture by pairing a regular peanut with a magic peanut and then removing them both from the picture.

If you use connecting lines to pair magic peanuts with regular ones, leave the picture on the board. Write an appropriate number sentence next to the picture.



$5 + \hat{5} = 0$

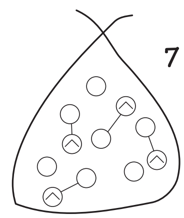
T: ***Five regular peanuts plus five magic peanuts is…?***

S: ***No peanuts.***

S: ***0.***

T: ***Poor Eli was puzzled. He didn't know the secret of the magic peanuts and he couldn't imagine where his peanuts had gone! He was still hungry, so he went looking for more peanuts. This time, he found seven regular peanuts and put them into his bag.***

Erase your previous picture and draw a new one.



$7 + \hat{4} = 3$

T: ***Eli also found four magic peanuts and put them into his bag.***

Add these four magic peanuts to you drawing.

T: ***When Eli returned home, what do you suppose he found when he opened his bag?***

Ask several students to explain their answers; then choose volunteers to pair up regular peanuts with the magic ones. Write the number sentence next to the picture.

T: ***Seven regular peanuts plus four magic peanuts is…?***

S: ***Three (regular peanuts).***

Reading Activity

You may like to follow this lesson with a book such as *The Mystery of the Missing Peanuts* published by Walt Disney Productions.

F114.2 NUMBER FRIENDS #2

Capsule Lesson Summary

Draw arrows for "You are my 6-friend" between labeled dots. (Two numbers are 6-friends if and only if their sum is 6.)

Materials

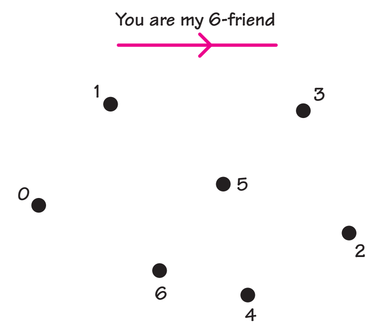
Teacher
- Colored chalk
- Numeral cards (optional)

Student
- Colored pencils
- Worksheets F114.2*, **, and ***

Description of Lesson

Note: You may prefer to give students numeral cards and let them act out the number friends relation as was suggested in Lesson F87.2.

Draw this picture on the chalkboard.



T: ***Who remembers what number friends are? What are 6-friends?***

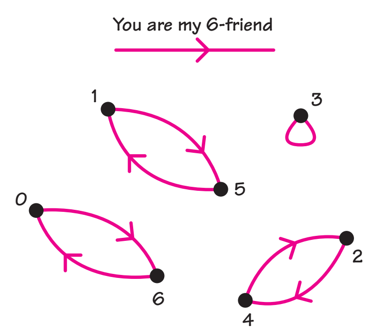
S: ***6-friends are numbers that add up to 6.***

T: ***Where can we draw an arrow in our picture for "You are my 6-friend"?***

Call on students to draw arrows, asking each time for an appropriate explanation; for example,

S: ***I drew an arrow from 1 to 5, because 1 + 5 = 6.***

For your reference, the completed picture is shown here. If no one suggests drawing a loop at 3, draw the students' attention to this part of the picture.



T: ***3 plus what number is 6?***

S: ***3.***

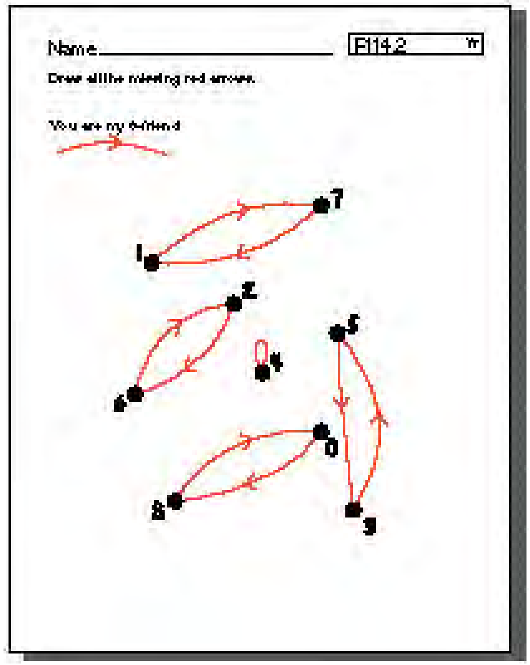
T: ***How can we show that 3 is its own 6-friend?***

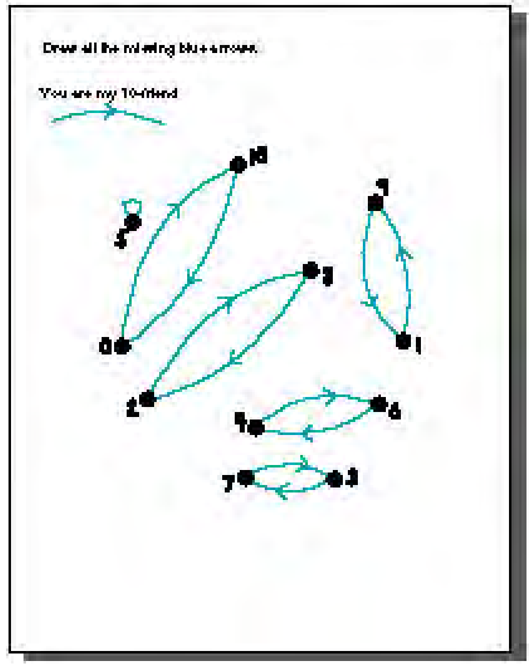
S: ***Draw a loop at 3.***

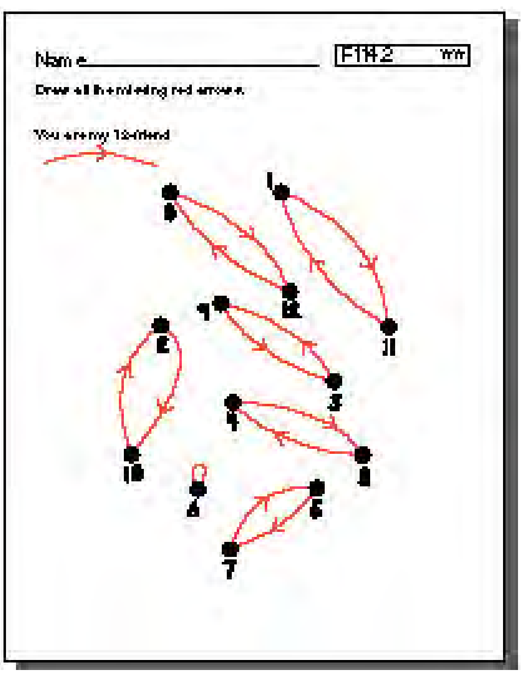
Distribute Worksheet F114.2*. Explain that the students are to draw "You are my 8-friend" arrows on the front side and "You are my 10-friend" arrows on the reverse. Worksheets F114.2** and *** are available for students who complete the * worksheet and need more of a challenge.

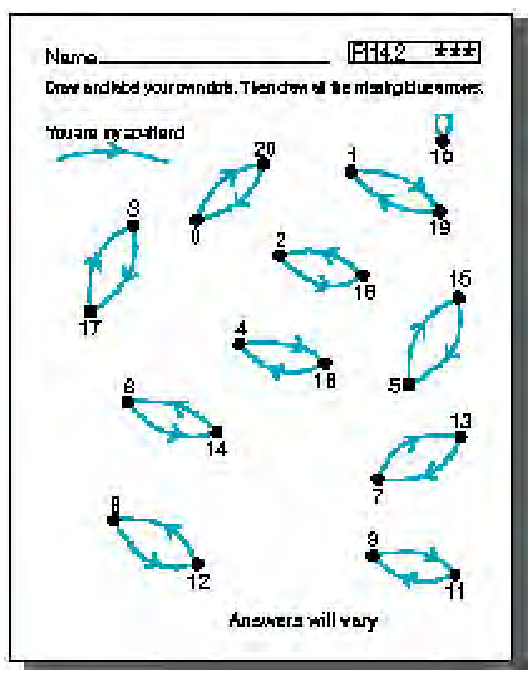
Home Activity

Send home a number friends problem for students to complete with family members. Blackline F114.2 has an example or use one of the worksheets.


Name
F114.2




Name
F114.2


Name
F114.2
Answers will vary

F115.1 THE FUNCTIONS 2x AND $\frac{1}{2}$x #1

Capsule Lesson Summary

Begin with mental arithmetic activities on doubling. Label the dots in a 2x arrow picture. Ask students to draw return arrows for $\frac{1}{2}$x. **Optional:** Extend the arrow picture to include greater numbers.

Materials

Teacher	• Colored chalk	**Student**	• Paper • Colored pencils

Description of Lesson

Exercise 1

Begin this lesson with about five minutes of mental arithmetic activities similar to those described below. The pace of these activities should be brisk, and you should try to involve all the students by varying the difficulty of your questions. If a student cannot answer, or answers incorrectly, simply ask another student to respond. A sample dialogue is provided here.

T: ***What number is 3 + 3?*** **S:** ***6.***
What number is 2 x 3? **S:** ***6.***
What number is one-half of 6? **S:** ***3.***

10 + 10? **S:** ***20.***
2 x 10? **S:** ***20.***
$\frac{1}{2}$ x 20? **S:** ***10.***

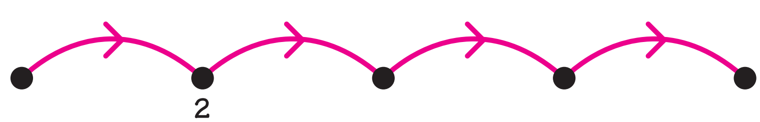
2 + 2? **S:** ***4.***
2 x 2? **S:** ***4.***
$\frac{1}{2}$ x 4 **S:** ***2.***

7 + 7? **S:** ***14.***
2 x 7? **S:** ***14.***
$\frac{1}{2}$ x 14? **S:** ***7.***

50 + 50? **S:** ***100.***
2 x 50? **S:** ***100.***
$\frac{1}{2}$ x 100? **S:** ***50.***

Exercise 2

Draw this arrow picture on the chalkboard. You may like to direct the students to copy the picture so they can follow the class activity on their papers.



F115

T: ***Point to the least number in this arrow picture.*** (The left-most dot)
Show me with your fingers what the least number is. (1)

Ask a student to label the dot for 1. Then, point to this dot and trace the arrow from 1 to 2.

T: ***What number fact does this part of the picture tell?***

S: ***2 x 1 = 2.***

T: ***Yes. Now, point to the greatest number in this arrow picture.*** (The right-most dot)
If you know what this number is, write it on your paper or whisper it to a neighbor.

Check several responses and compliment students who know that the greatest number is 16.

T: ***Who would like to label another dot in our arrow picture?***

As each dot is labeled, ask a student to read the corresponding number fact. When the dot for 4 is labeled, for example, the number fact is 2 x 2 = 4. Continue until every dot has been labeled and then write $^1/_2$x in blue near the arrow picture.

T: ***Who can draw an arrow for $^1/_2$x*** (read as "one-half of") ***in this arrow picture?***

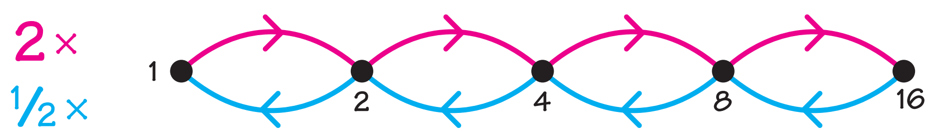
If none of the students is able to draw a $^1/_2$x arrow, point to 4 and hold up four fingers.

T: ***What is one-half of 4? 2 + 2 = 4, so one-half of 4 is …?***

S: ***2.***

T: ***Who can draw the arrow showing $^1/_2$ x 4 = 2 in our picture?***

Continue in this manner until the arrow picture is complete.



If some of your students are good at mental arithmetic, you may wish to extend this arrow picture to include 32 and 64.

F115.2 PARADE OF PROBLEMS #2 LESSON TWO

Capsule Lesson Summary

Provide individual practice with the Minicomputer, arrow pictures, counting problems, string pictures, and so on.

Materials

Teacher	• None	**Student**	• *Parade of Problems #2* Workbook • Colored pencils

Description of Lesson

Note: This is the second of two lessons using the *Parade of Problems #2* Workbook. The first was Lesson F105.2.

Distribute the students' copies of *Parade of Problems #2*. Instruct students to begin by correcting or completing those pages you have indicated on the workbook cover. Demonstrate this by discussing your checking method and turning to a page which requires corrections or completion. When students have finished correcting or completing pages, they should continue working on the workbook for the remainder of the period.

Collect and check the workbooks.† An individual student progress record for the workbook is available on Blackline F115.2. You may like to use this form to monitor student work.

This is the last time this particular workbook is scheduled, but you may want to let students work on pages that require corrections at a later time. If so, be aware that not all students should be required to complete the workbook. As mentioned earlier, the difficulty of the problems increases and students who are pushed beyond their ability may become frustrated. If you choose to send workbooks home with students, remind parents/guardians that you do not expect all students to complete the workbook.

†The answer key for this workbook follows Lesson F105.2.

F116 ESTIMATION #3

Capsule Lesson Summary

Estimate how many beans are in a jar. Then, take the beans out in handfuls; count and record. Use a calculator to do the resulting addition problem. Decide which estimates were closest.

Materials

Teacher
- Transparent jar (containing 300-400 dried beans, dried peas, or something similar)
- Number line
- Calculator

Student
- Post-it™ notes

Description of Lesson

This lesson is a virtual repetition of Lesson F91 *Estimation #2*, except that the number being estimated in this lesson is greater. Please refer to Lesson F91 for a complete description. The extension suggestion in F91 could be the focus of this lesson. That is, you may like to use the same jar and fill it with smaller objects than those used in Lesson F91. In this case, begin this lesson with a reminder of the results from Lesson F91, compare the size of the objects used earlier with those being used now, and discuss what happens when you fill the same container with smaller objects.

F117.1 BOOKER'S BAKERY

Capsule Lesson Summary

Use a story about sharing cakes and cookies to discuss dividing a shape into two pieces of exactly the same size. Use the symmetry of a shape to find several ways of dividing it in half. Examine the shapes of the numerals 0 to 9 to determine which of them can be easily cut into two pieces of the same size.

Materials

Teacher	• *FG Posters* #3 and #4 • Ruler or meterstick • Tape	Student	• Paper

Advance Preparation: Cut out the three geometrical shapes on *FG Poster* #3.

Description of Lesson

Exercise 1

T: ***A friend of mine, Mr. Booker, owns a bakery. What kinds of things are sold in a bakery?***

Allow some time for a brief discussion of this question.

T: ***One of Mr. Booker's finest and most delicious cakes is his chocolate fudge cake. The chocolate fudge cake looks like this.***

Tape the demonstration circle (which you cut from *FG Poster* #3) to the chalkboard.

T: ***This chocolate fudge cake is so filling that many people do not want to buy a whole cake. One day, a man came in to the store and asked to buy one-half of a chocolate fudge cake. Who would like to pretend this ruler*** (hold up the ruler) ***is a knife and show us how to cut the cake in half?***

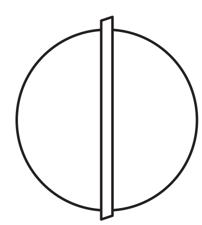
Choose a student to place the ruler on edge against the figure to show it being cut in half. Provide help as necessary.

T: ***How many pieces of cake are there now?***

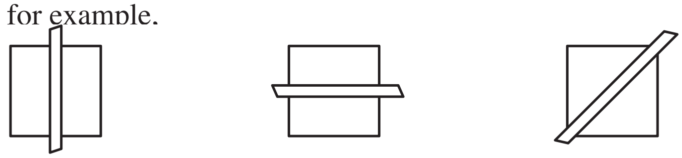
S: ***Two.***

T: ***Do they both seem to be the same size?***

S: ***Yes.***



Tell the class another episode about a pineapple upside-down cake, taping the demonstration square to the chalkboard and following the procedure described above. This square-shaped cake may be cut in half in many ways; for example.

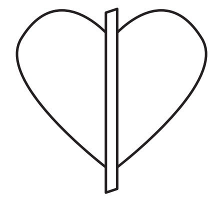


F117

T: ***For Valentine's Day, Mr. Booker bakes a special cake. What do you think this cake looks like?***

S: ***It's shaped like a heart.***

Tape the heart-shaped figure to the chalkboard and choose a volunteer to show how to cut it in half.



T: ***How many pieces of cake are there?*** (Two)
Do they both seem to be the same size? (Yes)

If the class suggests cutting the cake in some other way, proceed as follows.

T: ***How many pieces of cake are there?*** (Two)

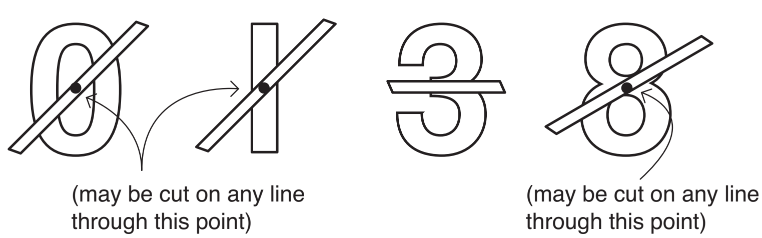
Yes; but when we cut the cake this way, it's not very easy to see whether or not both pieces are really the same size. Does anyone know a different way to cut the cake so that it will be easier to check that both pieces are the same size?

When someone suggests cutting the cake as shown above, continue. Instruct the students to draw a shape on their papers for a cake that can be cut easily in half; i.e., into two pieces the same size. Encourage students to find different shapes and perhaps exchange with a partner to check that they can be cut easily.

Exercise 2

T: ***A pair of twins lives on Mr. Booker's street. For the twins' birthday, Mr. Booker baked ten cookies shaped like the numerals 0 to 9. The twins wanted to share the cookies, so they decided to cut each of the cookies in half. Sometimes, however, they couldn't be sure that the two pieces of cookie were both the same size.***

Tape *FG Poster* #4 (showing the ten numerals from 0 to 9) to the chalkboard and choose volunteers to show how the numerals may be cut into two pieces which appear to be of equal size. Those which may be cut this way are shown below. The other numerals, of course, may also be cut into two equal pieces, but since the two pieces do not have the same shape, the equality of their areas are not immediately apparent.



F117.2 MAGIC SQUARES #2

Capsule Lesson Summary

Use addition to check whether or not a three by three array of numbers is a magic square.

Materials

Teacher
- Calculator

Student
- Calculator
- Minicomputer set
- Worksheets F117.2* and **

Description of Lesson

Provide each student or group of three students with a calculator. Draw a three by three square on the chalkboard.

T: ***Do you remember the magic squares we worked with some time ago? What was magic about them?***

S: ***You always get the same answer whether you add up and down, or across, or from corner to corner.***

You may need to assist the students with an explanation. When the class understands the properties of a magic square, continue by putting numbers in the square on the chalkboard.

Invite the class to discuss whether or not this is a magic square. (It is not.)

5	12	13
10	14	6
15	4	11

Check the accuracy of whatever conclusion is offered by performing the addition problems for the square. One way to do this is to organize the class into eight groups (possibly three per group) and

$$\left.\begin{array}{l}5+12+13=30\\10+14+6=30\\15+4+11=30\end{array}\right\}\text{Rows}\qquad\left.\begin{array}{l}5+10+15=30\\12+14+4=30\\13+6+11=30\end{array}\right\}\text{Columns}\qquad\left.\begin{array}{l}5+14+11=30\\15+14+13=42\end{array}\right\}\text{Diagonals}$$

If the class is working as a whole, perhaps they will discover that one of the sums is 30 and another is 42 without solving all the addition problems. The class may properly conclude that the square is not magic.

Distribute Worksheets F117.2*. Instruct the students to solve the addition problems on the front page using their individual Minicomputers and check them with a calculator. A square is shown on the reverse side; students should determine whether or not it is a magic square. You may like to allow students to work in groups and share the job of checking various sums. Students or groups who finish Worksheet F117.2* should continue with F117.2**. Ask students to write the number sentences for the eight addition problems they must solve to check for a magic square.

F117

Home Activity

Prepare three by three number squares, one that is a magic square and one that is not, for students to check at home with the help of family members. (You will need to send home a brief description of a magic square.) Also, suggest that calculations be checked with a calculator.

A Magic Square

11	1	15
13	9	5
3	17	7

Not a Magic Square

1	8	9
6	10	2
11	3	7

Magic Square: The sum of the three numbers in each row, column, and diagonal is always the same.

Name____________________ F117.2 ☆

Complete.

$$\begin{array}{r} 11 \\ +6 \\ \hline 17 \end{array} \qquad \begin{array}{r} 21 \\ +8 \\ \hline 29 \end{array} \qquad \begin{array}{r} 25 \\ +11 \\ \hline 36 \end{array}$$

14 + 22 = 36

23 + 12 = 35

24 + 15 + 40 = 79

6	1	8
7	5	3
2	9	4

Rows

6 + 1 + 8 = 15

7 + 5 + 3 = 15

2 + 9 + 4 = 15

Columns

6 + 7 + 2 = 15

1 + 5 + 9 = 15

8 + 3 + 4 = 15

Diagonals

6 + 5 + 4 = 15

8 + 5 + 2 = 15

Is this a magic square? Yes

Name____________________ F117.2 ☆☆

8	3	10
9	7	5
4	11	7

Is this a magic square? No

Rowe	Columne	Diagonale
8 + 3 + 10 = 21	8 + 9 + 4 = 21	8 + 7 + 7 = 22
9 + 7 + 5 = 21	3 + 7 + 11 = 21	10 + 7 + 4 = 21
4 + 11 + 7 = 22	10 + 5 + 7 = 22	

21	16	23
22	20	18
17	24	19

Is this a magic square? Yee

Rowe	Columne	Diagonale
21 + 16 + 23 = 60	21 + 22 + 17 = 60	21 + 20 + 19 = 60
22 + 20 + 18 = 60	16 + 20 + 24 = 60	23 + 20 + 17 = 60
17 + 24 + 19 = 60	23 + 18 + 19 = 60	

Capsule Lesson Summary

Review the language of strings for classifying A-blocks. Arrange three strings—one for first graders, one for boys, and one for students wearing sneakers today—so that every student in the class may be placed in the string picture.

Materials

Teacher
- A-block set
- Colored chalk
- Loops of colored string (yarn)

Student
- Paper
- Colored pencils

Description of Lesson

Exercise 1

Draw a large, red string on the chalkboard and label it **Green**. You may like to model your drawing with a loop of colored string on the table or the floor.

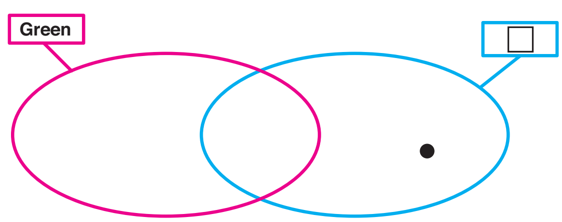
T: ***This string is for all green A-blocks. Who can draw and label a string for all of the square A-blocks?***

Ask a volunteer to do so. You may also like to give a loop of blue string to a student to place on the table or floor.

Choose an A-block piece (such as a red square) and display it to the class.

If you have strings on the table or floor, ask a student to place the piece.

T: ***Let's draw a dot in our picture for this A-block.***



The class should help judge the correctness of a dot. Continue choosing A-blocks and calling on students to draw dots for the pieces until at least one dot has been drawn in each of the four regions of the string picture.

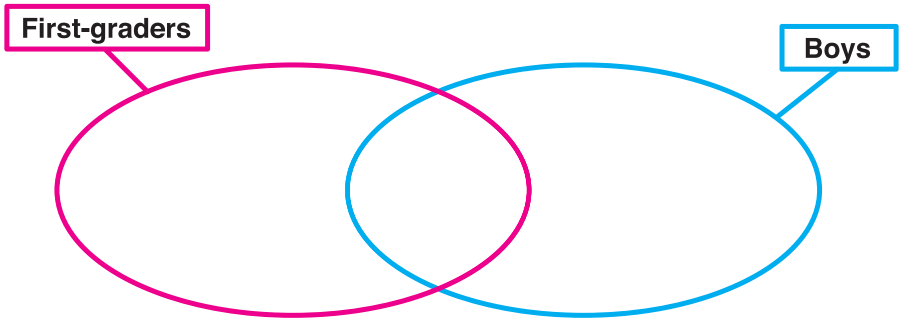
Exercise 2

You may again like to use actual loops of colored string during this exercise. This time you will need big loops in three colors.

Erase the picture and begin a new one. Draw a red string labeled **First-graders**.

F118

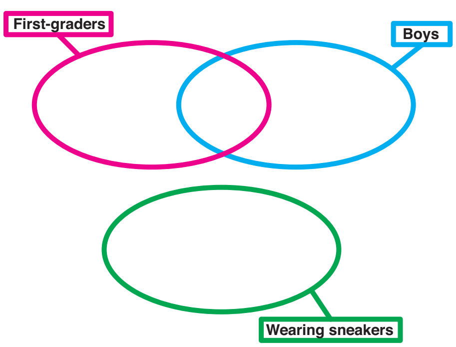
T: ***This string is for all the first-graders at our school. Who would like to draw a string for all the boys at our school?***



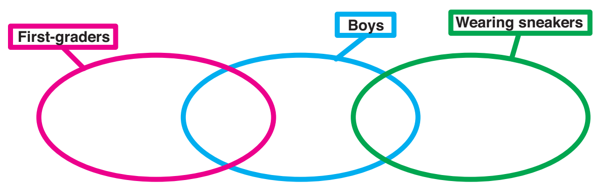
Ask several students, one at a time, to draw dots for themselves. When several students have correctly located themselves, erase all of the dots and ask,

T: ***Who can draw a third string for all of the students who are wearing sneakers today?***

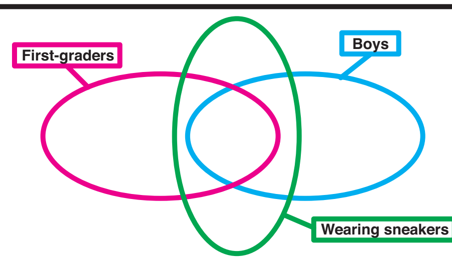
Note: At this point, an incorrect placement of this third string by a student may actually prove quite useful in demonstrating why a string picture is drawn the way it is; i.e., if the picture were drawn in any other way, some students could not be correctly placed in it. In the case of the three possible (and incorrect) responses that follow, you might ask where to place…



… a boy wearing sneakers

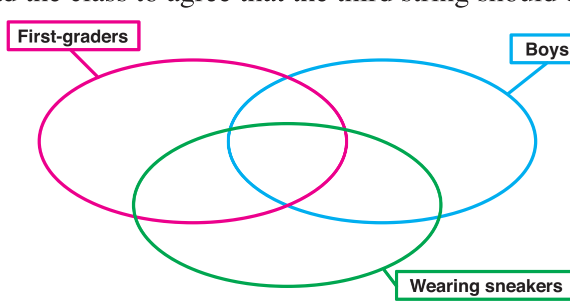


… a first-grader wearing sneakers



… a first-grade boy not wearing sneakers

The discussion should lead the class to agree that the third string should be drawn as follows:



Ask several students to locate dots for themselves. Then, one at a time, draw dots in each of the eight possible regions of the picture and say,

T: ***If this dot could be for you, stand up.***

After you consider all eight regions, ask if everyone had a chance to stand up. If some say they did not, help those students to locate their dots.

T: ***Did anyone stand more than once?***

If so, help those students determine exactly when they should have stood. (Each student should stand exactly once.)

Exercise 3

Leave the three string picture from Exercise 2 on the chalkboard, but erase the labels. Organize the class into cooperative groups of two to four students each. Provide each group with unlined paper and colored pencils. Instruct each group to copy the three string pictures. Then direct the groups to choose string labels that describe some of their classmates. Allow the groups to collect data about where their classmates would be in their pictures. As time allows, encourage groups to tell the class about their pictures.

F119.1 SUBTRACTION ON THE MINICOMPUTER #3

Capsule Lesson Summary

Present two stories in which there are subtraction problems and use the Minicomputer to do the calculations. Write the related number sentences. Conclude by solving a subtraction problem given only a calculation.

Materials

Teacher		Student	
	• Minicomputer set		• Paper • Minicomputer set

Description of Lesson

Tell the following stories to your class, choosing several students to star in them.

T: ***Shannon has an aquarium at home with 57 guppies in it. Who knows what a guppy is?***

Allow the students to comment. The guppy is a small fish known for being especially prolific.

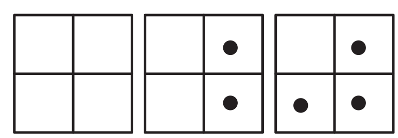
T: ***Yesterday Shannon decided that her aquarium had too many fish in it, so she gave 16 of her guppies to Gabrielle. How many guppies does Shannon have left?*** (41)

Invite students to offer their suggestions.

T: ***What calculation could we write about Shannon's guppies?***

S: ***57 – 16.***

Display three Minicomputer boards and ask a volunteer to put 57 on the Minicomputer.

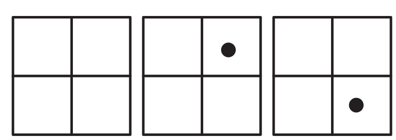


T: ***How can we do the calculation?***

S: ***Take away 16.***

T: ***Do we need to make trades first?*** (No)

Send a student to the Minicomputer to take away 16. Then complete the number sentence.



57 – 16 = 41

T: ***57 take away 16 equals 41. Who has more guppies now, Shannon or Gabrielle?***

S: ***Shannon does.***

Remove all checkers from the Minicomputer before continuing to the next story.

T: ***Wally's uncle raises rabbits. When Wally's family visited him last weekend, Wally's uncle had 30 rabbits in pens near the garage. Why might Wally's uncle raise rabbits?***

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During the discussion, explain that many people raise rabbits to sell as pets.

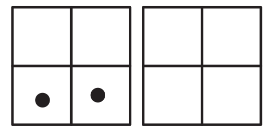
T: ***While Wally was at his uncle's house, eight rabbits were sold. How many rabbits does Wally's uncle have left?***

Allow several students to suggest an answer.

T: ***What problem could we write about the rabbits?***

$$\begin{array}{r} 30 \\ -\ 8 \\ \hline \end{array}$$

Ask a volunteer to put 30 on the Minicomputer.



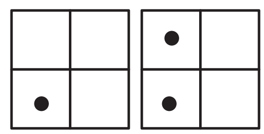
T: ***What should we do next?***

S: ***Take away 8; but first we need to make a trade.***

T: ***Yes; there is no checker on the 8-square, so we need a trade to get a checker there. What trade should we make?***

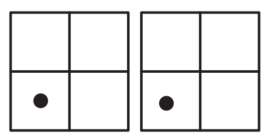
S: ***A backward trade; 10 = 8 + 2.***

Ask one student to make this trade on the Minicomputer, and another to take away 8.



T: ***How many rabbits did Wally's uncle have left?*** (22)

Call on a student to complete the subtraction problem on the chalkboard.



$$\begin{array}{r} 30 \\ -\ 8 \\ \hline 22 \end{array}$$

Remove all checkers from the Minicomputer and erase the chalkboard before continuing. Then, write this calculation on the chalkboard.

$$69 - 14 =$$

T: ***What number is 69 – 14?*** (55)

Record several of the students' responses before doing the calculation on the Minicomputer. Then complete the number sentence on the chalkboard.

$$69 - 14 = 55$$

Writing Activity

Ask students to write a story in which they must solve a subtraction problem. Instruct them to solve the subtraction problem using individual Minicomputers if they wish.

F119.2 IS LESS THAN RELATION #1

Capsule Lesson Summary

Relate pairs of numbers given in non-standard form (e.g., 62 + 4 and 62 + 12) by writing < or > between them. Draw *is less than* arrows between dots labeled with non-standard names.

Materials

Teacher
- Colored chalk
- 0–109 numeral chart or number line
- Minicomputer set (optional)

Student
- Colored pencils
- Worksheets F119.2* and **

Description of Lesson

Exercise 1

Put this information on the chalkboard.

62 + 4	62 + 12
87 + 16	87 + 9
66 + 35	35 + 66

Point to the first horizontal line and ask,

T: ***Can we draw Goldy's mouth or equals here? Do we need to do the calculations first?***

Call on a volunteer to draw Goldy's mouth without doing the calculations.

T: ***How do you know?***

S: ***4 is less than 12; so 62 + 4 is less than 62 + 12.***

If many of the students fail to see this, use the 0–109 numeral chart or number line to demonstrate it. If necessary, use the Minicomputer to do the calculations and then draw Goldy's mouth.

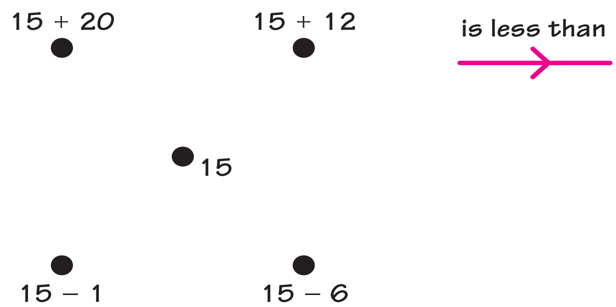
Repeat this process for the numbers in the second and third lines.

62 + 4	<	62 + 12
87 + 16	>	87 + 9
66 + 35	=	35 + 66

F119

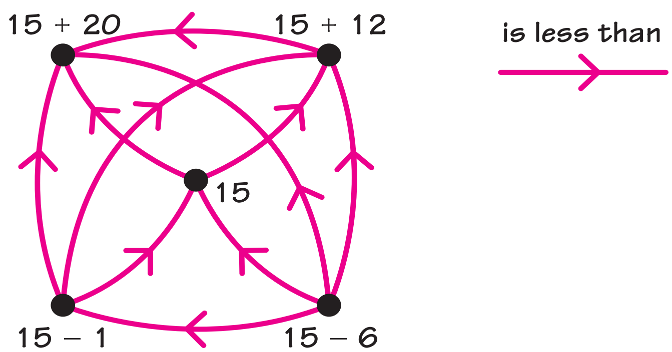
Exercise 2

Erase the previous number sentences from the board and draw this picture.

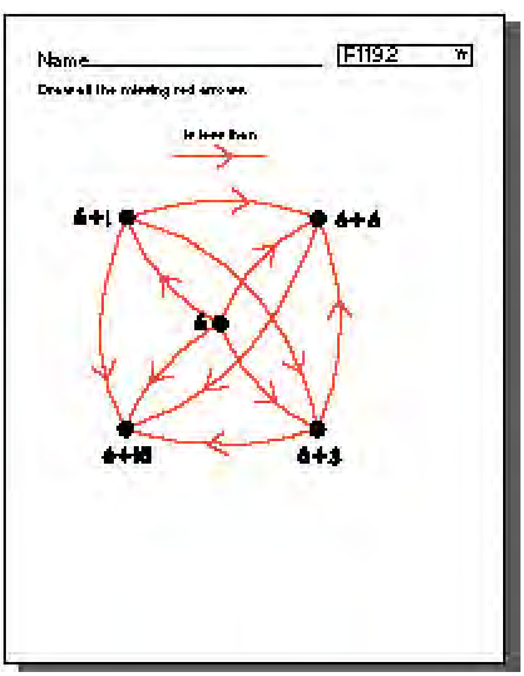


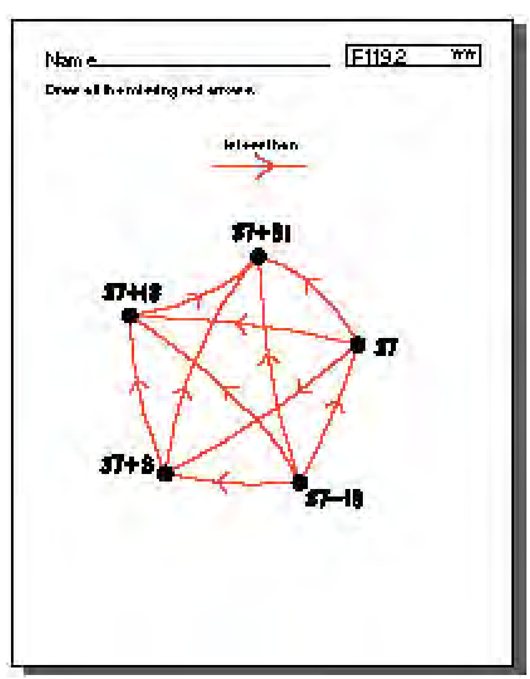
T: ***Who can show me where to draw an* is less than *arrow?***

Call on several students to suggest where arrows may be drawn. Encourage them to think about what makes number sense; for example, 15 is less than 15 + 12. If students find this difficult, you may prefer to ask them to do calculations and find standard names for the numbers, adding these to your picture.



Distribute Worksheets F119.2* and ** and explain to the students that they should draw *is less than* arrows. You may like to let students work with a partner on these worksheets.





F120 ADJUSTMENT/ASSESSMENT DAY #11

Note: See Section One, page 1-9, for a full explanation of the purpose of scheduled adjustment days. Worksheet F120 provides for a short, written assessment.

On this day you may wish to repeat an earlier lesson either for a small group of students or for the entire class. Many of the lessons can be made to appear completely different by changing the story and/or the numbers in the lesson. If you omitted exercises or worksheets from an earlier lesson, you may wish to include these. This is also a good time to allow students to work in centers or on a project of your choice.

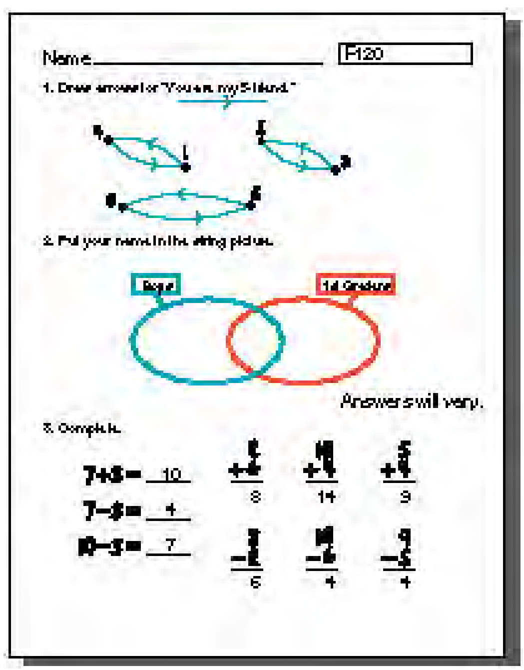
If you believe some of your students can work further in the *Parade of Problems #2* Workbook, you may want to allow extra time for individual work in the workbook. This might also be a good time for students to work with a partner on a few of the more challenging pages in the workbook.

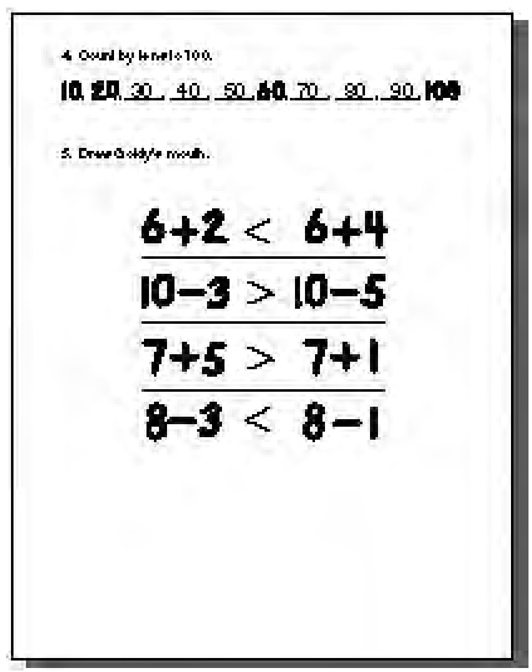
If your class is experiencing little difficulty with the *CSMP* curriculum, you may wish to omit this adjustment day and continue immediately with F121.1 *Addition Story #4*.

Early Warning

Among the next nine classroom lessons are some that require extra preparation time or make use of materials not included with the *CSMP* Classroom Set. The lessons are listed here for your convenience in preparing for them. A more detailed description of the materials can be found on the first page of each lesson. (Special materials are listed here only once, even if they are needed more often in the nine-day period.)

F122.1 *Multiplication Story #5*: Overhead or class calculator
F123.1 *Counting Calculator #4*: Objects that come packaged in threes
F124.2 *Length #2*: Meter stick; orange C-rods (optional)
F126.1 *Coin Problem #3*: Coins; small opaque container
F129 *Combinatorics with Three Digits #1*: Place value manipulatives; index cards





F121.1 ADDITION STORY #4 ____________________ F121

Capsule Lesson Summary

Decide if a group of first graders have enough money to buy a kickball after earning money from sales of three types of things. Do the addition on the Minicomputer and compare the sum to the cost of the kickball.

Materials

Teacher	• Minicomputer set • Calculator (optional)	**Student**	• Minicomputer set • Calculator (optional)

Description of Lesson

You may like to pair students to work with individual Minicomputers during this lesson.

Tell the following story or a similar one to the class.

T: ***In a school near here, the first grade class needed some money to buy a kickball. They decided to sell candy, cookies, and popcorn balls brought from home. Each item sold for a penny apiece. The class collected 127 pennies from candy sales, 275 pennies from cookie sales, and 146 pennies from popcorn ball sales.***

Write these three amounts on the chalkboard.

T: ***How can we find out how much money they collected in all?***

S: ***Add the three numbers together.***

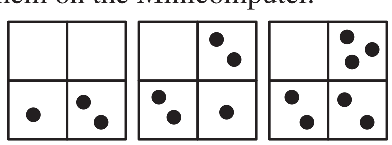
$$127 + 275 + 146 =$$

T: ***The students needed 500 pennies to buy the kickball. Do you think they had enough?***

Allow the class to discuss this question. Some students may reason that the sum is more than 500. Encourage estimation, but do not expect or insist on well-phrased explanations.

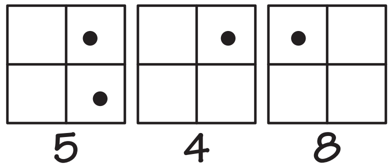
T: ***Let's discover exactly how much money was collected.***

Ask volunteers to put 127, 275, and 146 on the Minicomputer. Using different colored checkers for the three numbers will highlight them on the Minicomputer.



F121

Then call on students to make trades until the standard configuration is obtained. Write the result below (above) the Minicomputer.



Finally, complete your number sentence on the board. You may also like to let students check the calculation with a calculator.

$$127 + 275 + 146 = 548$$

T: ***How many pennies are there in a dollar?*** (100) ***These students have 548 pennies. How many dollars and cents do they have?*** (5 dollars and 48 cents) ***Who can write "5 dollars and 48 cents" as we usually see an amount of money?***

$$\$5.48$$

Select a volunteer to do so.

T: ***The kickball costs $5.00. Did the students have enough money to buy it?***

S: ***Yes.***

T: ***Did they have any money left over? If so, how much?***

S: ***Yes, 48¢.***

T: ***What coins might the children get as change?***

Writing Activity

Instruct students to write a story about shopping. Ask them to tell two or three things they bought, how much the items cost, and what the total was.

Home Activity

Suggest parents/guardians find opportunities to add prices. For example, after going to the store, suggest they write down the costs of two different items less than 50¢ and ask their child to find the total using a Minicomputer or a calculator.

F121.2 ELI'S MAGIC PEANUTS #2

Capsule Lesson Summary

Review what happens when magic peanuts and regular peanuts meet. Write the corresponding number sentences involving the addition of positive numbers and negative numbers.

Materials

Teacher
- None

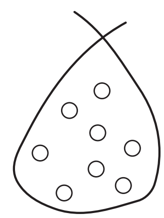
Student
- Worksheet F121.2
- Plastic bags and checkers (optional)

Description of Lesson

During this lesson you may like to let students act out the stories in pairs using a bag (the clear ziplock type) and individual Minicomputer checkers.

T: ***Who remembers Eli the Elephant and the magic peanuts?***

Invite a student to describe magic peanuts and how they behave.
Then, draw this picture on the chalkboard.



T: ***Here is Eli's bag of peanuts. How many regular peanuts are in it?*** (Eight) ***Eli still doesn't know what happens with magic peanuts. He just picked three magic peanuts and is about to put them in his bag. What will happen?***

S: ***The three magic peanuts and three regular peanuts will disappear.***

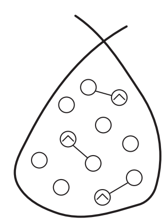
S: ***Only five peanuts will be left.***

Draw the three magic peanuts and call on students to pair them with any three regular peanuts.

T: ***Eight regular peanuts plus three magic peanuts is…?***

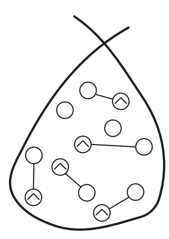
S: ***Five regular peanuts.***

Write a number sentence for this on the board.

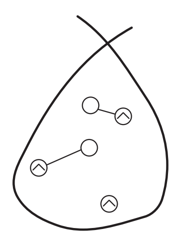


$8 + \hat{3} = 5$

Repeat this activity for the following two situations.



$7 + \hat{5} = 2$



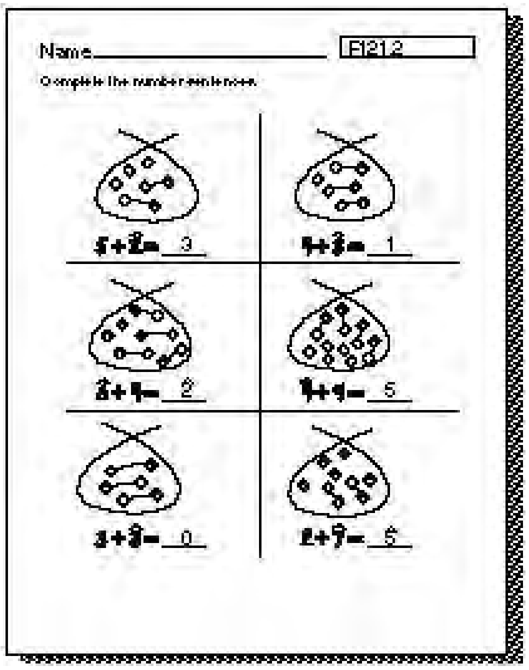
$\hat{3} + 2 = \hat{1}$

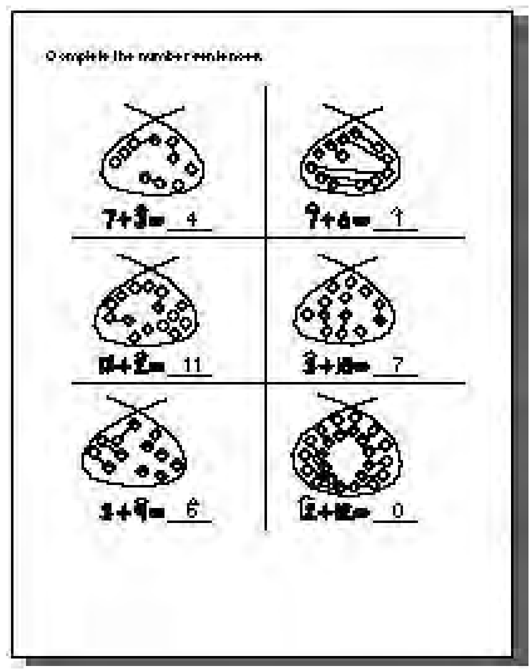
F121

Distribute Worksheet F121.2 and tell the students to complete the number sentences for each of Eli's bags of peanuts. Students who finish quickly can make up some of their own problems. On a separate sheet of paper, instruct students to draw Eli's bag, showing any number of regular and magic peanuts they choose; ask them to write the appropriate number sentences for their drawings.

Center Activity

Laminate Eli problems or put bags and checkers out for students to make up their own problems.





F122.1 MULTIPLICATION STORY #5

Capsule Lesson Summary

In a story situation, divide 3 x 29 pieces of candy among 26 classmates. How many pieces will each student receive? How many pieces will be left over?

Materials

Teacher	• Minicomputer set • Overhead or class calculator	**Student**	• None

Description of Lesson

Begin the lesson by playing two or three games of Guess My Rule, as described in Lesson F94.1.

Tell the following story or a similar one, letting one of your students star in the story. Adjust the story, if necessary, so that each bag of candy described in the story contains exactly three more candies than the number of students in your class. The sample dialogue here assumes that there are 26 students in the class.

T: ***Last week, Eunice went with her mother to a department store hoping to find some candy to bring to school. When she found what she wanted, she bought three bags; each bag had 29 candies in it. How can we find out how many pieces of candy she has to bring to school?***

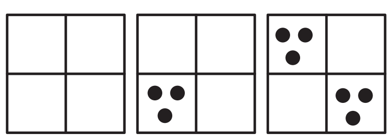
S: ***Put 29 on the Minicomputer three times.***

T: ***What calculation would we do?***

S: **29 + 29 + 29.**

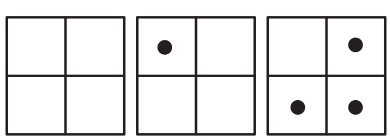
S: **3 x 29.**

Write the multiplication problem on the chalkboard and ask three volunteers to each put 29 on the Minicomputer.



$3 \times 29 =$

Call on students to make trades until the number (87) is shown in its standard configuration and then ask a student to complete the number sentence.



$3 \times 29 = 87$

T: ***Eunice wants to share her candy with all of the students in our class; how many students are there?*** (26) ***If each of you receives the same number of candies, how many would each of you get?***

F122

Any student who knows the answer (three) may be asked to explain how they found it. After a brief discussion, however, continue by drawing a picture of three bags with 29 on the chalkboard.

T: ***Here are the three bags of candy. Can we give each student a piece from the first bag?*** (Yes)
How many pieces does each student receive from this bag? (One)
Will there be pieces from this bag left over?
How many? (Three)

Add this information to your drawing, as shown below.

T: ***How many pieces of candy from the second bag does each student receive?*** (One)
How many are left over? (Three)

Add this information to your drawing and repeat these questions for the third bag, to complete the picture.

T: ***How many pieces of candy does each student receive in all?***

S: ***Three.***

T: ***In all, how many pieces are left over?***

S: ***Nine.***

Center Activity

Set up a story situation like the one above but use smaller amounts in the bag and smaller groups of students. Use counters, chips, or some item to represent the candy. Let students who need more experience physically portion out the candy from each bag.

F122.2 FROGS IN A POND #1

Capsule Lesson Summary

Find common multiples of 3 and 5 in the context of a story in which two frogs hop down a long line of numbered lily pads. The large frog always hops five pads at a time; the other always hops three pads at a time. Determine on which pads they will meet.

Materials

Teacher		Student	
	• Colored chalk • Numeral cards (optional)		• Desk number line • Pictures of frogs or frog counters (optional)

Description of Lesson

Tell the following story, or a similar one, to your class.

T: ***This is a story about two frogs who lived near the edge of a large, clear pond. On the surface of the water, there were many lily pads that stretched from the shore far out into the middle of the pond.***

One day, when they were not very busy, the frogs decided to give each lily pad a number.

Draw this picture on the chalkboard.

● ●
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Note: This activity can be done either with students using their desk number lines and pictures of two frogs (big and small), or using dots drawn on chart paper on the floor with students acting out the frog jumps. Another alternative is to give students numeral cards from 0 to 20 and let them form a human number line. Other students can play the role of the frogs and jump from place to place on this number line.

T: ***This lily pad*** (point to 0) ***is next to the shore. The lily pads continue far out into the pond; I've only drawn some of them.***

One day, the two frogs were sitting on lily pad 0 when they decided to hop out into the pond for lunch. One of the frogs was very large and always hopped five pads at a time. The other frog was smaller and always hopped three pads at a time.

Is there a lily pad on which both frogs could land to have lunch together?

Allow a few moments for the students to discuss this and to express their opinions before you continue.

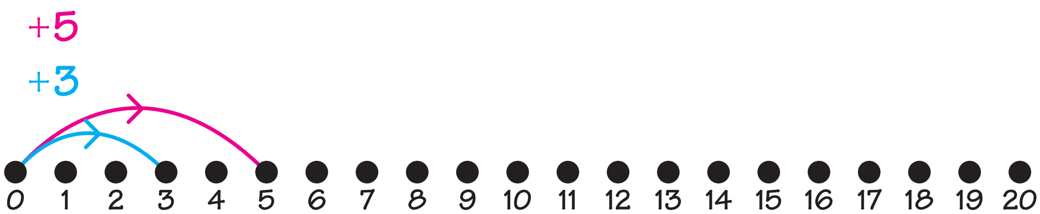
T: ***The big frog hops five pads at a time; let's show this in red.***

F122

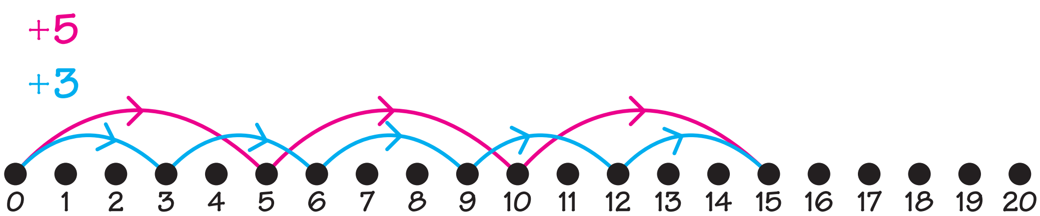
Ask the class to count with you as you begin at 0 and point to each dot, up to 5. Then, draw a red arrow for the big frog's first hop.

T: ***The little frog hops three pads at a time; we can show this in blue.***

Start at 0 and point to 1, 2, and 3 in turn as the class counts. Draw a blue arrow for the little frog's first hop.



Call on students to show the frogs' successive jumps by drawing more red and blue arrows. Direct this activity toward trying to find a meeting place for the frogs. For example, the students might first draw another blue arrow (from 3 to 6), then another red arrow (from 5 to 10), then two more blue arrows (from 6 to 9 and from 9 to 12), then another red arrow (from 10 to 15), and finally another blue arrow (from 12 to 15). Continue to ask whether the frogs will find a meeting place.



T: ***So, both frogs land on lily pad* 15 *and can have lunch together there.***

Compliment students who predicted this and ask how they knew the answer. Some students may reply that they counted in their heads.

T: ***Let's suppose that the frogs decide to go even farther out into the pond; is there another lily pad on which they both land? Remember, there are more lily pads than those I've drawn here—they keep on going!***

If any student answers "30," ask for an explanation; otherwise, simply leave this problem unresolved. The students will encounter similar problems in later lessons. Students might like to work together to solve this problem.

Reading Activity

You may like to follow or begin this lesson with a book such as *The Caterpillar and the Polliwog* by Jack Kent or one of the "frog and toad" stories by Arnold Lobel.

F123.1 COUNTING CALCULATOR #4

Capsule Lesson Summary

Review how to teach a calculator to count forward and backward by ones, twos, fives, or tens. Discuss how to teach a calculator to count by threes, forward and backward.

Materials

Teacher	• Overhead or class calculator • Objects that come packaged in threes.	**Student**	• Calculator

Description of Lesson

Display an overhead or class calculator. Review how to teach the calculator to count by ones or twos, forward and backward. Let some students demonstrate. Then review how to teach the calculator to count by fives or tens, forward and backward. Again, let some students demonstrate.

Exercise 1

T: ***Today I want to teach the calculator to count by threes starting at 0. Can any of you count by threes?***

Invite students to do the counting, if they can, to about 30.

T: ***How would we teach the calculator to do this?***

S: ***Press ° å £ ≠ ≠ ≠ and so on.***

Solicit some discussion about when counting by threes might be used. Choose one or two ideas to demonstrate and use counting by threes (e.g., landing places of +3 jumps on the number line, counting things that come packaged in threes such as juice drinks, tennis balls, and so on).

Invite a student to teach the calculator to count by threes and ask the student to stop at 15. Before pressing any more keys, ask the class some prediction questions and then use the calculator to check.

T: ***What is the next number we will see on the calculator?*** (18)
What number will we see if we press ≠ two more times? (21)
What is a number greater than 30 that we will see? (33, 36, and so on)
Can you predict a number greater than 50 we will see? (51 or 60, for example)

At some point (for this example, at 60) stop counting forward by threes with the calculator and ask,

T: ***We used the calculator counting by threes to get to 60. What could we do to go backward, to start at 60 and see all the same numbers in reverse? Count backward by threes?***

S: ***Press ß £ ≠ ≠ ≠ and so on.***

Demonstrate this on the class or overhead calculator.

F123

Distribute calculators to pairs of students. Let students explore the effects of counting by threes forward and backward with the calculator. You may also like to suggest that students explore counting by fours or some other number of their choice.

Home Activity

Suggest to parents/guardians that they ask their child to show them how to teach a calculator to count forward and then backward by threes, starting at 0. Use counting by threes to count how many things are in several packages when packages contain three items each.

F123.2 –3 ARROW ROAD

Capsule Lesson Summary

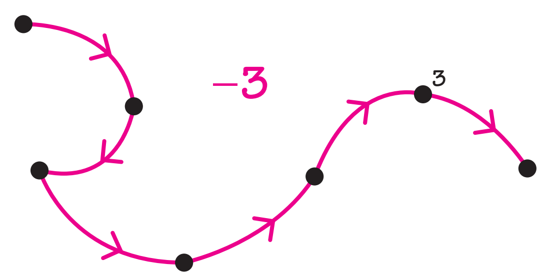
Use return arrows to help label the dots in a –3 arrow road.

Materials

Teacher	• Colored chalk • Number line • Calculator (optional)	Student	• Colored pencils • Worksheet F123.2 • Calculator (optional)

Description of Lesson

Draw this arrow picture on the chalkboard.



T: ***What are the red arrows for?***

S: ***–3.***

T (pointing to the dot at the extreme right)***:***
Who can label this dot?

Call on a volunteer to label the dot 0 and then check the label.

T (tracing the arrow from 3 to 0)***: 3 minus 3 is 0. Is that right?***

S: ***Yes.***

Demonstrate this fact by starting at 3 on the number line and hopping three spaces to the left or by using counters to model 3 – 3. You may also like to write the fact 3 – 3 = 0 near the arrow. Next, point to the dot to the left of the dot for 3.

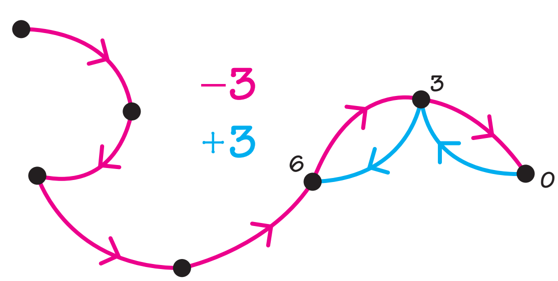
T: ***Who can label this dot?***

Use the procedure described above to check the label of this dot. (6)

In blue, write +3 near your picture.

T: ***Who can draw a blue +3 arrow?***

Call on one or two students to draw blue arrows. Most likely they will draw these two arrows.



In each case trace the +3 arrow as you say the corresponding number fact.

One by one, call on volunteers to add other blue arrows, asking them to explain why each arrow may be drawn. In the case of a blue arrow starting at 3, for example, the following two explanations are possible.

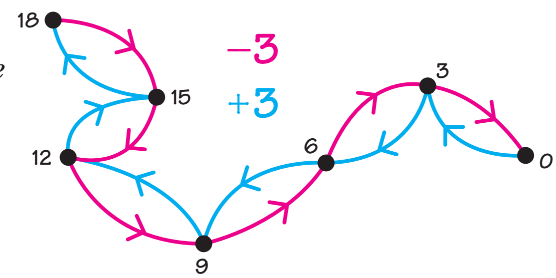
S: ***3 + 3 = 6 and this dot*** (to the left of 3) ***is 6.***

F123

S: ***I can draw a blue +3 arrow from 3 to 6 because there is a red –3 arrow going the other way, from 6 to 3; +3 is the opposite of –3.***

If no one offers this second explanation wait until all the arrows are drawn and ask the students if they notice anything about the red and the blue arrows.

S: ***Where there is a red arrow going in one direction, there is a blue arrow going in the opposite direction.***

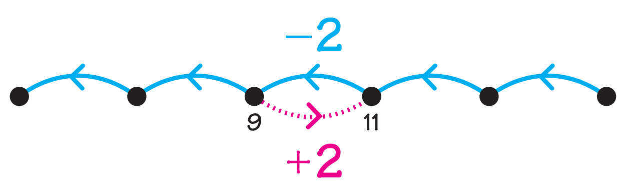


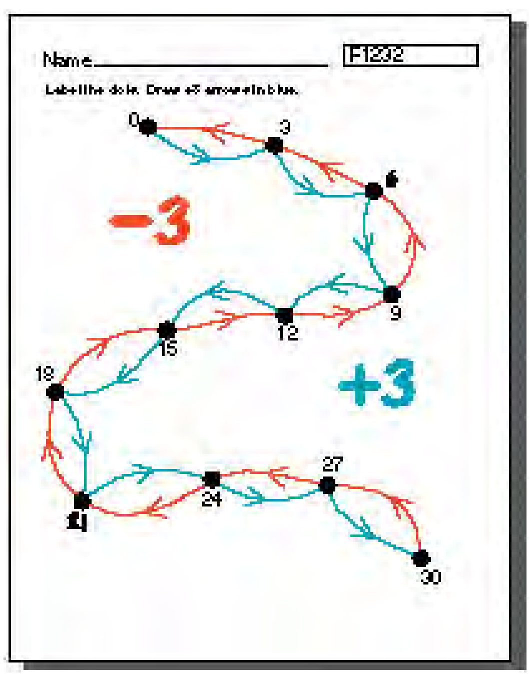
A completed arrow picture is shown here. You may like to suggest checking the picture with a counting (by threes) calculator.

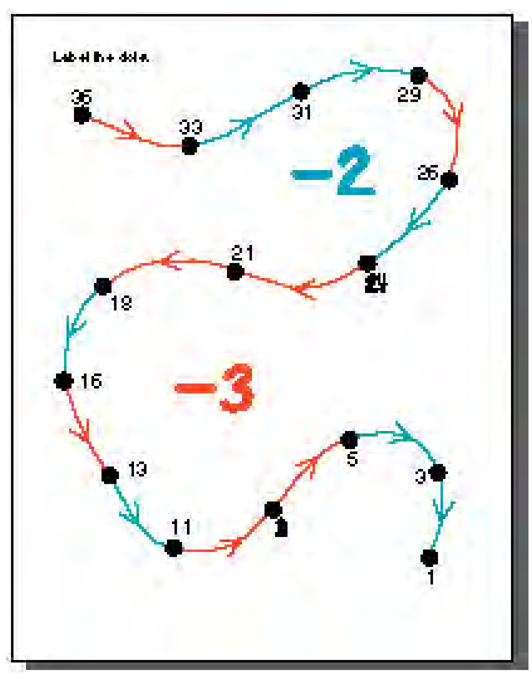
Distribute copies of Worksheet F123.2 and explain the directions. On the front side, students should label the dots and draw +3 return arrows in blue. The reverse side of the worksheet involves both –3 and –2 and is available for students who need an added challenge. Students may like to use calculators to check their own work.

Home Activity

Send home an arrow picture similar to the one used in this lesson with an explanation of drawing return arrows (opposites). Have parents/guardians work with their child to label the dots and draw opposite arrows. For example.







F124.1 THE FUNCTIONS 2x AND ½x #2

Capsule Lesson Summary

Begin with some mental arithmetic practice involving doubling and halving. Draw 2x and $^1/_2$ x arrows between labeled dots.

Materials

Teacher	• Colored chalk	Student	• Worksheet F124.1 • Colored pencils

Description of Lesson

Exercise 1

Begin this lesson with about five minutes of mental arithmetic activity. Try to involve many students by varying the difficulty of the questions you pose. Keep this activity moving briskly. If a student cannot answer or answers incorrectly, ask another student to respond. A sample dialogue follows.

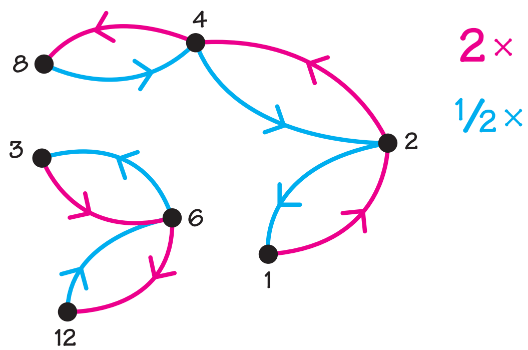
T:	***What number is 4 + 4?***	**S:**	***8.***
	What number is 2 x 4?	**S:**	***8.***
	What number is ½ x 8 (read as "one-half of eight")	**S:**	***4.***
	What number is 40 + 40?	**S:**	***80.***
	What number is 2 x 40?	**S:**	***80.***
	What number is ½ x 80?	**S:**	***40.***
	What number is 2 x 5?	**S:**	***10.***
	What number is ½ x 10?	**S:**	***5.***
	What number is 2 x 50?	**S:**	***100.***
	What number is ½ x 100?	**S:**	***50.***
	What number is 2 x 3?	**S:**	***6.***
	What number is ½ x 6?	**S:**	***3.***
	What number is 2 x 30?	**S:**	***60.***
	What number is ½ x 60?	**S:**	***30.***

Exercise 2

Distribute Worksheet F124.1 and copy the picture from the worksheet on the chalkboard.

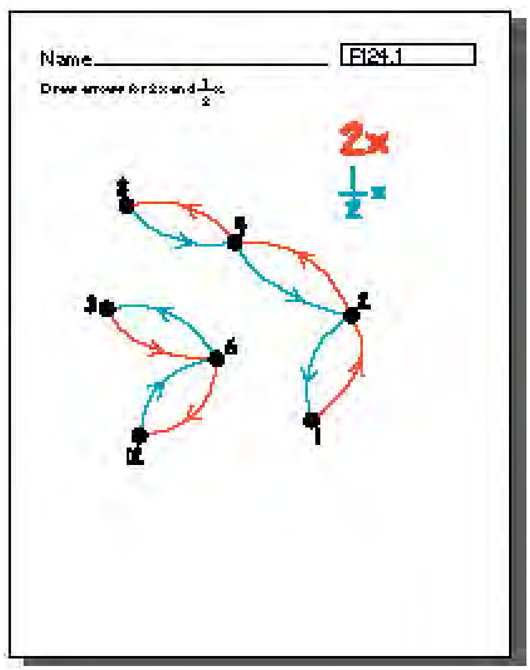
T: ***We are going to draw red arrows for 2x and blue arrows for ½x. Does anyone see where we can draw an arrow in our picture?***

Invite several volunteers to draw arrows in the picture on the board and instruct students to follow along by drawing the arrows on their worksheet. Occasionally ask the students how they know a red (or blue) arrow may be drawn in a particular place. You may wish to write some of the corresponding number facts on the board or instruct students to write them. Continue until the arrow picture is complete.



Center Activity

Exercises similar to the worksheet can be made and laminated for use in centers.



F124.2 LENGTH #2

Capsule Lesson Summary

In meters, measure the length of the chalkboard and other items in your room. Measure one of those items using a much shorter unit. Then compare the two measurements.

Materials

Teacher
- Meter Stick
- Orange C-rods (optional)

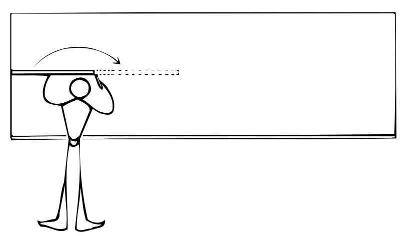
Student
- None

Description of Lesson

Hold up a meter stick for the class to see.

T: ***This is a meter stick; it is one meter long. How long, in meters, do you think our chalkboard is?***

Accept estimates of the chalkboard's length and then measure it with the meter stick. Ask a student volunteer to help you in the measurement process as you demonstrate it to the class. Place the meter stick on the chalkboard, let the student make a mark at the end of the meter stick, then advance the stick one meter.



Continue until you reach the end on the chalkboard.

If the length of your chalkboard is other than a whole number of meters (for example, 4 meters 26 centimeters), students may well suggest a fraction (in this case 4½ meters). Take time to discuss whether the length is exactly 4½ meters, concluding that the measurement is simply "between 4 and 5 meters" or "more than 4 meters."

Repeat this activity to measure other items in the room: the coat closet door; your desk; a student's height or your height; the width of the room; and so on.

T: ***Let's find things in the room that are about 1 meter long or high.***

Make a list of some things the students find.

T: ***Are you 1 meter tall? Where does the meter stick come on you? What if you hold your arms out?***

F124

Before concluding this lesson, select a second object much shorter than the meter stick with which to measure. For example, you might choose a chalkboard eraser or, if you prefer, orange C-rods. Use this object to conduct the activity described below, substituting your actual measurements for those given here.

T: ***Now let's measure my desk using this eraser instead of the meter stick. My desk measured two meters long*** (hold up the meter stick). ***How many erasers long do you think it is; more than two or less than two erasers long?***

The class should agree that it is more than two erasers long. Let some students predict the length in erasers and then measure your desk.

T: ***My desk is certainly more than two erasers long. How were we sure, even before we measured?***

S: ***Since the eraser is shorter than the meter stick, it takes more of them to go across the desk.***

Do not be concerned if students are not able to verbalize this explanation.

Home Activity

Suggest to parents/guardians that they work with their child to find some things at home that are about 1 meter long or high. Ask them to make a list to bring to class.

F125 INTRODUCTION TO EVEN AND ODD NUMBERS #2

Capsule Lesson Summary

Ask students whether their house numbers are even or odd. In some cases, use the Minicomputer to help determine this. Draw a picture of part of a street and show even-numbered houses on one side and odd-numbered houses on the other side.

Materials

Teacher
- Minicomputer set
- Calculator (optional)

Student
- Paper
- Minicomputer set (optional)

Description of Lesson

The day before you present this lesson, ask students to find out their street addresses. For students who forget, you might do the following:

- Have a telephone book on hand to show the students their family name and address.
- Look in your records for their addresses.
- Make up addresses for the students to use.

In many suburban communities the house numbers are quite large; if the house numbers of your students are 10,000 or larger, you will need more than four Minicomputer boards for this lesson. In this case, borrow extra Minicomputer boards from another *CSMP* teacher at your school or draw the extra Minicomputer boards on the chalkboard.

Note: If it is difficult to get street addresses for students in your class, you can take a walk down a residential street near the school and note house numbers. For example, girls can make a list of house numbers on one side, and boys on the other side.

This may be the first time students see their street addresses as whole numbers. (218, for example, is frequently read aloud as “two-eighteen”; 1,021 is read as “ten-twenty-one.”) Point out that these are only abbreviated names and give the full names yourself; that is, “two-eighteen” is a short way of saying “two hundred eighteen.”

T: ***Who knows his or her house number?***

Ask volunteers to write their house numbers on the chalkboard and to put them on the Minicomputer (one at a time).

T: ***Is this an even number or an odd number?***
How do you know?

One possible explanation is that even numbers can be put on the Minicomputer without a checker on the 1-square, whereas odd numbers cannot. If necessary, remind the students of this fact.

If the first student you call on has an even (odd) house number, ask next for someone with an odd (even) house number. Ask the student to write the number on the chalkboard and put it on the Minicomputer. Continue this activity for one or two additional house numbers.

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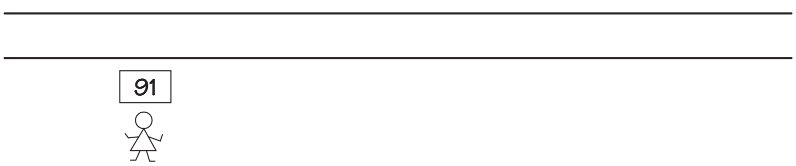
Write the words *even* and *odd* on the chalkboard. Tell the students to write their house numbers on their papers and to write the word that describes their particular house number. Circulate among the students to check their work. Those who need help may be asked to put their house numbers on the Minicomputer and to check the 1-square before deciding whether the number is even or odd.

Note: The calculator can also be used to check for even and odd. That is, if you make the calculator count by twos starting at 0 (press $\boxed{0}$ $\boxed{+}$ $\boxed{2}$ $\boxed{=}$ $\boxed{=}$ $\boxed{=}$ …), you see even numbers. If you make the calculator count by twos starting at 1 (press $\boxed{1}$ $\boxed{+}$ $\boxed{2}$ $\boxed{=}$ $\boxed{=}$ $\boxed{=}$ …), you see odd numbers.

T: ***In most cities and towns, the houses with even numbers are on one side of the street and those with odd numbers are on the other side. On your way home today, look at the house numbers on your street; you'll see even numbers on one side and odd numbers on the other side.***

I know a girl named Arvella who lives on Kookamonga Street. Her address is 91 Kookamonga. Let's show Arvella's house on Kookamonga Street.

Tell the students to copy this picture, as you draw it on the chalkboard.



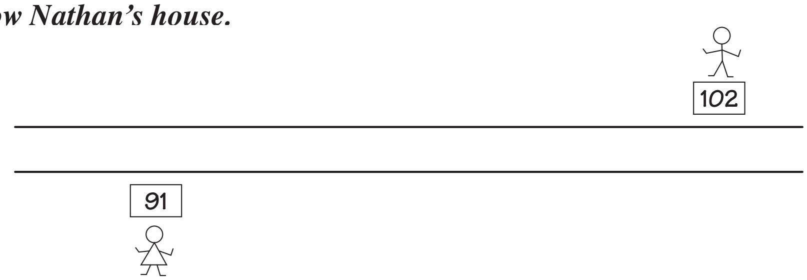
T: ***What do you suppose these two long, parallel lines are for?***

S: ***Kookamonga Street?***

T: ***Yes. Arvella's friend, Nathan, also lives on Kookamonga Street. Nathan's address is 102 Kookamonga Street. Does Arvella have to cross the street when she goes to visit Nathan?*** (Yes) ***How do you know?***

S: ***91 is an odd number and 102 is an even number. Odd numbers are on one side of the street and even numbers are on the other.***

T: ***Let's show Nathan's house.***



T: ***Arvella and Nathan often play catch with a dog who lives on Kookamonga Street. The dog's name is Duke so Arvella and Nathan call him "'Kookamonga Duke." Kookamonga Duke lives at 97 Kookamonga.***

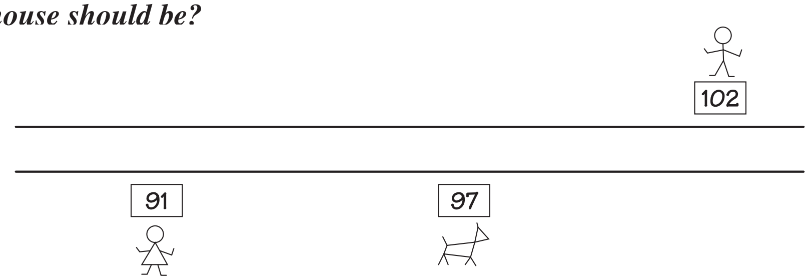
Does Arvella have to cross the street when she goes to visit Kookamonga Duke? (No) ***How do you know?***

S: ***Both Arvella and Duke have odd house numbers, so they both live on the same side of the street.***

T: ***Does Nathan have to cross the street when he goes to visit Kookamonga Duke?*** (Yes) ***How do you know?***

S: ***Nathan's house number is even and Duke's is odd. They live on opposite sides of the street.***

T: ***Let's draw Kookamonga Duke's house. Who would like to show us where Kookamonga Duke's house should be?***



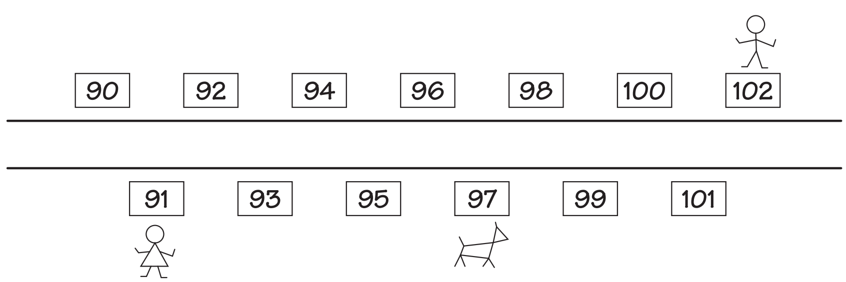
T: ***There are some houses between Arvella's house and Duke's house. Can someone draw one of these houses?***

Ask the volunteer to draw one of the houses between Arvella's house and Duke's house.

The number of any house between Arvella's and Duke's must be an odd number between 91 and 97, so it could be 93 or 95. Record the answer on the chalkboard.

T: ***There are other houses on the same side of the street as Duke's house, and there are other houses across the street from Arvella and Duke. Draw as many of these houses as you can and put numbers on them.***

Encourage students who finish quickly to continue their drawings of Kookamonga Street, adding some house numbers more than 102 and some less than 91. Invite students who have correctly drawn these houses to each put one of them in the drawing on the board. Continue for as long as you feel is appropriate. (It is not necessary to include all of the house numbers between 91 and 102 in your drawing.)



Writing Activity

Ask the students to write a story about the street in this lesson and to tell the reader how to find a certain house number.

Center Activity

Prepare another street picture. Put in some odd and even house numbers. Let students fill in other house numbers. You might do the houses in color and ask, What number is the blue house?… the orange house?… the houses at the ends of the street?

F126.1 COIN PROBLEM #3

Capsule Lesson Summary

Using three clues, discover how much money is in a container.

Materials

Teacher
- Two dimes and two nickels
- A small opaque container
- Collection of coins

Student
- Paper

Advance Preparation: Review with the class what they know about detectives. Put two dimes and two nickels into a small opaque container, chosen so that the coins inside are not visible, but may be heard clearly when the container is shaken.

Description of Lesson

T: ***Today you will all be detectives. You must discover how much money is in this container.***

Hold up the container, shake it, and ask several students to shake it also.

T: ***What coins could be in this container?***

S: ***Three dimes?***

Let students pick out the coins they suggest from your collection.

T: ***There could be three dimes in this container. Three dimes make how many cents?***

S: ***30¢.***

T: ***Yes; who else has a guess about the money in this container?***

S: ***27¢?***

T: ***What coins could make 27¢?***

Accept any correct combination of coins. Let students pick out the combination of coins they suggest and count it to check. Try to keep this part of the lesson moving briskly. When a specific combination of coins is suggested, ask how many cents it makes. When a specific amount of money is suggested, ask which coins could make that much money.

T: ***How much money could there be if all the coins were dimes?*** (10¢, 20¢, 30¢, …)

S: ***70¢.***

T: ***How many dimes do we need to make 70¢?***

S: ***Seven.***

Use coins as you check that seven dimes is 70¢.

Repeat this question supposing that all of the coins are nickels or all of the coins are pennies.

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Clue 1

T: ***Here is a clue: There are only dimes and/or nickels in this container. Each coin is either a dime or a nickel. There could be all dimes. There could be all nickels. There could be some dimes and some nickels.***

Accept some suggestions for the container's contents. If a combination of coins is suggested, ask how much money it makes; if an amount of money is suggested, ask which coins could make that much money. Encourage the class to observe that you can get the amount of money counting by fives. You may like to reinforce the counting by fives pattern by writing an ordered list of possible amounts on the chalkboard. Proceed quickly to the next clue.

Clue 2

T: ***There are exactly four coins in this container. Remember that each coin is either a nickel or a dime. What could be in this container?***

Accept several suggestions, recording each possibility or circling the possibility in your list on the board. If a student suggests three dimes and one nickel, for example, record the suggestion as follows or put out the actual coins.

10¢	10¢	10¢	5¢	35¢

Continue until your list of possibilities is complete as shown below. (If necessary, suggest one of the possibilities yourself.)

5¢	5¢	5¢	5¢	20¢
10¢	5¢	5¢	5¢	25¢
10¢	10¢	5¢	5¢	30¢
10¢	10¢	10¢	10¢	35¢
10¢	10¢	10¢	10¢	40¢

T: ***What is the least amount of money that could be in this container?***

S: ***20¢.***

T: ***What is the greatest amount of money that could be in this container?***

S: ***40¢.***

Clue 3

T: ***Here is the last clue, so listen carefully: There are exactly as many dimes in this container as there are nickels. When you know how much money is in this container, write it on your paper or whisper it to me.***

Look at several responses or accept several whispers. (It may be necessary to repeat this last clue.) Ask a student to answer aloud and then reveal the coins in your container to the class. (30¢)

Center Activity

Put coins in "purses" and instruct students to record the amount of money in each purse. Or, write an amount of money to go into a purse and instruct students to place coins in the purse to make that amount.

Home Activity

Suggest to parents/guardians that they find opportunities to count the amount of a small collection of coins (dimes, nickels, pennies) with their child. Also, suggest they let their child choose coins to make a given amount of money (between 10 and 50 cents).

F126.2 COMPOSITION OF FUNCTIONS #5

Capsule Lesson Summary

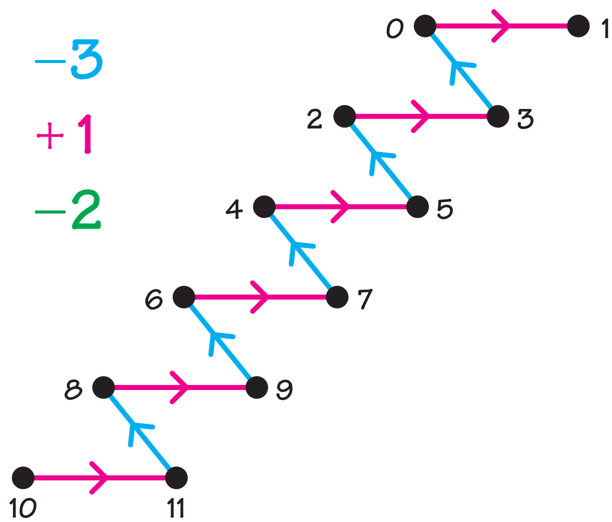
Label the dots in an arrow picture which has –3 and +1 arrows. Ask where –2 arrows can be drawn. Look for number patterns in the picture.

Materials

Teacher	• Colored chalk • Number line or 0–109 numeral chart (optional)	**Student**	• Worksheet F126.2 • Colored pencils

Description of Lesson

Distribute Worksheet F126.2 and copy the picture from the worksheet on the board. Call the students' attention to the dot for 10 in the picture. Invite students to label other dots, occasionally asking them to explain the labels they offer. You may wish to demonstrate some of the calculations involving subtraction using fingers, counters, the number line, or the 0–109 numeral chart. Continue until all of the dots are labeled.



Point to –2 near the arrow picture.

T: ***Where could we draw –2 arrows in this picture?***

Ask a student to trace a –2 arrow; if it is correct, draw it yourself and instruct students to draw it on their papers. Continue this activity until the class finds all the –2 arrows. Occasionally, ask students to explain how they know they may draw a –2 arrow between two particular dots.

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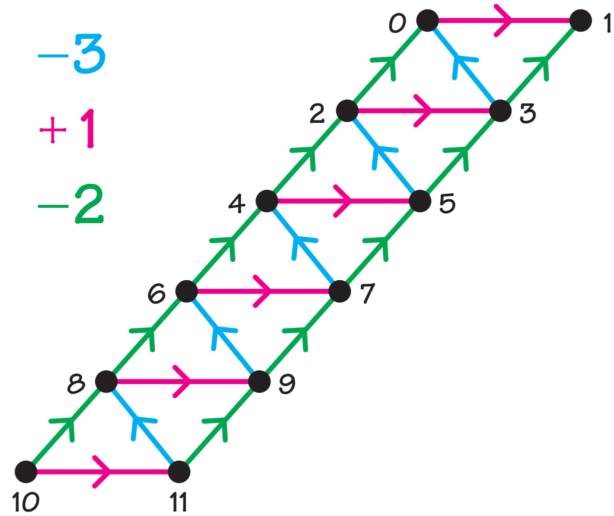
For your information, the completed arrow picture is shown below.



Point to the dots along the right side of the arrow picture (the dots for 1, 3, 5, and so on).

T: ***What do you notice about these numbers?***

S: ***They are two apart.***

S: ***They are all odd numbers.***

Point to the dots on the left side of the arrow picture (the dots for 0, 2, 4, and so on).

T: ***What do you notice about these numbers?***

S: ***They are all even.***

S: ***They are two apart also.***

F127.1 MENTAL ARITHMETIC WITH +1 ARROW PICTURES

Capsule Lesson Summary

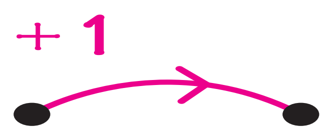
Use a +1 arrow picture to do some mental arithmetic activities.

Materials

Teacher	• Colored chalk	Student	• None

Description of Lesson

Draw this arrow picture on the chalkboard.



T: ***What is this red arrow for?***

S: ***+1.***

T: ***If this number*** (point to the dot on the left) ***is 5, what is this number*** (point to the dot on the right)***?***

S: ***6.***

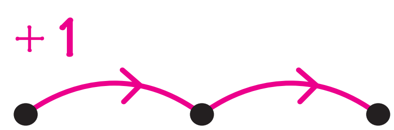
Continue this activity for a few minutes. Try to include many students by alternating large numbers with smaller ones.

T: ***If this number*** (point to the dot on the right) ***is 8, what is this number*** (point to the dot on the left)***?***

S: ***7.***

Continue this new activity for a few minutes, again trying to include many students.

Add a second arrow to your drawing.



T: ***If this number*** (point to the left-most dot) ***is 3, what is this number*** (point to the right-most dot)***?***

S: ***5.***

Continue this activity for a few minutes, and then reverse the question.

T: ***If this number*** (point to the right-most dot) ***is 10, what is this number*** (point to the left-most dot)***?***

S: ***8.***

Extend the arrow picture with a third (or fourth) red +1 arrow and ask similar questions.

F127.2 STRING GAME WITH A-BLOCKS #3

Capsule Lesson Summary

Put the A-block pieces into a two-string picture in which the string labels are given. Play the A-Block String Game.

Materials

Teacher
- A-Block String Game kit
- Colored chalk

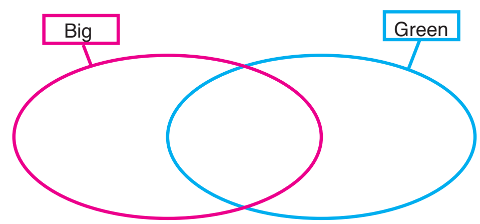
Student
- None

Description of Lesson

Before the lesson begins, prepare the team board and divide the class into two or more teams.

T: ***Last time we played the string game we only used one string. Today we will play it with two strings. First, let's practice a little.***

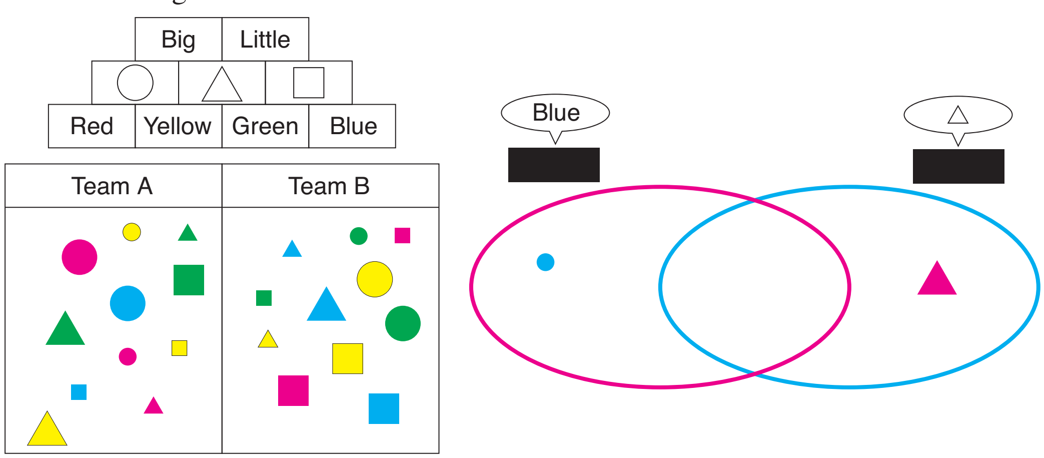
Draw and label these two strings.



Call on several students to place A-block pieces until two or three pieces have been placed in each of the four regions. Emphasize that all big, green pieces must be placed where the two strings overlap, and that all small, nongreen pieces must be placed outside of both strings.

T: ***Let's begin again, but this time I won't tell you what the strings are for. You must guess where each piece goes.***

Place the string labels face down as shown in the next illustration. (The "bubbles" indicate what is hidden on the cards.) Take one A-block piece from each team's collection and place it correctly in the picture. You may like to let the teams tell you which of their pieces they want you to place. This provides some starting clues for the students.



T: ***The strings can have any of these labels*** (point to the list of possible labels above the team board)***. Let's read them together.***

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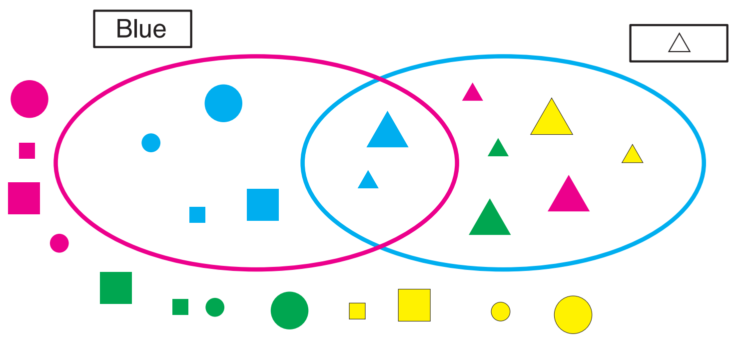
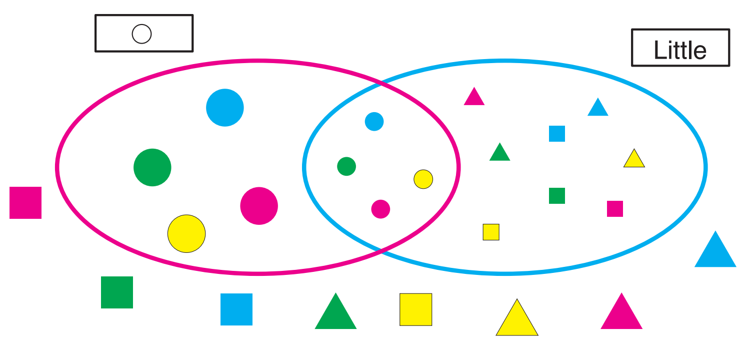
T: ***I have one new rule for the game this time: If you place a piece correctly on your turn, you may have a bonus turn and try a second piece. After two pieces, though, it is the other team's turn, even if you are correct both times.***

The other rules are the same. When one team has placed all of its pieces correctly, the last player can say what the strings are for and win. You must give correct labels for both strings in order to win. Otherwise, the game continues.

If a piece is correctly placed, say "yes," and allow the piece to remain in the picture (and the student to have a second turn); if the piece is placed incorrectly, say "no," and return it to the team board. To assist you in judging, the correct placement of all pieces is show below.



If your class enjoys this game and some time remains, play a second game using **O** and **LITTLE** for the face-down cards. Again, place two pieces, such as a big circle and a little triangle, as starting clues. The correct placement for all of the pieces is shown below.



F128 CONSECUTIVE JUMPS ON THE NUMBER LINE

Capsule Lesson Summary

Use the number line to do some addition and subtraction calculations. Make consecutive +2 jumps on the number line starting at 1 and discuss which numbers you land on. Conduct a similar activity, making consecutive +3 jumps on the number line starting at 2.

Materials

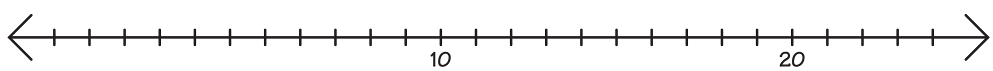
Teacher	• Colored chalk • Calculator (optional)	**Student**	• Desk number line • Worksheet F128 • Colored pencils

Description of Lesson

Exercise 1

Draw part of the number line on the chalkboard. The gradations should be equally spaced, at least six centimeters apart.

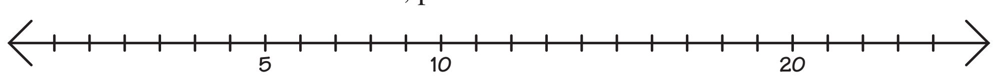
T: ***Here is a line with some numbers on it.***



Indicate the marks to the left of 10.

T: ***What are some of these numbers?***

Accept several suggestions from the class; then choose a volunteer to locate 5. The student might begin counting from the left; if so, point to the last mark on the left and remind the class that they cannot be sure what number is there. Then, point to 10 and note that this number is known to be 10.



T: ***How did you know this number is 5?***

S: ***I counted backward from 10.***

Demonstrate counting backward from 10 to 5. Then, point to the position for 0.

T: ***What number goes here?*** (0) ***How do you know?***

S: ***I counted backward from 5.***

T: ***Who can show us where 15 is on this number line?***

Continue this activity until all of the marks to the right of 0 have been labeled. Alternate asking a student to identify what number is at a certain position and to indicate the position of a certain number.

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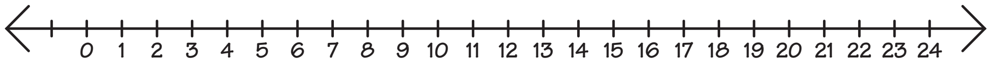

Possibly, one of the students will suggest erasing the marks to the left of 0, claiming that there are no numbers less than 0. In such a case, you should say simply, “There are many numbers less than 0, but perhaps you don’t know any of them yet.”† If your students are aware that negative numbers are less than 0, you may wish to label the points to the left of 0.

Exercise 2

Refer the students to their desk number lines. Point to 3 on the number line with your left hand and ask the students to do the same on their desk number lines.

T: ***Let’s calculate 3 + 5 with the help of our number lines. Use your right hand to count forward five spaces from 3.***

Point to 3 on the number line with your right hand, too.

T: ***Now count forward five spaces.***

With your right hand, point to each mark from 4 to 8 as you count aloud, “One, two, three, four, five.” Your movements should be as obvious as possible.

T: ***What number is 3 + 5?***

S: ***8.***

Write the fact 3 + 5 = 8 on the board.

Repeat this activity to calculate 6 + 4, 9 + 3 and 8 + 7.

T: ***Do you think we can calculate 18 – 5 on our number lines? How?***

S: ***Count backward five marks from 18.***

T: ***Yes; we can subtract by going backward on our number lines. Point to 18 with your right hand. Now count backward five marks with your left hand.***

Demonstrate this on the board. Point in turn to the marks from 17 to 13 as you say, “One, two, three, four, five.”

T: ***What number is 18 – 5?***

S: ***13.***

Write the fact 18 – 5 = 13 on the board.

Continue this activity to calculate 14 – 4 and 16 – 9.

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†Of course, your students have had several lessons on negative numbers in the context of magic peanuts, but do not expect them to see these numbers as being less than 0.

Exercise 3

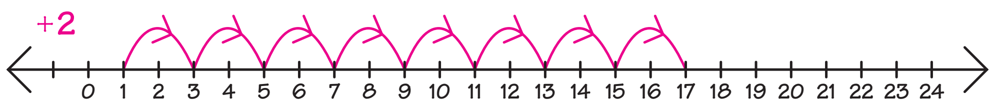
Distribute Worksheet F128 to the students and write +2 in red near your number line at the board. Draw the students' attention to the number line at the top of their worksheets.

T: ***We are going to start at 1 and draw +2 arrows; use your red pencils to draw them. Who would like to draw the first +2 arrow on the chalkboard?***

The arrow can be drawn above or below the number line, but it should begin and end at the appropriate points. Take a moment to check the students' papers.

T: ***Let's draw another +2 arrow, starting at 3. Who can draw this arrow on the board?***

Continue this activitv until the students reach 17 on their number lines.



T: ***What do you notice about the numbers we meet, when we start at 1 and draw +2 arrows?***

S: ***You land on every other number.***

S: ***You land on odd numbers.***

T: ***If we continue drawing arrows, will we land on 20? How do you know?***

S: ***No; because 20 is an even number.***

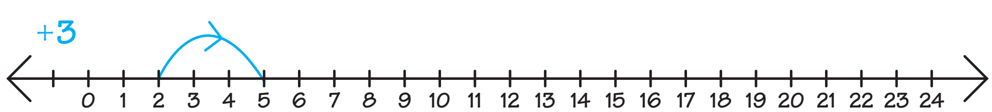
T: ***What other numbers will this +2 arrow road land on if we keep going?***

Any odd number is a correct answer. If the students understand fairly well, you may wish to ask them to name some "large" numbers that the +2 arrow road would land on.

Note: You may want to look at the odd numbers on the calculator by making it count by twos starting at 1 (press $\boxed{1}$ $\boxed{+}$ $\boxed{2}$ $\boxed{=}$ $\boxed{=}$ $\boxed{=}$ …).

Ask the students to look at the second number line on their worksheets and read the instruction aloud. In your drawing on the board, erase the arrows but not the number line itself. Write +3 in blue near the number line.

T: ***We are going to start at 2 and draw +3 arrows. Who can draw the first +3 arrow on the board?***



T: ***If we start at 2 and count over three spaces, we land on 5; 2 + 3 = 5. Now, start at 5 and draw another +3 arrow.***

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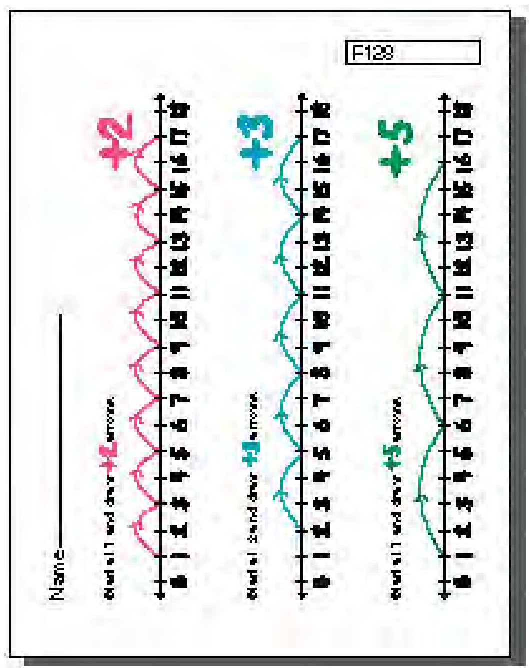
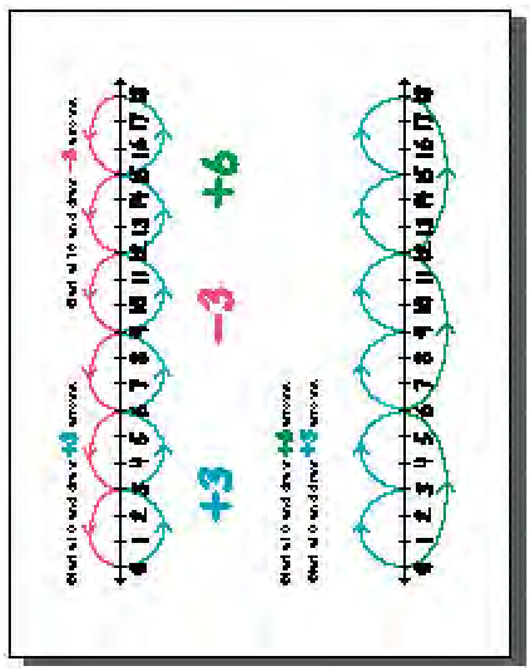
Allow the students to continue this activity on their own. Send students who finish quickly to draw +3 arrows on the board.

Note: You may like to use the calculator to follow the blue arrows in your picture (press 2 + 3 = = = …).

Repeat this activity with the third number line on the students' worksheets. The students should start at 1 and draw +5 arrows. You may wish to ask the students to predict some other numbers on which the +5 arrow road would land if the number line pictures were longer. Compliment students who realize that the arrows will only land on numbers ending in 1 or 6 (i.e., whose ones' digit is 1 or 6). Again, you may like to follow the +5 arrows with the calculator by pressing 1 + 5 = = = … .

After awhile, ask the students to turn their worksheets over to look at the first number line. Invite a student to read the instructions aloud. Allow the students to work independently on this as you circulate and offer assistance where needed. Students who finish quickly can draw the arrows on the number line at the board (erase all previous arrows first). When all the arrows have been drawn ask the students if they notice anything interesting about the numbers on which the arrows land (the +3 and –3 arrows land on the same numbers). If necessary, mention this yourself.





F129 COMBINATORICS WITH THREE DIGITS #1

Capsule Lesson Summary

Using three numeral cards as a visual aid, discover the six possible three-digit numbers which have 1, 2, and 3 as digits. Draw an arrow picture in which the dots are for those six numbers and the arrows are for "is more than."

Materials

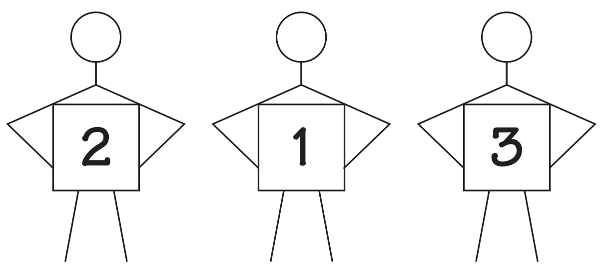
Teacher
- Numeral cards
- Colored chalk

Student
- Base-10 blocks or other place value manipulatives
- Index cards

Description of Lesson

For this lesson, group students so that three work together with a set of place value materials.

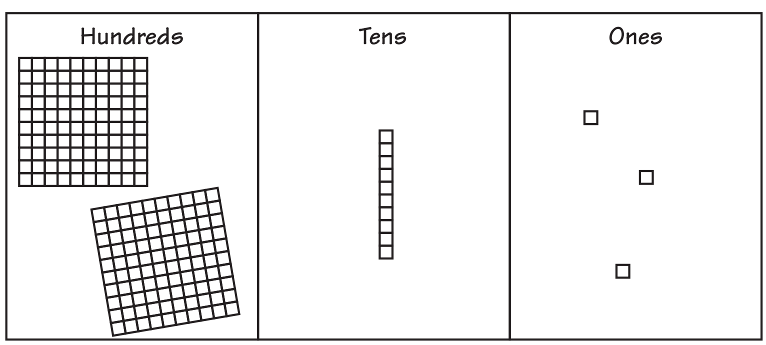
Display the 1, 2, and 3 numeral cards. Choose three students to come to the front of the room, giving each of them a card. Ask them to stand close together, face the class, and hold up their numeral cards. The order in which the students stand is not important at this moment; for example,



T: ***We are showing a number with these numeral cards. What number is it?***

S: ***213.***

Instruct the other students in their groups to show 213 with the place value materials. For example,



At the same time you may like to write "Hundreds," "Tens," and "Ones," respectively on the chalkboard above the students holding the cards.

T: ***Who would like to draw and label a dot for 213 on the chalkboard?***

F129

What is another number we could make with these numeral cards?

Accept a suggestion and tell the students holding the numeral cards to move to new positions to show this number. (Do not explicitly tell them where to stand; if necessary, call on a fourth child to place them in the correct positions.) Other students should show the number with their place value materials.

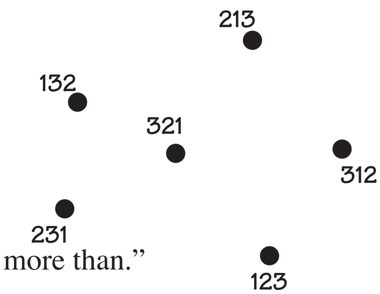
T: ***What number do you see now? Who would like to draw and label a dot for this number on the board?***

Continue in this way until dots for all six possible numbers are drawn and labeled on the board. Supply any numbers that your students miss.

T: ***Which of these six numbers is the greatest?***

S: ***321.***

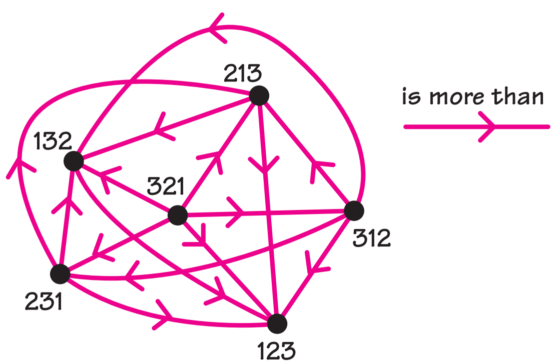
T: ***Which number is next to the greatest?*** (312)
Which number is the least? (123)
Which number is next to the least? (132)



On the board near the dot picture, draw a red key arrow for “is more than.”

T: ***With red arrows, these numbers are saying, “I am more than you.” Who can draw a red arrow in our picture?***

Send volunteers to the board to draw arrows, each time asking for the appropriate number sentence. Continue for as long as you feel is appropriate, but do not expect the students to find all possible arrows. For your information, the completed arrow picture is shown below.



Provide each group with three index cards and tell them to write a different digit on each card. Then instruct the groups to form as many three-digit numbers with the cards as they can. Suggest they use place value materials to show some of the numbers they form. Also, ask the groups to make a list of all the numbers, ordering them from least to greatest.

End the lesson with the groups sharing their results. Perhaps some will notice that they all got six numbers from the three different digits.

F130 ADJUSTMENT/ASSESSMENT DAY #12

Note: See Section One, page 1-9, for a full explanation of the purpose of scheduled adjustment days. Worksheet F130 provides for a short, written assessment.

On this day you may wish to repeat an earlier lesson either for a small group of students or for the entire class. Many of the lessons can be made to appear completely different by changing the story and/or the numbers in the lesson. If you omitted exercises or worksheets from an earlier lesson, you may wish to include these. This is also a good time to allow students to work in centers or on a project of your choice.

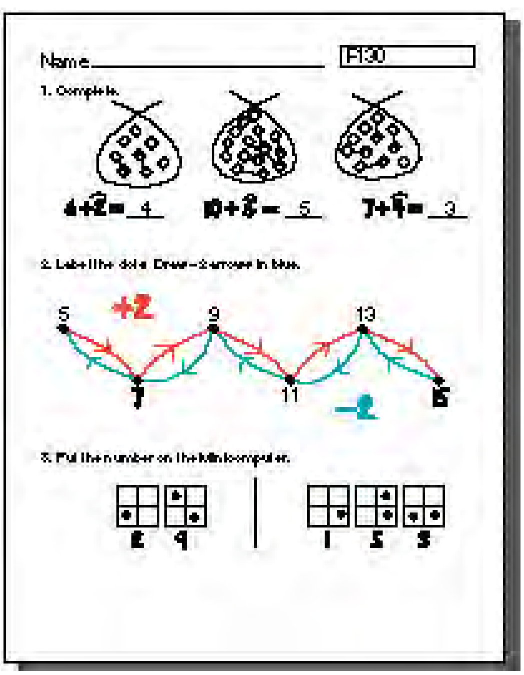
This might be a good time to reintroduce the Tangram or Geoboards. Students can work again on some of the Tangram puzzles in the *Tangram* Booklet, or they can make shapes on the Geoboard that can easily be cut into two equal pieces (i.e., they have a line of symmetry).

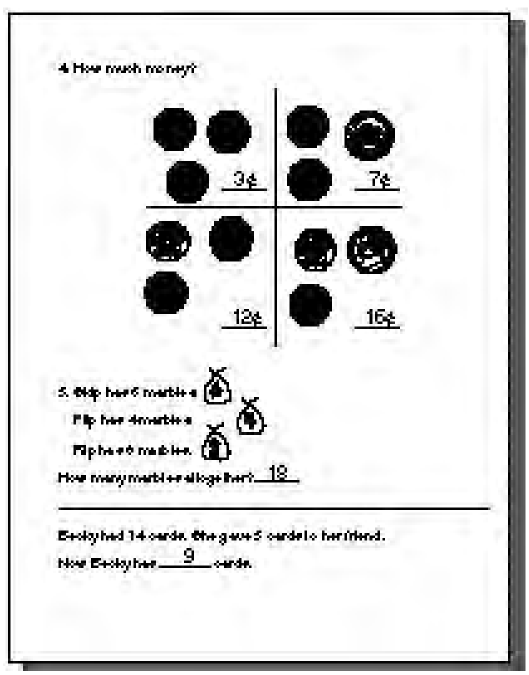
If your class is experiencing little difficulty with the *CSMP* curriculum, you may wish to omit this adjustment day and continue immediately with F131 *Subtraction on the Minicomputer #4*.

Early Warning

Some of the next nine classroom lessons require extra preparation time or make use of materials not included with the *CSMP* Classroom Set. The lessons are listed here for your convenience in preparing for them. A more detailed description of the materials can be found on the first page of each lesson. (Special materials are listed here only once, even if they are needed more often in a nine-day period.)

F132.2 *Fractional Parts #2*: String; scissors
F133.1 *Counting Activity #3* : Overhead or class calculator
F134.1 *Eli Visits Grandmother*: Plastic bags
F134.2 *Addition Story #5*: Calculators
F135 *May Baskets*: Tape
F137 *Reflective Symmetry*: Tape; blocks; mirrors; cardboard





F131 SUBTRACTION ON THE MINICOMPUTER #4

Capsule Lesson Summary

Present a subtraction problem in a story situation and solve the problem on the Minicomputer. Do some sequences of subtraction problems on the Minicomputer.

Materials

Teacher	• Minicomputer set	**Student**	• Minicomputer set • Worksheets F131 * and **

Description of Lesson

Exercise 1

Tell the following story or one similar to it. Choose one of your students to star in this story.

T: ***Bruce went to the grocery story last night for his father. His father gave him a $20 bill to pay for the groceries, but the groceries cost only $12. How much money did Bruce get back to bring home to his father?***

Allow students to estimate the answer, recording some of their predictions on the chalkboard.

T: ***What calculation could we do to solve this problem?***

S: ***20 – 12.***

Let a student write the problem on the chalkboard.

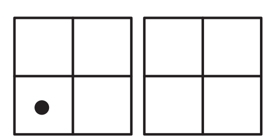
$$20 - 12 = \qquad \begin{array}{r} 20 \\ -\ 12 \\ \hline \end{array}$$

Display three Minicomputer boards.

T: ***How can we calculate 20 – 12 on the Minicomputer?***

S: ***Put 20 on the Minicomputer and then take away 12.***

Call on a student to put 20 on the Minicomputer.



T: ***Can we take away 12 now?***

S: ***No; we need to make some backward trades first.***

T: ***Yes, where would the checkers for 12 be? Show me.***

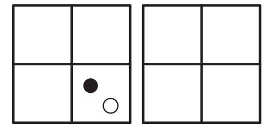
S: ***On the 10-square and the 2-square.***

T: ***Does anyone see a trade to help us get checkers on the 10-square and 2-square?***

S: ***20 = 10 + 10.***

F131

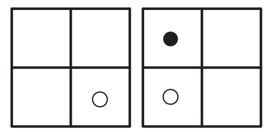
Let a volunteer make this trade; then push one of the two checkers into a corner of the 10-square or make it a different color.



T: ***That trade helped us; we have a checker on the 10-square. We still need a checker on the 2-square. Does anyone see a trade that will help us?***

S: ***10 = 8 + 2.***

If you are using color to identify the checkers for 12, put that color checker on the 2-square.



T: ***We now have checkers on the 10-square and 2-square, so we're ready to take away 12.***

Send a volunteer to take 12 away from the number on the Minicomputer. Ask someone else to complete the number sentence on the board.

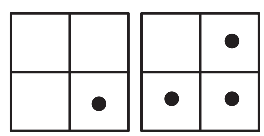
Erase the board and remove the checkers from the Minicomputer before continuing.

Exercise 2

Distribute some checkers and an individual Minicomputer sheet (with two Minicomputer boards) to each student or pair of students.

T: ***Put 17 on your Minicomputer.***

Check the students' Minicomputers and choose a volunteer to put 17 on the demonstration Minicomputer. Write this problem on the chalkboard.



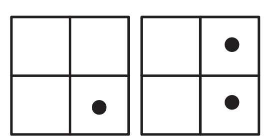
17 − 2 =

T: ***Take away 2 from the number on your Minicomputer. What number is 17 – 2?***

S: ***15.***

Ask a student to take away 2 from the number on the demonstration Minicomputer and to complete the number sentence on the board. Write a new problem on the chalkboard directly below the previous one.

T: ***Now you have 15 on your Minicomputer. Take away 10. What number is 15 – 10?***



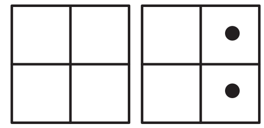
17 − 2 = 15
15 − 10 =

S: ***5.***

Ask students to take away 10 from the number on the demonstration Minicomputer and to complete the number sentence. Then, write a third problem on the chalkboard.

T: ***What number is 5 – 1?***

S: ***4.***

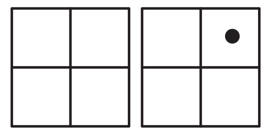


17 – 2 = 15
15 – 10 = 5
5 – 1 =

Ask a student to take away 1 from the number on the demonstration Minicomputer and to complete the number sentence. Write a final problem on the chalkboard.

T: ***Take away 4.***
What number is on your Minicomputer now?

S: ***0.***



17 – 2 = 15
15 – 10 = 5
5 – 1 = 4
4 – 4 =

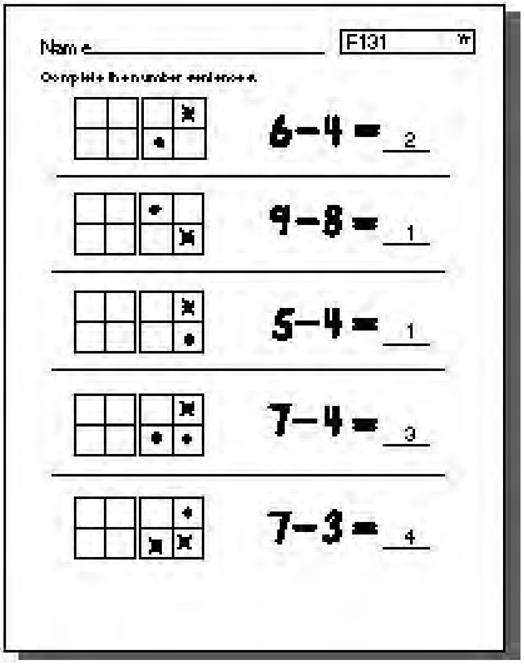
Ask a student to take away 4 from the number on the demonstration Minicomputer and to complete the number sentence.

Repeat this exercise with the following sequences of problems. (None of the calculations require backward trades.)

Put 36 on all Minicomputers.	Put 79 on all Minicomputers.
36 – 4 =	79 – 9 =
32 – 10 =	70 – 30 =
22 – 2 =	40 – 0 =
20 – 20 =	40 – 40 =

Exercise 3

Worksheets F131 * and ** are available for the remainder of the period; allow approximately ten minutes for individual or partner work. Explain to the students that they are to complete the number sentences and that the illustrated Minicomputers are provided for their benefit. Students who have difficulty with these subtraction problems should be encouraged to take away the appropriate checkers by crossing them out.


Name________________ F131 ¥

Complete the number sentences.

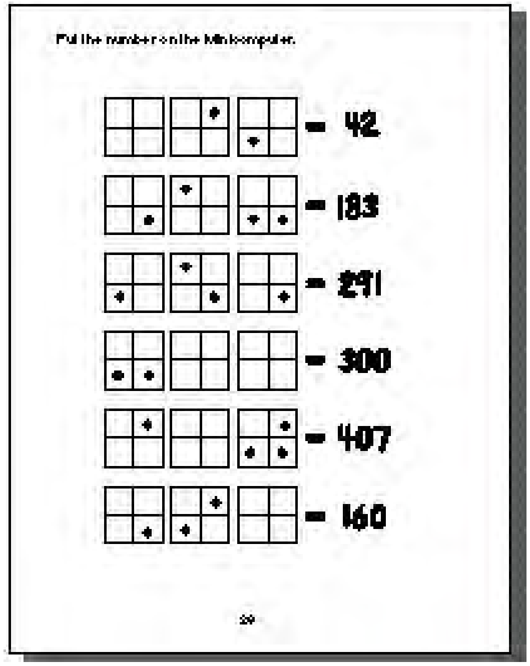
6 − 4 = 2

9 − 8 = 1

5 − 4 = 1

7 − 4 = 3

7 − 3 = 4


Put the number on the Minicomputer.

= 42

= 183

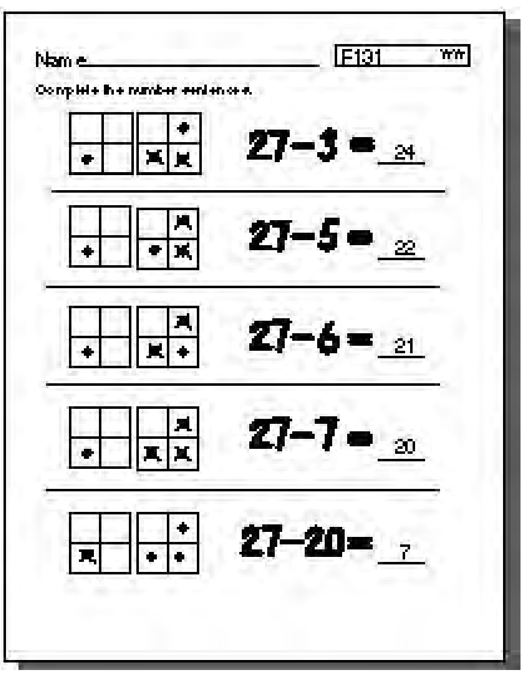
= 291

= 300

= 407

= 160

29


Name________________ F131 ¥¥

Complete the number sentences.

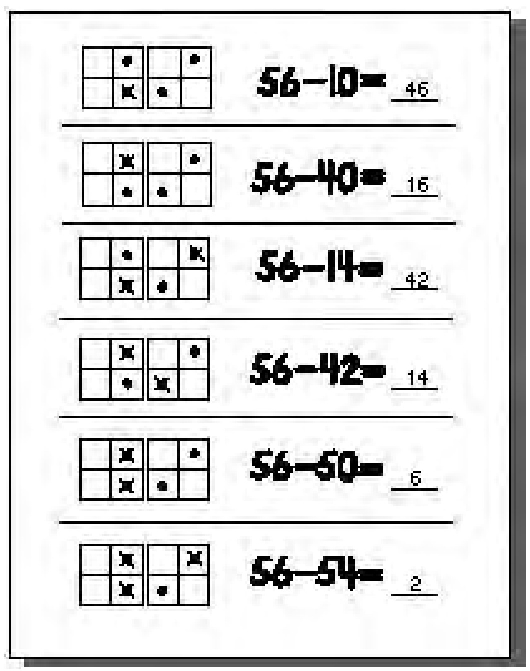
27 − 3 = 24

27 − 5 = 22

27 − 6 = 21

27 − 7 = 20

27 − 20 = 7


56 − 10 = 46

56 − 40 = 16

56 − 14 = 42

56 − 42 = 14

56 − 50 = 6

56 − 54 = 2

F132.1 FRACTIONS FROM PAPER FOLDING

Capsule Lesson Summary

Fold a rectangular piece of paper in halves, fourths, and eighths. Label the parts with fractions and explore equivalent fractions.

Materials

Teacher	• Paper • Colored markers	**Student**	• Paper • Colored pencils

Description of Lesson

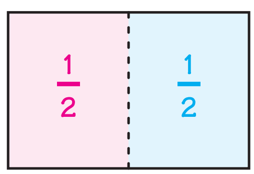
Organize the class in pairs and provide three rectangular pieces of unlined white paper to each pair. Hold up a piece of paper. You may like to create a story to go with the following folding problems. That is, let the paper represent something that needs to be divided into equal size pieces.

T: ***This is a whole piece of paper. How could we fold it to see two parts both the same size?***

Let students suggest ways to fold the paper and check several suggestions with your piece of paper (or several pieces of paper). Agree on one way and instruct each pair of students to fold one piece of paper carefully.

T: ***Now when we open the paper there are two parts. Each part is one-half of the paper and the two halves together make the whole paper.***

Instruct the students to color each part of the paper in a different color and label each section $\frac{1}{2}$; model with your paper.



Hold up a second piece of paper.

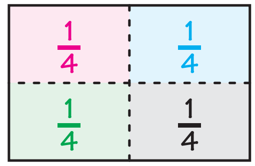
T: ***How could we fold this paper to see four parts all the same size?***

Again let students make suggestions. If someone suggests folding it in half as you did the first paper, then folding the paper in half again, do so, or suggest this yourself.

T: ***Now when we open the paper there are four parts. Each part is one fourth of the paper and the four parts together make the whole paper.***

F132

Instruct the students to color each part of the paper in a different color and label each section $\frac{1}{4}$ as you model with your paper.



Compare the two papers (halves and fourths) and ask, "How many of the smaller $\frac{1}{4}$ parts does it take to make the same as the $\frac{1}{2}$ part?"

Repeat this activity with the third piece of paper to fold it into eight parts all the same size. First fold it like you did to see halves, then fold again to see fourths, and then fold it again to see eight pieces all the same size.

T: ***Now, when we open the paper how many parts make the whole?*** (8)
What should we call one part? ($\frac{1}{8}$)

Instruct students to color and label. Then compare the three papers and ask:

T: ***How many eighths make the same as a fourth?*** (2)
How many eighths make the same as a half? (4)

Instruct students to cut their papers along fold lines to get separate pieces labeled $\frac{1}{2}$ or $\frac{1}{4}$ or $\frac{1}{8}$. Then suggest they can make trades with other groups, but they must always trade for equal amounts. After some trading, check that each group can still put pieces together to get three whole papers—even though they may not be the original pieces.

Reading Activity

You may wish to follow this lesson by reading a book such as *Eating Fractions* by Bruce McMillan.

Capsule Lesson Summary

Unravel a ball of string and decide where to cut the string so that the resulting piece will be half as long as another given piece. Divide eight students into two groups so that half of the students are in each group. Discuss the result, write a corresponding number sentence, and draw an appropriate arrow picture.

Materials

Teacher	• A three–meter piece of string • A ball of string • Scissors • Colored chalk	**Student**	• None

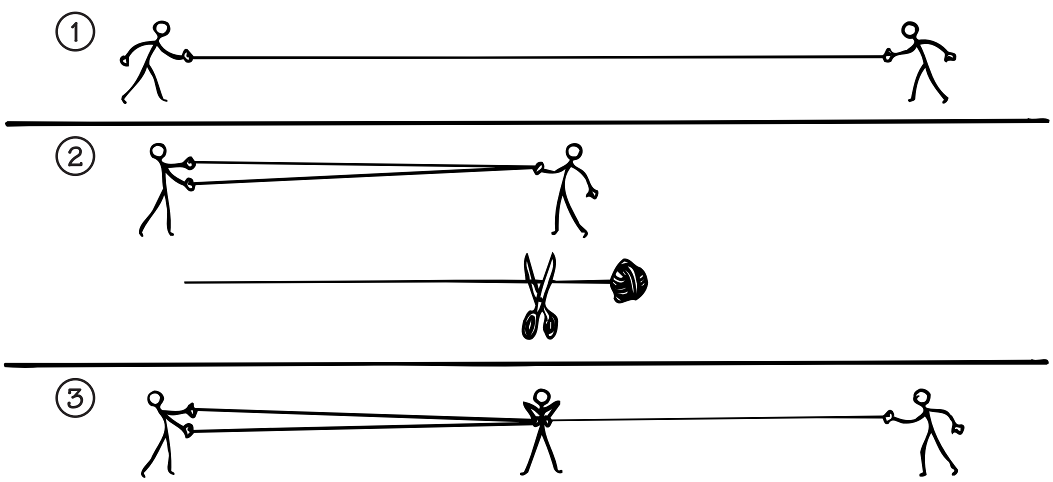
Description of Lesson

Choose two volunteers to stretch out a long (three-meter) piece of string in front of the class. In the sample dialogue that follows, substitute the names of two students in your class.

T: ***I want to cut a piece from this ball of string exactly one-half as long as the piece Yolanda and James are holding. How might I do that?***

Allow the class to discuss the problem. Most suggestions will probably involve estimating the middle of the long piece of string. Most students will agree, however, that by only estimating the middle, they cannot be sure that the two halves of the string are the same length. Someone may eventually suggest folding the long piece of string in half and measuring the new length of string from the folded string (as illustrated below).

When the students agree that this process will work, carry it out and then unfold the first string to check this method.



Repeat this activity to cut a piece one-fourth as long as the long piece of string.

Ask the students to be seated and call eight new volunteers to the front of the room.

F132

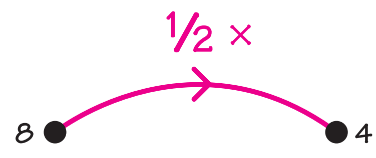
T: ***When I say "go," one-half of you should move over to the door, and one-half of you should go to the window. … Go!***

After several moments, four students should be at the door and four should be at the window. Any other arrangement should cause the class to protest, and the eight students to redistribute themselves.

T: ***We began with eight students. One-half of them moved to the door. What number sentence can we write about this?***

S: $\frac{1}{2} \times 8 = 4$ (read as "one half of eight equals four").

Write this number sentence on the chalkboard and draw an arrow picture next to it.



$\frac{1}{2} \times 8 = 4$

T (pointing to the dot at the right): ***What number goes here?***

S: ***4.***

Label the dot 4.

T: ***What number is 4 + 4?*** (8)
What number is 2 x 4? (8)
What number is $\frac{1}{2}$ ***x 8?*** (4)

Repeat these three questions for the following numbers.

5 + 5	6 + 6	10 + 10
2 x 5	2 x 6	2 x 10
$\frac{1}{2}$ x 10	$\frac{1}{2}$ x 12	$\frac{1}{2}$ x 20

F133.1 COUNTING ACTIVITY #3

Capsule Lesson Summary

Count by twos, starting at 0 and continuing to at least 40. Count by fives, starting at 0 and continuing to at least 100.

Materials

Teacher
- 0–109 numeral chart
- Overhead calculator

Student
- None

Description of Lesson

Exercise 1

Remind the students about the counting activities you conducted earlier in the school year in which each student counted one number, in turn.

T: ***Today we are going to count by twos. We'll begin by counting as a group starting at 0.***

As the class counts, point to each numeral on the 0–109 numeral chart, counting up to at least 40.

Repeat counting by twos starting at 0 this time going around the room with students adding to the count, one at a time. Explain the order in which the student should count (i.e., from left to right or from front to back).

Point to the student who will start counting at 0; if necessary, point to each student whose turn it is to say a number. Make corrections as needed.

T: ***Do you remember how we taught our calculator to count by twos?***

S: ***Start at 0 and press å ™ ≠ ≠ ≠ and so on.***

T: ***What numbers do we see when we count by twos starting at 0?***

S: ***Even numbers.***

Use the calculator counting by twos to observe and predict even numbers between, for example, 60 and 70.

You may like to repeat Exercise 1, this time counting by twos starting at 1 to generate odd numbers.

Exercise 2

T: ***Now we are going to count by fives. Let's all count together, starting at 0.***

As the students count, point to each numeral on the 0–109 numeral chart, continuing up to at least 100. Then, repeat the process described in Exercise 1, having each student count individually. Continue until all of the students have taken a turn.

Use the calculator to again look at counting by fives, and perhaps to predict some numbers you will see greater than 100 or 200.

F133

If your students need a little more challenge, repeat Exercise 2, counting by fives starting at a number between 0 and 5 (for example, 3). Observe the pattern in the ones' digit of the numbers generated.

F133.2 ADDITION PROBLEMS #6

Capsule Lesson Summary

Use the Minicomputer to do some mental arithmetic involving addition.

Materials

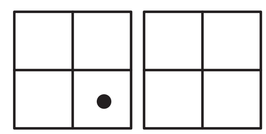
Teacher	• Minicomputer set	Student	• Worksheets F133.2 * and ** • Minicomputer set (optional)

Description of Lesson

Display two demonstration Minicomputer boards.

T: ***Today we will use the Minicomputer to solve some addition problems.***

Put 10 on the Minicomputer.



T: ***What number is on the Minicomputer?*** (10)
What number is 10 + 8?
Whisper your answer to your neighbor or to me. (18)

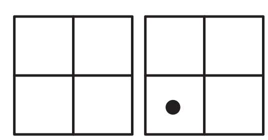
As you ask this question, point to the checker on the 10-square and pretend to put a checker on the 8-square. Accept several whispers and then ask a student to answer aloud.

S: ***18.***

Put this checker on the 8-square.

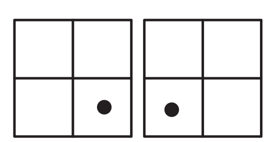
T: ***Yes, 10 + 8 = 18.***

Write this number fact on the chalkboard and remove the checkers from the Minicomputer. Put a checker on the 2-square.



T: ***What number is on the Minicomputer?*** (2)
What number is 2 + 10? (12)

Again, pretend to put a checker on the 10-square. Allow a few students to whisper their answers to you, and then ask a student to answer aloud. Call on a student to add 10 to the number on the Minicomputer and to write the number fact 2 + 10 = 12 on the chalkboard.



T: ***What number is on the Minicomputer?*** (12)
What number is 12 + 20? (32)

Accept a few whispers before sending a student to add 20 to the number on the Minicomputer. Write the number sentence 12 + 20 = 32 on the board and continue this activity with 32 + 5 = 37.

Begin again by putting 3 on the Minicomputer and repeat the procedure described above for the following sequence:

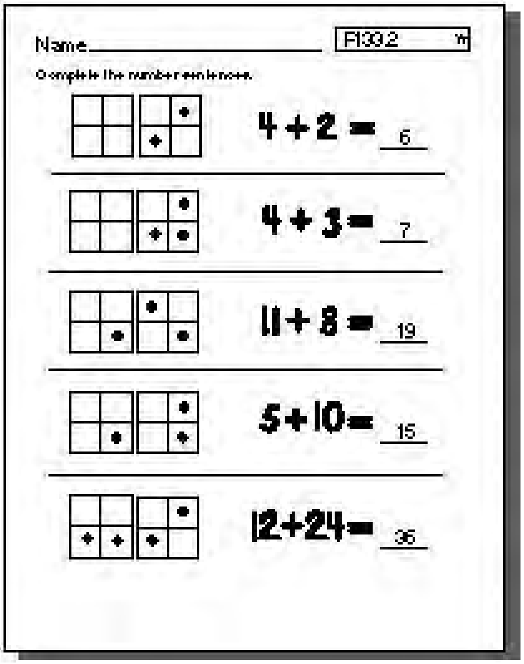
$$\begin{aligned} 3 + 4 &= 7 \\ 7 + 20 &= 27 \\ 27 + 10 &= 37 \end{aligned}$$

If your class remains interested, proceed to generate three more sentences starting with 40 on the Minicomputer.

$$\begin{aligned} 40 + 14 &= 54 \\ 54 + 21 &= 75 \\ 75 + 4 &= 79 \end{aligned}$$

The last calculation (75 + 4) requires a 4 + 4 = 8 trade to see the result in standard configuration.

Worksheets F133.2 * and ** are available for the remainder of the period. The students should complete the number sentences using the illustrated or individual Minicomputers, as needed, for help with the calculations. On the Minicomputers of the two-star worksheet, no checkers are shown. Students who have difficulty with this worksheet can draw in the checkers or use individual Minicomputers.



Name ____________ F133.2

Complete the number sentences.

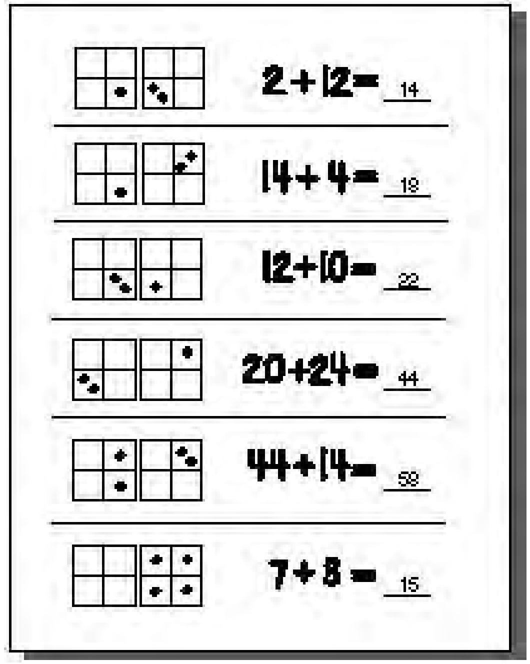
4 + 2 = 6

4 + 3 = 7

11 + 8 = 19

5 + 10 = 15

12 + 24 = 36



2 + 12 = 14

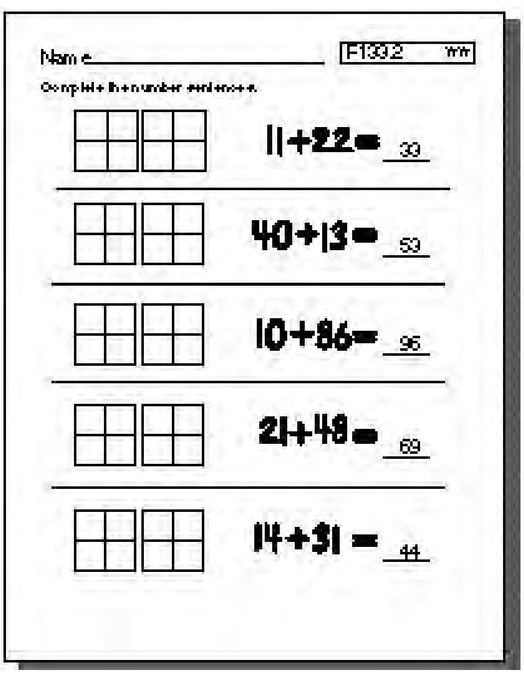
14 + 4 = 18

12 + 10 = 22

20 + 24 = 44

44 + 14 = 58

7 + 8 = 15



Name ____________ F133.2

Complete the number sentences.

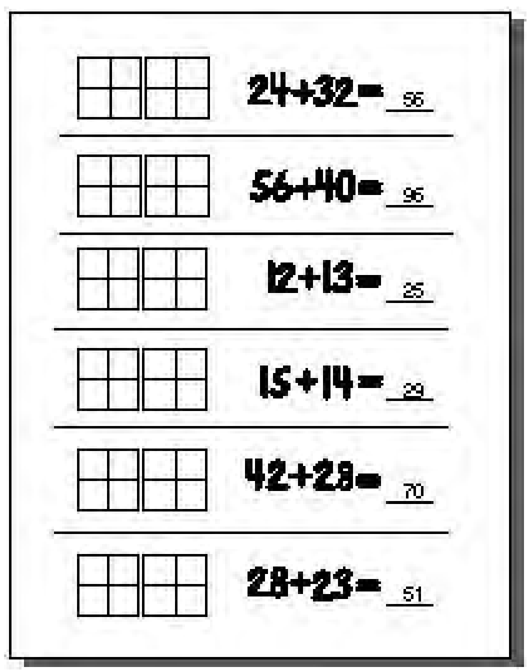
11 + 22 = 33

40 + 13 = 53

10 + 86 = 96

21 + 48 = 69

14 + 31 = 44



24 + 32 = 56

56 + 40 = 96

12 + 13 = 25

15 + 14 = 29

42 + 28 = 70

28 + 23 = 51

F134.1 ELI VISITS GRANDMOTHER

Capsule Lesson Summary

There are three paths Eli can take to his grandmother's house. Draw a map which shows how many peanuts he picks up along each of the three paths. Decide which path Eli takes to arrive with the most peanuts.

Materials

Teacher
- None

Student
- Paper
- Plastic bags and checkers (optional)

Advance Preparation: You may want to draw the map on the chalkboard before the lesson.

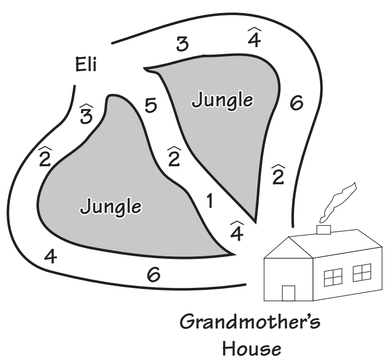
Description of Lesson

During this lesson, you may like to let student pairs act out the story at their seats using a bag (the clear ziplock type) and individual Minicomputer checkers.

T: ***Do you remember Eli the Elephant? Well, Eli's grandmother was lonely, so Eli decided to visit her. To cheer her up, he planned to bring her a bag of peanuts—all of the peanuts he could pick up on the way to her house.***

Eli still doesn't know the difference between magic peanuts and regular peanuts, so he might pick up either kind along the way.

Draw this picture on the chalkboard.



T: ***There are three paths Eli can take to his grandmother's house. This picture shows the number of peanuts he can pick up and put in his bag at various places along each path. Which path would Eli take to arrive at his grandmother's house with the most peanuts in his bag?***

Allow several minutes for the class to think about and discuss this situation. Then, ask the students to vote for either the upper, middle, or lower path.

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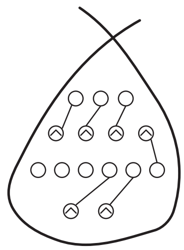
T: ***Let's see how many peanuts Eli would have if he takes the upper path. First, he would find three regular peanuts; then, four magic peanuts; then, six regular peanuts; and finally, two magic peanuts.***

As you say each number, draw that many peanuts in Eli's bag and write the appropriate numeral in a calculation on the chalkboard. Student pairs can act out this story with a bag and checkers.

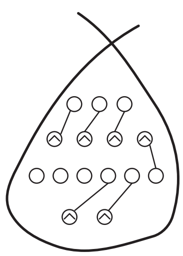
Call on students to pair the magic peanuts with regular peanuts and to complete the number sentence; for example,



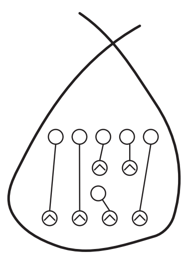
$$3 + \widehat{4} + 6 + \widehat{2} = 3$$

Repeat this procedure to obtain a total number of peanuts for the other two paths.

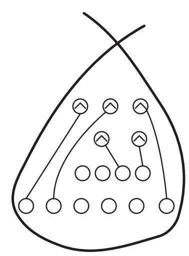
For easy identification, draw the middle path's picture next and then the lower path's picture.



$3 + \widehat{4} + 6 + \widehat{2} = 3$



$5 + \widehat{2} + 1 + \widehat{4} = 0$



$\widehat{3} + \widehat{2} + 4 + 6 = 5$

T: ***How many peanuts would Eli have if he takes the upper path?*** (Three)
How many if he takes the middle path? (Zero)
How many if he takes the lower path? (Five)
So, which path would Eli take to arrive at his grandmother's house with the most peanuts?

S: ***The lower path.***

Home Activity

This would be a good time to send home a letter to parents/guardians about Eli and magic peanuts as a model for negative numbers. Blackline F134.1 has a sample letter.

F134.2 ADDITION STORY #5

Capsule Lesson Summary

Investigate a problem situation in which two students bring brownies to school. Decide whether or not there are enough brownies so that everyone in the class can receive at least one or two.

Materials

Teacher • Calculator

Student • Calculator

Description of Lesson

Tell the following story or one similar to it, letting two students star in the story.

T: ***Pretend that our class is going to have a party and that Robin and Shannon have brought brownies for the party. Robin made 21 brownies; will that be enough for our class? Shannon made 27 brownies; will Shannon's brownies be enough for our class?***

Will there be enough brownies altogether so that everyone can have at least one? Could everyone have at least two brownies?

The answers to these questions, of course, will depend upon the size of your class. Your students will probably agree about the first three questions, but disagree about the last one. To avoid a lengthy discussion, you might conclude simply that it is not yet clear whether or not every student could have at least two brownies.

T: ***Robin made 21 brownies and Shannon made 27 brownies. What calculation should we do to find how many brownies there are, in all?***

S: **21 + 27.**

Ask a volunteer to write this calculation on the chalkboard. Students who know the solution should be told not to reveal it yet; instead, they should write it on their paper or whisper it to you. Instruct students to use their calculators to find the answer. Ask a student to complete the number sentence at the board in both vertical and horizontal formats.

T: ***Will there be enough brownies for everyone to have at least two?***

If necessary, ask how many brownies would be needed for everyone in the class to receive at least two. If no one can answer this, use calculators to find two times the number of students in your class.

If the class remains interested, you may wish to repeat this activity for a second story situation in which two students bring 35 and 43 oatmeal cookies. Ask if there would be enough cookies for everyone in the class to receive at least three.

Capsule Lesson Summary

Discuss an arrow picture in which the arrows are for "I gave you a May basket." Draw individual May basket pictures.

Materials

Teacher
- *FG Poster #5*
- Tape

Student
- Paper
- Colored pencils

Description of Lesson

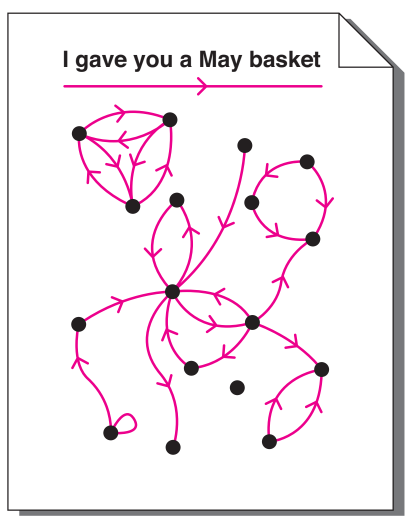
This lesson uses the spring celebration of May Day, which traditionally takes place on May 1st, to create and discuss an arrow picture. In some communities, it is the custom to have a Maypole or for young people to make May baskets for their friends. May baskets are usually small, open baskets with a handle, filled with spring flowers and perhaps a few sweets. A basket is left on a friend's doorstep after dusk on April 30th to be discovered when the friend opens the door the next morning.

T: ***I have a friend named Michal who lives in a small town in Kansas. Every year Michal and some of his friends prepare May baskets for May Day. Do you know when May Day is and what May baskets are?***

After a short discussion, continue.

T: ***Michal drew this picture about May Day in his town.***

Tape the *FG Poster* #5 to the board.



T: ***The dots are for children in Michal's neighborhood. What are the red arrows for?***

S: ***"I gave you a May basket."***

T: ***What do you think about Michal's picture?***

Allow the students to comment spontaneously, even if their remarks are not directly related to the meaning of the arrow picture. Your students might make some of the following remarks.

S: ***It's a very complicated picture.***

S: ***I think it's pretty.***

S: ***There are many arrows.***

S: ***It looks funny.***

S: ***I see someone who gave a lot of May baskets.***

Ask this last student to point to the dot of a child who gave many May baskets. Illustrate this kind of comment by tracing all of the arrows that begin at the dot. Mention that each child who gave a May basket is at the beginning of an arrow and each child who received a May basket is at the end of an arrow.

S: ***I see a child who gave four May baskets.***

Ask this student to point to that dot and to trace the four arrows that start there.

S: ***I see a child who didn't receive any May baskets.***

Ask this student to point to that dot and to show that no arrows end there.

Allow the discussion to continue for a while if the students remain interested. Encourage a variety of observations. You may also wish to guide the discussion by asking questions of your own.

T: ***Michal told me that he gave the most May baskets. Where is Michal? How many May baskets did he give?***

S: ***Four.***

Call on a student to point to the dot for Michal and then label it.

T: ***Can you find a child who gave exactly one May basket and received exactly one May basket?***

Encourage the students to find several such children.

T: ***Michal's friend Peggy received the most May baskets. Where is Peggy? How many May baskets did she receive?***

S: ***Five.***

Call on a student to point to the dot for Peggy; then label it.

T: ***Find pairs of children who gave May baskets to each other.***

There are several such pairs; encourage the class to find them all.

T: ***What do you think about the child with the loop?***

S: ***He gave a May basket to himself.***

T: ***How many May baskets were given in all?*** (24)
How many May baskets were received in all? (24)

T: ***Which child would you like to be? Why?***

Use your own judgment about which questions are most appropriate for your class and how much time should be devoted to this part of the lesson. These decisions depend on the language abilities of your students and on their interest in the story.

Provide the students with unlined paper and colored pencils. Ask them to draw their own pictures of a May basket story.

T: ***Draw and label a dot for yourself in the middle of your paper. Then draw a May basket story about yourself. Give a May basket to at least four people.***

Encourage students to write "I gave you a May basket" on their papers. You will probably receive many different arrow pictures. Show some of them to the class and let the students comment briefly.

Extension Activity

Put out materials to make May baskets before or on the day of this lesson. Let each child deliver one to someone at home or school.

Reading Activity

Follow or preceed this lesson with a book such as *Miss Flora McFlimsey's May Day* by Mariana or *The Flower Mother* by Mary Calhoun.

F136.1 SUBTRACTION ON THE MINICOMPUTER #5

Capsule Lesson Summary

Using the Minicomputer, decide how many pears and how many apples were left in the kitchen after a second grade class took some of them to eat on a walk.

Materials

Teacher • Minicomputer set

Student • Minicomputer set

Description of Lesson

During this lesson, you may like to let students work with a partner using individual Minicomputers to follow along.

T: ***One of our second grade classes was going for a walk and wanted to take along some fruit. There were 54 pears in the kitchen and the second grade class took 28 of them. How many pears were left in the kitchen? What calculation should we solve?***

S: ***54 – 28.***

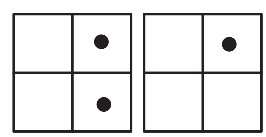
Write this calculation on the chalkboard.

T: ***About how many pears were left, do you think?***

Accept several estimates and record them on the chalkboard.

T: ***Let's do this calculation on the Minicomputer.***

Choose a volunteer to put 54 on the Minicomputer.



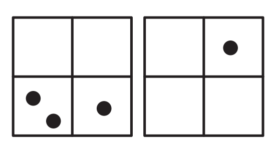
T: ***Who can take away 28?***

S: ***We need a backward trade first.***

T: ***We need a checker on the 20-square. What backward trade can we make to get a checker on the 20-square?***

S: ***40 = 20 + 20.***

Ask a volunteer to make the trade using both hands and saying the trade aloud.



T: ***Now, who can take away 28?***

S: ***We still need a checker on the 8-square.***

S: ***We need a backward trade: 10 = 8 + 2.***

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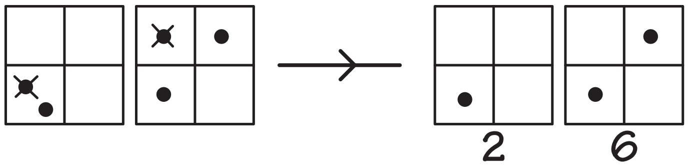
Invite students to make the backward trade, then to take away 28, and to write the answer below (above) the Minicomputer boards. Complete the calculation on the chalkboard.



54 – 28 = 26

T: ***26 pears were left in the kitchen.***

Students who correctly predicted this result might be asked how they arrived at the answer.

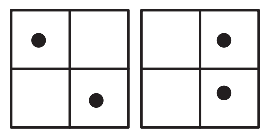
Remove all checkers from the Minicomputer and erase the board before continuing.

T: ***There were also 95 apples in the kitchen and the second grade class took 46 of them. What calculation should we write to find out how many apples were left in the kitchen?***

S: ***95 – 46.***

Write this calculation next to the Minicomputer.

As before, accept and record several students' estimates. Then, choose a volunteer to put 95 on the Minicomputer.

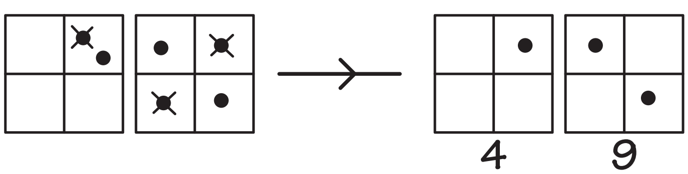


T: ***Who can take away 46?***

S: ***We need some backward trades first.***

Call on students to make the backward trades (80 = 40 + 40 and 10 = 8 + 2), and to write the answer under the Minicomputer boards.

Complete the number sentence on the chalkboard.



95 – 46 = 49

T: ***There were 49 apples left in the kitchen.***

Ask students who predicted correctly to explain their methods for obtaining the answer.

Invite students to make up subtraction problems to solve on the Minicomputer with their partners.

F136.2 NUMBER LINE ACTIVITY

Capsule Lesson Summary

Given the positions of 99 and 100 on the number line, locate various numbers. Play the Number Line Game.

Materials

Teacher • None

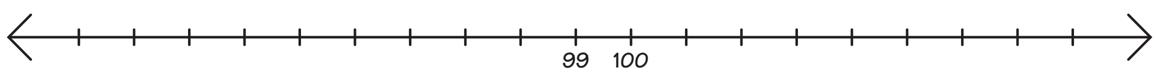
Student • Worksheets F136.2* and **

Description of Lesson

Exercise 1

Draw part of the number line on the chalkboard. The graduations should be spaced equally, at least ten centimeters apart. Make the line as long as your chalkboard will permit.

T: ***Here is a line with some numbers on it.***



T: ***Who can show us where 101 is on this number line?***

Put 101 in its proper place; then point to the position of 103.

T: ***What number goes here?***

S: ***103.***

Label this point 103. Continue the activity until many points along the number line have been labeled. Alternate asking students to identify a point you indicate or to point to the position of a specific number. Point to the far right mark.

T: ***What number goes here?***

Let students whisper their answers to you or a neighbor, and then ask a student to label the point. Point to the next to last mark from the right.

T: ***What number goes here? How do you know?***

Encourage students to count backward.

Repeat this activity, labeling the last point, and the next to last point to the left. If the students have difficulty, count backward with them from the closest point that is labeled.

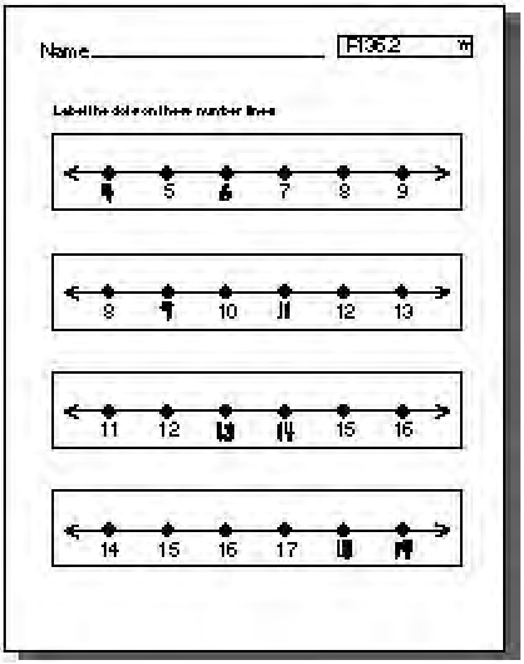
Exercise 2

Play the Number Line Game (see Lesson F103.2) with a secret number between 0 and 50.
Play a second game using a secret number between 50 and 100.

Worksheets F136.2 * and ** are available for individual practice. Allow about ten minutes for the worksheets, even if this means postponing the Number Line Game.

Home Activity

Send a page of blank number lines (see Blackline F92.2) home with students. Suggest to parents/ guardians that they choose a number between 50 and 150 to put on a number line, and that they work with their child to label other marks.


Name ____________ F136.2 *

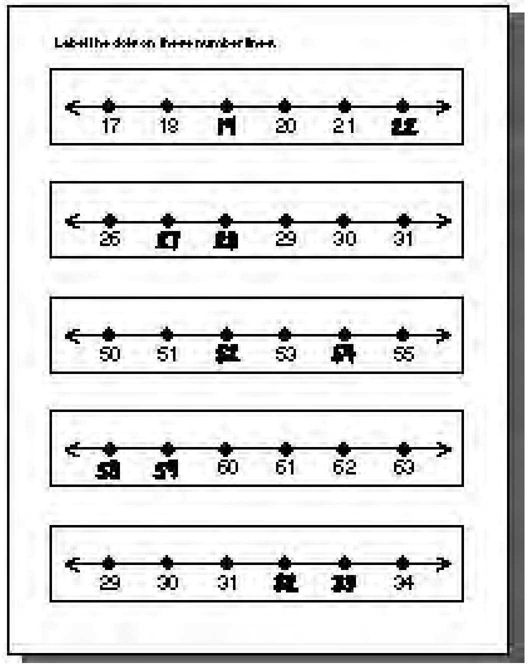
Label the dots on these number lines.

4 5 6 7 8 9

8 9 10 11 12 13

11 12 13 14 15 16

14 15 16 17 18 19


Label the dots on these number lines.

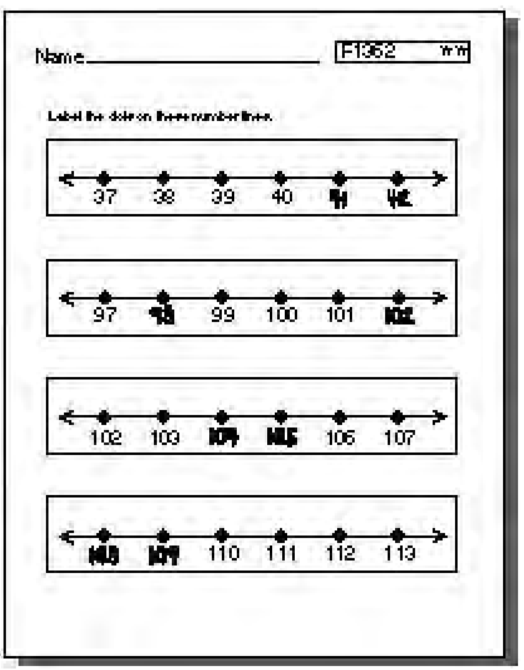
17 18 19 20 21 22

26 27 28 29 30 31

50 51 52 53 54 55

58 59 60 61 62 63

29 30 31 32 33 34


Name ____________ F136.2 **

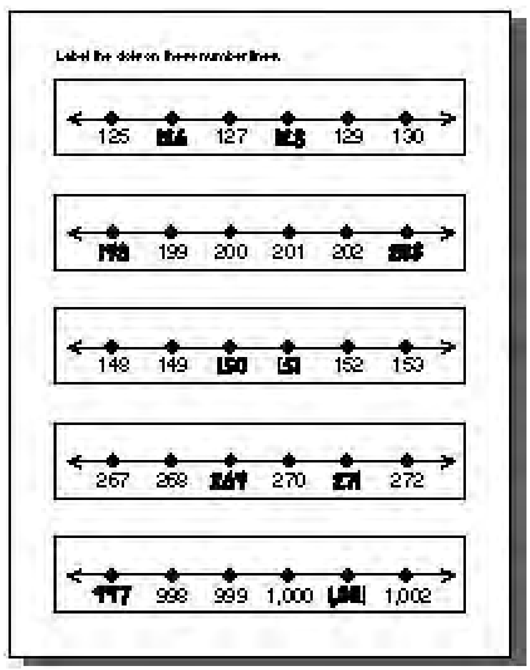
Label the dots on these number lines.

37 38 39 40 41 42

97 98 99 100 101 102

102 103 104 105 106 107

108 109 110 111 112 113


Label the dots on these number lines.

125 126 127 128 129 130

198 199 200 201 202 203

148 149 150 151 152 153

267 268 269 270 271 272

997 998 999 1,000 1,001 1,002

Capsule Lesson Summary

Using a story about Mirror City, investigate reflective symmetry and create structures that are mirror images of each other.

Materials

Teacher
- Masking tape
- Blocks of several shapes and sizes
- Mirror

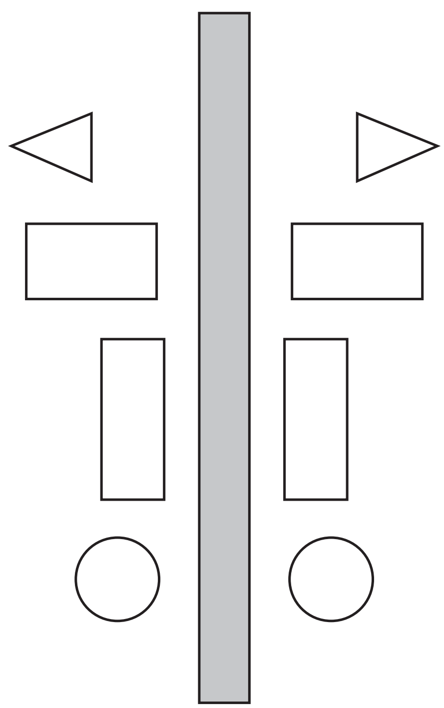
Student
- Blocks
- Mirror
- Cardboard screen

Description of Lesson

Prepare a line of wide masking tape on a table or the floor. Leave space on both sides of the line to place blocks.

Tell the class a story about a funny place called Mirror City where the streets are like mirrors. When you walk down a street, whatever building you see on one side has an identical building facing it on the other side.

Model this idea using large blocks. Place a block on one side of the masking tape "street"; then place an identical block opposite it on the other side of the street. Invite students to contribute.



Note: Although this picture is a two-dimensional view of reflective symmetry, your display should have three dimensional symmetry. That is, the height of the blocks facing each other should also be the same. You can also place blocks on top of other blocks.

As the class places blocks, discuss how the buildings are mirror images of each other and notice that they need to be placed the same distance from the street. You may like to use a mirror to check the placements. Use this opportunity to use position relevant language such as right, left, above, behind, and in front of.

Organize the class in groups of three or four. Provide each group with a collection of blocks and place a masking tape street on their table. Then instruct the groups to put buildings along the streets in Mirror City. Suggest they use a mirror to check placements. After several minutes call the students' attention to some of the groups' streets and discuss them.

Make this activity more challenging by describing a game for the groups to play. Place a cardboard screen along the masking tape street. Put two students on each side of the screen and give each pair the same collection of three to five blocks. Direct the first pair of students to create a building on one side of the screen. Then ask them to describe their building to the second pair of students on the other side of the screen. The second pair must try to make an identical building from the description only; they may not see the building. You may want to allow the second pair of students to ask "yes" or "no" questions of the first pair as they try to make the building. When they are finished, remove the screen and compare the buildings. Repeat the game with pairs of students exchanging roles.

Center Activity

Make the Mirror City game into a center activity using other materials such as pattern blocks.

Writing Activity

Ask students to write about Mirror City and include pictures of streets in the city.

Extension Activity

Take a walk through the school neighborhood and notice houses or buildings that seem to be mirror images of each other, either side by side or across the street. Students might notice duplexes that display reflective symmetry.

Reading Activity

Make books such as *The Mirror Puzzle Book*, *Look at Annette*, and *Make a Bigger Puddle, Make a Smaller Worm* by Marion Walter available for students to read and explore, perhaps with a partner.

F138.1 ELI'S MAGIC PEANUTS #3

Capsule Lesson Summary

Eli arrives home after gathering peanuts, only to find that his bag is empty! Discuss what could have happened.

Materials

Teacher • None

Student • None

Description of Lesson

T: ***Last week Eli was walking in the jungle gathering peanuts. Poor Eli still hasn't learned the difference between regular peanuts and magic peanuts.***

Ask one student to draw a regular peanut on the board and another to draw a magic peanut.

T: ***Eli gathered peanuts all day long, but when he got home and opened his bag, it was empty! What could he have put in his bag that day?***

S: ***Regular peanuts and magic peanuts.***

T: ***How many regular peanuts and how many magic peanuts?***

Accept suggestions from the class about what Eli put in his bag that day, recording the number sentences for each suggestion on the board.

S: ***Six regular peanuts and six magic peanuts.***

$$6 \times \hat{6} = 0$$

T: ***Yes; that would leave zero peanuts in the bag.***

Do not discourage more imaginative suggestions; for example,

S: ***He found six regular peanuts and then ate them.***

$$6 - 6 = 0$$

T: ***Maybe. He could have put six regular peanuts into the bag and then taken out six regular peanuts. Then there would be none left.***

S: ***He found six regular peanuts, ate one of them, and put in five magic peanuts.***

$$6 - 1 \times \hat{5} = 0$$

T: ***Yes. He could have put six regular peanuts into the bag and taken one out. Then, how many regular peanuts would have been in the bag?*** (Five)
He could have then put in five magic peanuts and that would have left zero peanuts in the bag.

Continue to accept suggestions for as long as the class is interested.

End the discussion by asking the class to try to explain in words (rather than numbers) what happened to Eli that day; that is, to explain a rule that gave Eli an empty bag when he got home. Encourage students to observe that Eli could have put any number of regular peanuts and the same number of magic peanuts in his bag and have ended up with zero..

If your class enjoys this activity, at another time change the situation a little by saying Eli found just one (regular or magic) peanut in his bag.

F138.2 STRING GAME WITH A-BLOCKS #4

Capsule Lesson Summary

Play the A-Block String Game. Observe that in the given situation the middle region is empty and should be hatched.

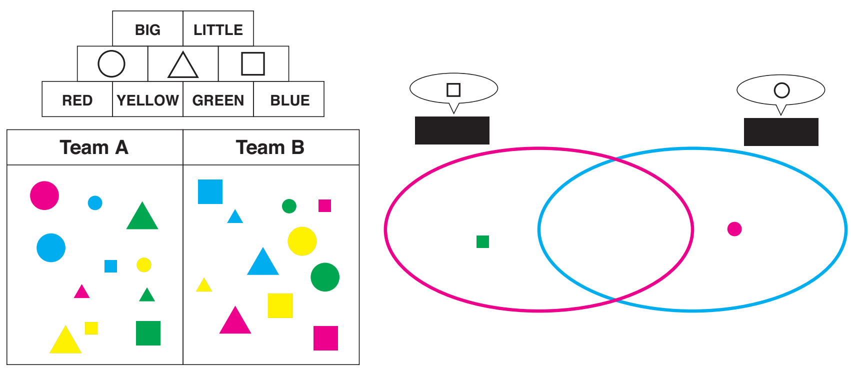
Materials

Teacher
- A-Block String Game kit
- Colored chalk

Student
- None

Description of Lesson

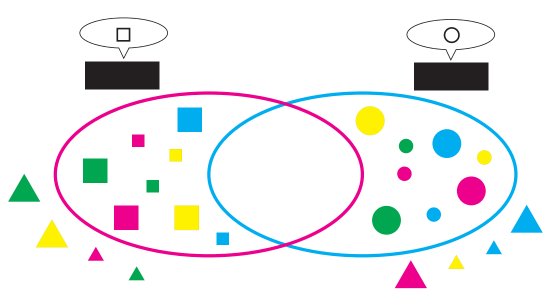
Before the lesson begins, prepare the team board as in the following illustration and divide the class into two or more teams. Draw two strings on the board and place string cards face down. Select two pieces to use as starting clues.



T: ***Today, we will play the String Game again. These cards show what the strings are for, but the labels are hidden because you have to discover what they are. Look carefully at the pieces already in the picture; they are clues. Remember that the strings can be for any of these*** (point to the list of possible string labels above the team board)***. Let's read them together.***

Play the game in the usual way. If a piece is correctly placed in the string picture, say "yes" and allow the piece to remain; if a piece is incorrectly placed, say "no" and return the piece to the team board. As before, students who correctly place an A-block piece may be given a bonus turn (then play returns to another team).

The correct placement for all pieces is shown below.



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When the game is over (a team wins by placing all of its pieces and identifying the strings), call the students' attention to the way the pieces are distributed.

T: ***Does anyone notice anything interesting about where the pieces are in this string picture?***

S: ***There are none in the middle.***

T: ***If I put the rest of the pieces in the picture, would there be any in the middle?***

S: ***No.***

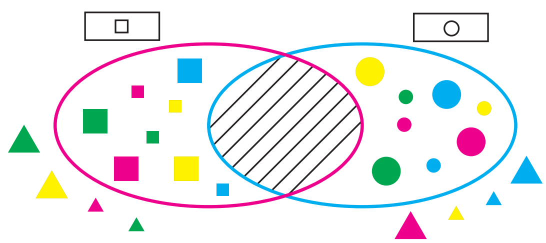
T: ***Why not?***

Ask students to consider this for a moment before answering.

S: ***No piece is both a square and a circle!***

T: ***That's right; and there is an easy way to show that nothing is in the middle of our picture.***

Use white chalk to hatch the center region of the string picture.



T: ***This will remind us that the middle is empty; none of the A-block pieces go there.***

You may like to ask the class to find other labels for the two strings that would result in an empty middle region.

F139.1 THE LITTLE DREAMER

Capsule Lesson Summary

Read and discuss the storybook *The Little Dreamer*.

Materials

Teacher		Student	
	• *The Little Dreamer* Storybook		• *The Little Dreamer* Storybook

Description of Lesson

Distribute storybooks to pairs of students so they can follow along with you during the lesson. Then, read *The Little Dreamer* to your class as you would any other story. Do not overemphasize the mathematical aspects of the story but do observe and discuss the use of the mathematical languages of dots, arrows, and strings. You may increase students' participation by posing questions and by asking them to identify various parts of the pictures.

Here are a couple specific suggestions for activities as you progress through the storybook.

Page 6

Ask the students to point to the nest (on page 5) that has three birds living in it; that has only one bird living in it; that is empty; that has two birds living in it.

Page 7

You might ask the students to invent another story about this picture.

When you have finished reading the story, allow some time for the class to talk about it or to draw pictures related to it. You may want to make copies of the storybook available for students who wish to look through it in their spare time.

Writing Activity

Suggest that students write or tell a story of their own illustrated with a picture that uses dots, arrows, and strings.

F139.2 STORY PROBLEM #3

Capsule Lesson Summary

Solve a problem to determine the total number of legs for a family of six octopi.

Materials

Teacher		Student	
	• None		• Paper • Colored pencils

Description of Lesson

T: ***Who knows what an octopus is?***

Let the students describe an octopus, being sure someone mentions that an octopus has eight legs.

T: ***One day, a family of six octopi† visits a shoe store because they all need new shoes. How many shoes are needed for all the octopi together?*** (48)

To find out, you may draw any kind of picture you wish.

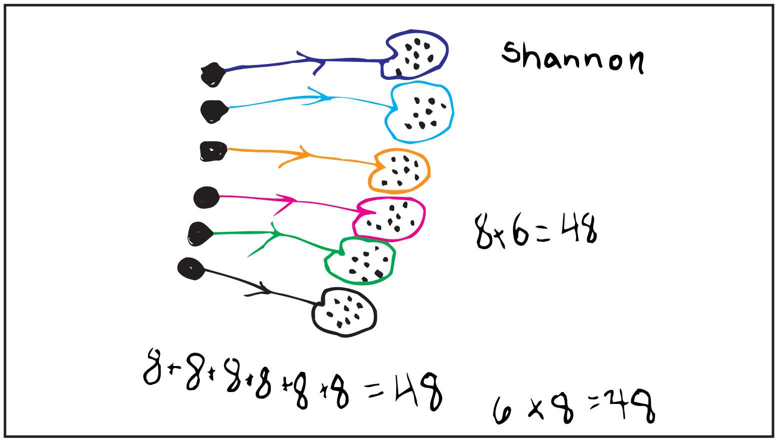
As the students work, do not offer any guidance, although you may want to repeat the details of the story. Students who finish early can be asked to write number sentences about their pictures.

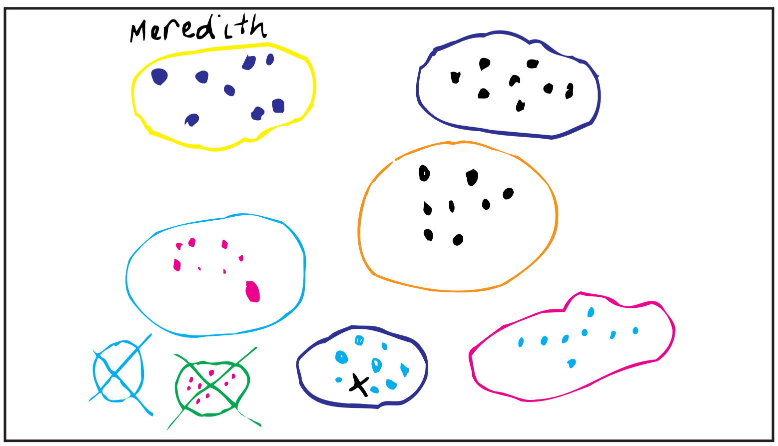
When most students have completed their pictures, allow some students to share their pictures and number sentences with the class. Discuss how each picture and number sentence relates to the problem.

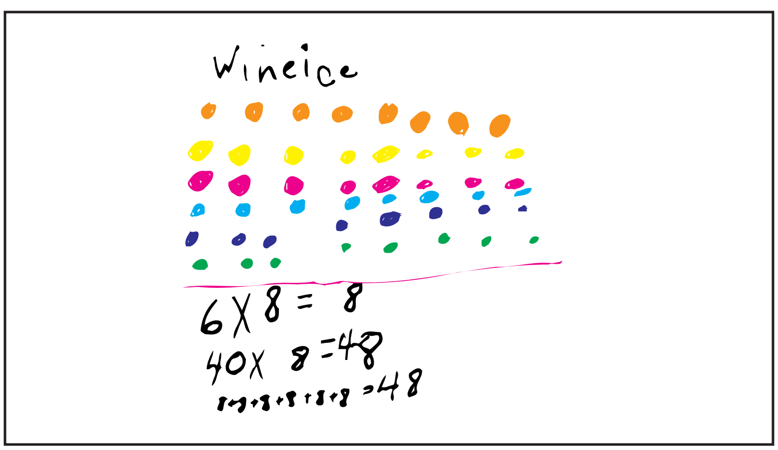
Note: Incorrect answers may result from simple counting errors; do not be concerned about this. What is more important, at this stage, is how well the students understand the problem and what methods they employ to solve it.

The pictures on the next page were drawn by *CSMP* students. Note that one of the students, Wineice, wrote 40 x 8 = 48 when she meant to write 40 + 8 = 48. The rest of her work, however, demonstrates an understanding of the problem and the calculations involved.

†If necessary, explain to the class that *octopi* is the plural form of *octopus*.


Shannon
8x6=48
8+8+8+8+8+8 =48
6 x8 =48


Meredith


Wineice
6X8 = 8
40X 8 =48
8+8+8+8+8+8 =48

F140 ADJUSTMENT/ASSESSMENT DAY #6

Note: See Section One, page 1-9, for a full explanation of the purpose of scheduled adjustment days. Worksheet F140 provides for a short, written assessment.

On this day you may wish to repeat an earlier lesson either for a small group of students or for the entire class. Many of the lessons can be made to appear completely different by changing the story and/or the numbers in the lesson. If you omitted the exercises or worksheets from an earlier lesson, you may wish to include these. This is also a good time to allow students to work in a center or on a project of your choice.

Exercise 1 of F136.2 *Number Line Activity* is a good exercise to repeat from time to time to help students gain facility with the number line.

You may like to repeat Lesson F132.1 *Fractions from Paper Folding* using a paper plate (circle) rather than a rectangular piece of paper. The circle could represent a pizza being divided into 2, 4, or 8 pieces.

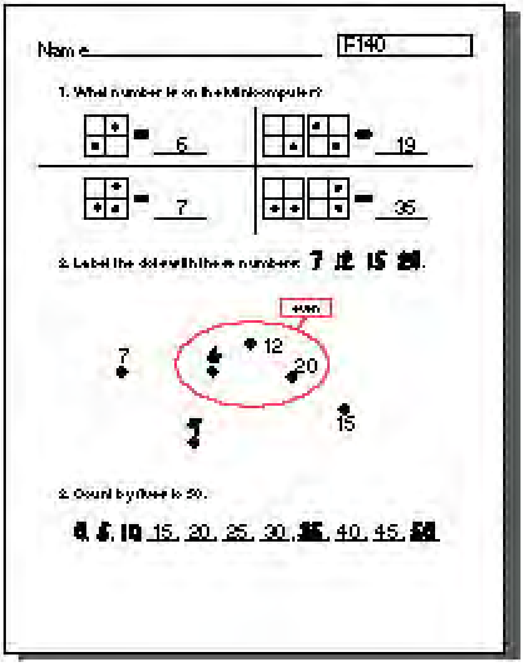
This might be a good time to repeat a version of the String Game where one region is hatched by adapting Lesson F138.2 *The String Game with A-blocks #4*.

If your class is experiencing little difficulty with the *CSMP* curriculum, you may wish to omit this adjustment day and continue immediately with Lesson F141.1 *Detective Story #2*.

Early Warning

Among of the next nine classroom lessons are some that require extra preparation time, or which make use of materials not included with the *CSMP* Classroom Set. The lessons are listed here for your convenience in preparing for them. A more detailed description of the materials can be found on the first page of each lesson. (Special materials are listed here only once, even if they may be needed more often in the nine-day period.)

F141.1 *Detective Story #2*: Calculator
F142.1 *½ x on the Minicomputer #1*: Pennies or counters
F143 *Arrow Road for Money*: Coins (nickels, dimes, quarters, and half-dollars)
F144.2 *Area #1*: Five cardboard squares
F145.1 *Place Value Review*: Base-10 blocks; calculators
F146.1 *Length #3*: Meterstick; tape; Post-it™ notes


Name ____________ F140

1. What number is on the Minicomputer?

= 6

= 19

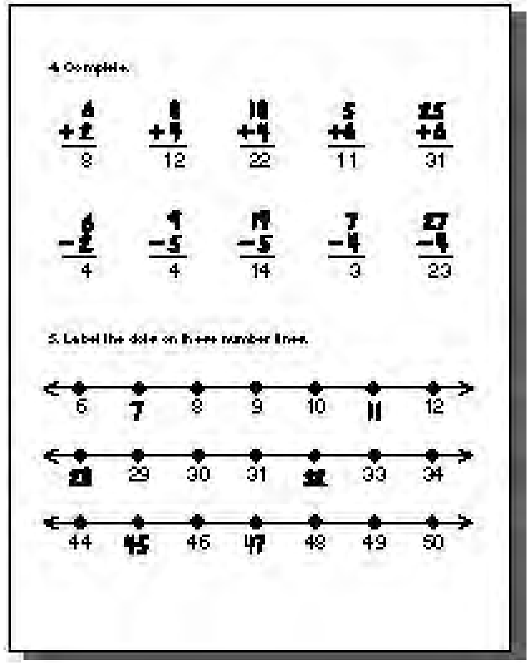
= 7

= 35

2. Label the dots with these numbers: 7 12 15 20.

3. Count by fives to 50.

0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50


4. Complete.

6 + 2 = 8	8 + 4 = 12	18 + 4 = 22	5 + 6 = 11	25 + 6 = 31
6 − 2 = 4	9 − 5 = 4	19 − 5 = 14	7 − 4 = 3	27 − 4 = 23

5. Label the dots on these number lines.

F141.1 DETECTIVE STORY #2

Capsule Lesson Summary

Count by ones so that every student says a number. Then, ask every third student to repeat the number he or she said, thus showing how to count by threes. Solve a detective story in which the secret number is a multiple of 3 and other clues are given with a string picture and an arrow picture.

Materials

Teacher
- Number line
- Overhead or class calculator

Student
- Paper
- Pencil

Advance Preparation: Before class begins, write the numeral 12 on a piece of paper and fold the paper so that the numeral cannot be seen by the class.

Description of Lesson

Exercise 1: Counting Activity

To begin this activity, explain to students the order in which they will count aloud by ones (from front to rear, from right to left, and so on). Then, beginning with 1 and continuing around the room, count off until all of the students have counted. Ask students to predict the last number that will be counted. After the students count off, compliment any student who correctly predicted the final number.

Repeat this counting sequence, asking every third student to stand up. Instruct the class to count by ones again, with the seated students saying their numbers softly and the students who are standing saying their numbers loudly. Tell the students to remember their numbers.

T: ***Now, only the students who are standing will say their numbers. They will be counting by threes. Listen carefully because in a moment we will all count by threes.***

Tell the students who are standing to say their numbers in order, assisting students who have difficulty.

T: ***Now let's count together by threes. The students who are standing may sit down when we say their numbers.***

As a group, count by threes up to 30. Point to the appropriate numerals on the number line as you count.

T: ***How do you think we could teach a calculator to count by threes?***

S: ***Press å £ ≠ ≠ ≠ and so on.***

Let the students teach the overhead or class calculator to count by threes and observe the numbers.

F141

Exercise 2: Detective Story

Show the students your folded piece of paper on which 12 is written. Tell them that a secret number is written on the paper and they must discover it.

Clue 1

T: ***The secret number is one of the numbers we say when we count by threes, as we just did. Let's write these numbers on the chalkboard.***

Ask the students to suggest numbers, perhaps reading the numbers as they observe them on the counting calculator.

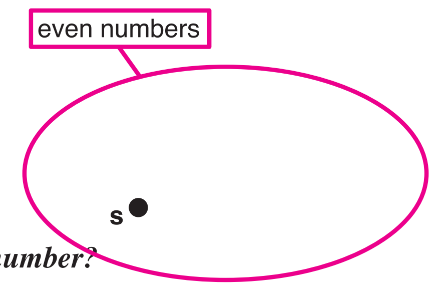
3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33,

T: ***The secret number is one of these numbers.***

At this point, some students may try to guess the secret number. Remind them that detectives follow clues until they are certain.

Clue 2

Draw this string picture on the board and point to the dot.



T: ***This dot is for the secret number.***
What does this clue tell us?

S: ***It's an even number.***

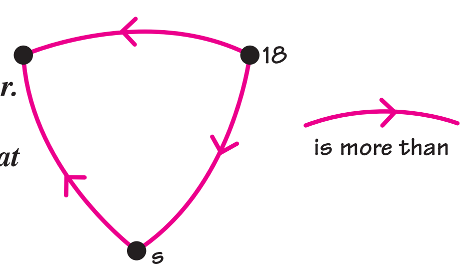
T: ***Yes, the secret number is an even number.***
Which of the numbers in our list could be the secret number?

As each number is suggested, ask the students if it is even. If a suggested number is even, circle it; if not, cross it out. When there is disagreement about whether a number is even or odd, put that number on the Minicomputer, reminding the students that an odd numbers always has a checker on the 1-square while even numbers can be put on the Minicomputer without a checker on the 1-square. Continue until all of the numbers on your list have been considered.

~~3~~, 6, ~~9~~, 12, ~~15~~, 18, ~~21~~, 24, ~~27~~, 30, ~~33~~,

Clue 3

Erase all of the numbers that have been crossed out and draw this arrow picture on the board.



T (pointing to the dot labeled **s**)***: Here is the secret number.***
The red arrows are for "is more than."
Tell me with whispers (or write on your paper) what you think the secret number is.

Allow several students to whisper their answers to you. You may need to remind the class that the secret number is one of the numbers in the list. Ask a student who knows the secret number (12) to label its dot at the board.

T: ***Could 12 be the secret number?***

Allow the students to comment; then, ask if 12 is in the list and if the arrow picture is correct as labeled. (If necessary, call on volunteers to read the number sentences told by the arrows aloud (for example, "18 is more than 12,"and so on.) The class should agree that 12 could be the secret number.

T: ***Is there any other number that could be the secret number?***

If any other number is suggested, check it with the class against the list and the arrow picture. Finally, unfold your piece of paper to reveal that 12, indeed, is the secret number.

F141.2 ODD AND EVEN NUMBERS

Capsule Lesson Summary

Put numbers in a string picture in which one string is for even numbers and the other string is for odd numbers.

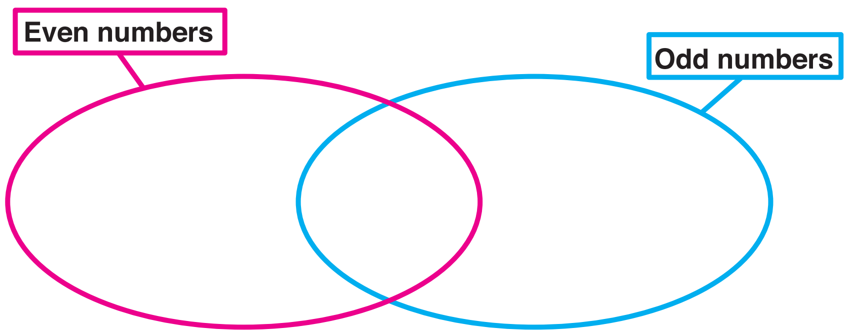
Materials

Teacher
- Minicomputer set

Student
- Colored pencils
- Paper
- Minicomputer set

Description of Lesson

Display four Minicomputer boards and draw this string picture on the chalkboard.



T: ***Let's put some numbers in this string picture.***

Ask a student to suggest a number between 20 and 100. Ask a second student to put the number on the Minicomputer.

T: ***Is this number even or odd? How do you know?***

Guide the students' comments until it is stated clearly that even numbers may be shown without a checker on the 1-square, while odd numbers always have a checker on the 1-square.

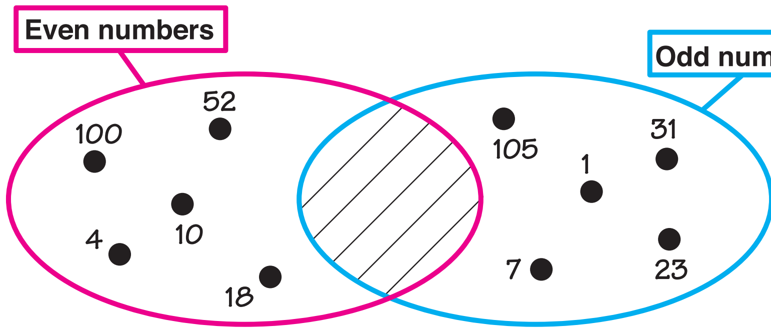
T: ***Who can draw and label a dot for this number in our string picture?***

Continue in this way until at least two odd and two even numbers are in the string picture. (Students may suggest that some large numbers be included in the picture; if a suggested number has more than four digits, you can draw additional Minicomputer boards on the chalkboard and draw dots for checkers.)

Ask the students to copy the string picture from the board onto their papers and then to put many more numbers in their string pictures. For the moment, do not say anything about that the middle region of this string picture (i.e., the intersection of the odd and even numbers); allow the students to discover that no number is in this region. Students who encounter difficulty can be encouraged to use individual Minicomputers to determine whether a number is even or odd.

F141

When most students have at least ten numbers in their pictures, let students share with the class where they placed numbers. Include some of these numbers in the picture on the board. Perhaps a student will comment that no number goes in the middle region. If not, ask the class if anyone found a number to put there. Lead the discussion toward the observation that this region is empty and remind students about hatching to show an empty region.



F142.1 ½ x ON THE MINICOMPUTER #1

Capsule Lesson Summary

Decide how many pennies each of two people will receive if 22 pennies are divided equally between them. Draw a corresponding string picture and write number sentences about it. Find one-half of a number using the Minicomputer.

Materials

Teacher
- Minicomputer set
- Colored chalk

Student
- Pennies or counters
- Paper
- Colored pencils

Description of Lesson

Pair up students and provide each pair with 22 pennies or counters.

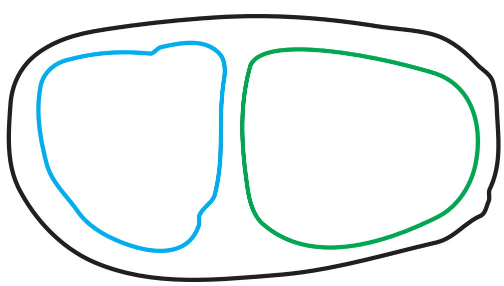
T: ***You are going to share 22 pennies with your partner. Each of you will get one-half of the pennies. Before you do it, let's estimate how many pennies each of you will get.***

Accept several estimates and record them on the chalkboard. Then, draw a large string on the board and ask student pairs to draw it on their papers.

T: ***This string is for the 22 pennies. Remember, each person will get one-half of the pennies. How many strings should I draw inside this string?***

S: ***Two.***

In two new colors of chalk, draw two strings inside the first string and ask the students to do the same.



T: ***Now share the pennies equally between the two of you—put them in two strings.***

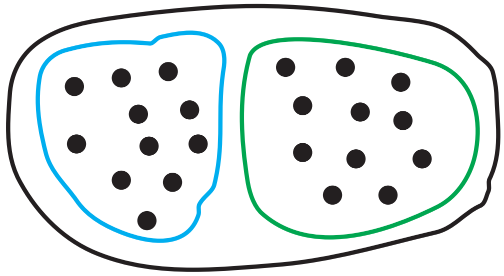
Let students share in their own ways. If appropriate discuss or comment on some of their methods.

T: ***Some of you gave one penny to one person and then one penny to the other person, and so on.***

Tara and Paul put ten pennies in one string and then ten pennies in the other string. They had two pennies left, so they put one in each string.

F142

Call on students to draw dots showing the distribution of the pennies.



T: ***What is ½ x 22*** (read as "one-half of twenty-two")***?***

S: ***11.***

Write the corresponding number sentence on the board.

$\frac{1}{2} \times 22 = 11$

T: ***The* 2** (point to the 2 in ½) ***indicates two strings, and the* 1** (point to the 1 in ½) ***means we count the pennies in just one of the strings. Who knows some other number facts about this picture?***

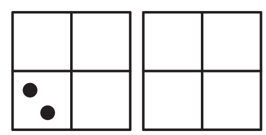
S: ***11 + 11 = 22.***

S: ***2 x 11 = 22.***

S: ***22 – 11 = 11.***

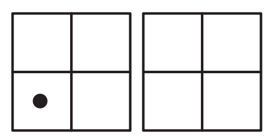
On the chalkboard, write any suggested number sentences that pertain to the situation.

Put the following configuration on the Minicomputer.



T: ***What number is on the Minicomputer?*** (40)
Who can take away one-half of this number on the Minicomputer?

Choose a volunteer to take away one of the checkers.



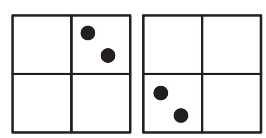
T: ***What is ½ x 40*** (read as "one-half of 40")***?***

S: ***20.***

Write the corresponding number sentence on the chalkboard.

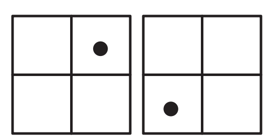
$\frac{1}{2} \times 40 = 20$

Put a new configuration on the Minicomputer.



T: ***What number is this?*** (84)
Who can take away one-half of this number?

Choose a volunteer to do so.



T: ***What is ½ x 84?***

S: ***42.***

Write the corresponding number sentence on the chalkboard.

$\frac{1}{2} \times 84 = 42$

F142.2 SUBTRACTION ON THE MINICOMPUTER #6

Capsule Lesson Summary

With the help of the Minicomputer, decide how many chicks are left when 56 out of 100 chicks are sold. Do sequences of subtraction calculations on the Minicomputer.

Materials

Teacher • Minicomputer set

Student • Minicomputer set

Description of Lesson

Exercise 1

Tell your class the following story, or one similar to it, using one of your students to be the star.

T: ***For vacation, Bronte's family went to visit her grandfather who lives on a farm. While she was there, her grandfather bought 100 baby chicks. What is a chick?***

Allow some time here for a discussion, which should include such facts as chicks are baby chickens; they are usually sold 100 at a time (in large, shallow boxes); and they are frail, delicate creatures that require warm surroundings and special care.

T: ***Yesterday Bronte received a letter from her grandfather saying that 56 of the chicks had been sold. How many chicks are left at Grandfather's farm?***

Record some of the students' predictions on the chalkboard. If no one suggests using the Minicomputer, suggest it yourself. Display three Minicomputer boards and ask a student to put 100 on the Minicomputer.

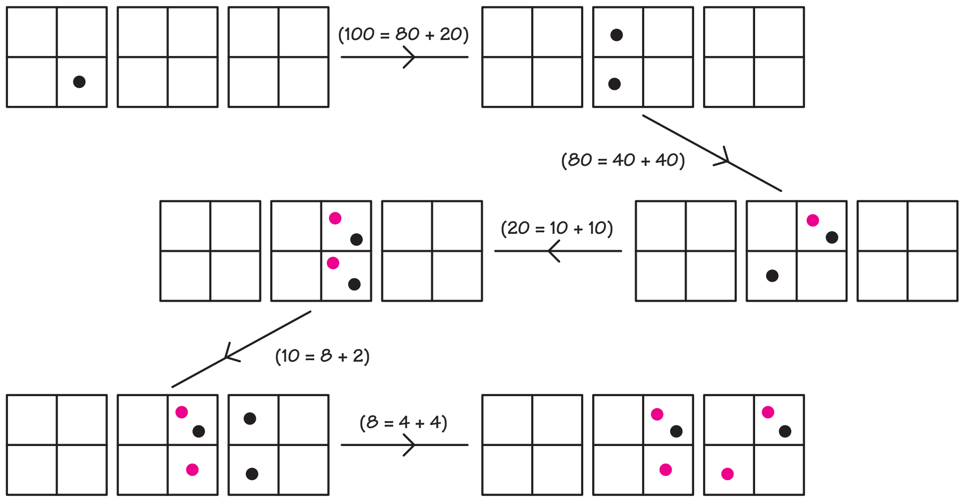
T: ***There were 100 chicks, but 56 were sold. What calculation should we do?***

S: ***100 – 56.***

Write the subtraction problem on the board. Some students may insist at this point that they cannot take away 56 from the Minicomputer. Be patient; if no one suggests making a backward trade, make the 100 = 80 + 20 trade yourself.

Ask the class where the checkers for 56 would be and ask if someone can make backward trades to put checkers on those squares. Students should then suggest other backward trades.

Continue this activity until 56 can be removed from the Minicomputer. A possible sequence of trades is shown on the following page.



Call on a volunteer to take away 56 (shown above with red checkers) from the number on the Minicomputer and complete the number sentence on the chalkboard.

$$100 - 56 = 44$$

Compliment students who correctly predicted the answer and ask if they can explain their methods.

Exercise 2

Each student or pair of students will need one individual Minicomputer sheet (two Minicomputer boards) and several checkers. Erase the chalkboard and remove the checkers from the demonstration Minicomputer.

T: ***Put 35 on your Minicomputers.***

Check the students' Minicomputers and ask one student to put the standard configuration for 35 on the demonstration Minicomputer. Write this subtraction problem on the chalkboard.

$$35 - 4 =$$

T: ***Calculate 35 – 4 on your Minicomputers.***
What number is 35 – 4? (31)

Invite a student to take away 4 from the number on the demonstration Minicomputer and to complete the number sentence. Frequently check that the students have the appropriate number on their Minicomputers. Write a new problem on the chalkboard.

$$35 - 4 = 31$$

$$31 - 20 =$$

T: ***Calculate 31 – 20 on your Minicomputers.***
What number is 31 – 20? (11)

Invite a student to take away 20 from the number on the demonstration Minicomputer and to complete the number sentence. Continue this activity with two more subtraction problems in turn. Answers are in the boxes.

$$\begin{aligned} 35 - 4 &= 31 \\ 31 - 20 &= 11 \\ 11 - 1 &= \boxed{10} \\ 10 - 10 &= \boxed{0} \end{aligned}$$

Follow a similar procedure for the following sequences of subtraction problems (or similar ones appropriate for the numerical abilities of your students), none of which require backward trades. Answers are in the boxes.

Put 57 on all Minicomputers.

$57 - 4 = \boxed{53}$
$53 - 10 = \boxed{43}$
$43 - 40 = \boxed{3}$
$3 - 3 = \boxed{0}$

Put 69 on all Minicomputers.

$69 - 40 = \boxed{29}$
$29 - 1 = \boxed{28}$
$28 - 8 = \boxed{20}$
$20 - 20 = \boxed{0}$

Put 75 on all Minicomputers.

$75 - 40 = \boxed{35}$
$35 - 1 = \boxed{34}$
$34 - 0 = \boxed{34}$
$34 - 30 = \boxed{4}$
$4 - 4 = \boxed{0}$

If your class successfully completes these problems, you may wish to continue to the following sequence, which does require backward trades.

Put 48 on all Minicomputers.

$48 - 8 = \boxed{40}$
$40 - 20 = \boxed{20}$
$20 - 10 = \boxed{10}$
$10 - 10 = \boxed{0}$

Put 59 on all Minicomputers.

$59 - 14 = \boxed{45}$
$45 - 21 = \boxed{24}$
$24 - 12 = \boxed{12}$
$12 - 12 = \boxed{0}$

F143 ARROW ROAD FOR MONEY

Capsule Lesson Summary

Use a +5 arrow road to discover a half-dollar's equivalent in nickels. Add +10 arrows to decide a half-dollar's equivalent in dimes, and add +25 arrows to decide its equivalent in quarters.

Materials

Teacher
- Colored chalk
- 0–109 numeral chart
- Nickels, dimes, quarters, and half-dollars

Student
- Worksheet F143
- Colored pencils

Description of Lesson

Exercise 1

Begin the lesson with about five minutes of mental arithmetic.

T:	***1 + 1 = … ?***	**S:**	***2.***
	10 + 10 = … ?	**S:**	***20***
	2 + 1 = … ?	**S:**	***3.***
	20 + 10 = … ?	**S:**	***30.***
	2 + 2 = … ?	**S:**	***4.***
	20 + 20 = … ?	**S:**	***40.***

Continue in this manner, first asking for the sum of two numbers whose sum is less than 10, and then asking for the sum after the two numbers are multiplied by 10. Occasionally, you may like to use the 0–109 numeral chart or the Minicomputer to illustrate a particular calculation. Before long, most of the students should recognize the pattern of your questions.

Exercise 2

Distribute copies of Worksheet F143. Have a collection of coins available during the following discussion and ask students to identify coins as they are mentioned.

T: ***How many pennies make a dollar?*** (100)
How many pennies make a half-dollar? (50)
How many pennies make a nickel? (5)
How many nickels make a half-dollar?

Most likely, few students in your class will know the answer to this last question immediately.

T: ***Let's draw an arrow picture to find out.***

Copy the picture from the worksheet on the chalkboard.

F143

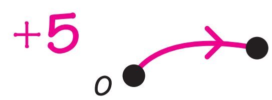
T: ***This picture is just like the one on your worksheets. When we draw arrows or label dots at the chalkboard, do it on your paper, too.***

How many pennies did we say make a nickel? (Five)
So, when we add a nickel, it's the same as adding five pennies.

In red, write +5 near your picture on the board; remind the students to do likewise.

T: ***Each time we add a nickel, we will draw a red arrow.***

Draw the first red arrow.



T: ***I start with zero cents and I add a nickel.***
How many cents do I have now?

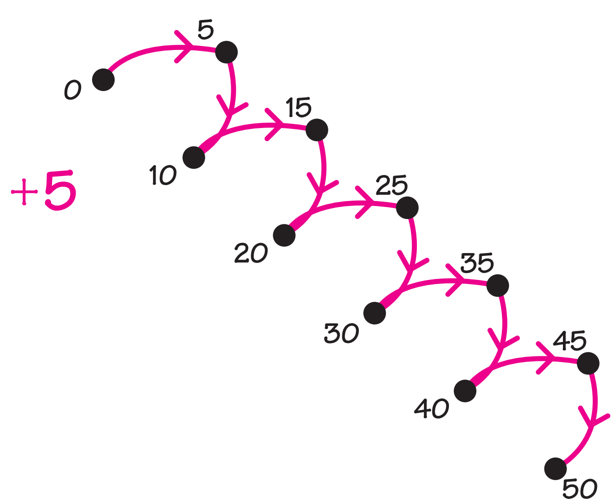
S: ***5¢.***

Let a student put a nickel in a designated place near the arrow picture.
Label the dot 5 and draw the next red arrow.

T: ***I have 5¢ and I add another nickel. How many cents now?***

S: ***10¢.***

Call on a student to add a nickel to the pile and another to label the dot. Continue in this manner until the last dot has been labeled.



T: ***Now we have 50¢ and a half-dollar is 50¢.***
How many nickels did we count?

S: ***Ten.***

T: ***Do we count the dots or the arrows to check?***

S: ***The arrows; we drew an arrow for each nickel.***

T: ***Right. How many nickels make a half-dollar?*** (Ten)
How many nickels make a whole dollar? (Twenty)
How do you know?

S: ***Because 10 + 10 = 20.***

S: ***Because 2 x 10 = 20.***

T: ***How many pennies make a dime?*** (Ten) ***How many nickels make a dime?*** (Two) ***Ten nickels make a half-dollar. How many dimes make a half-dollar?***

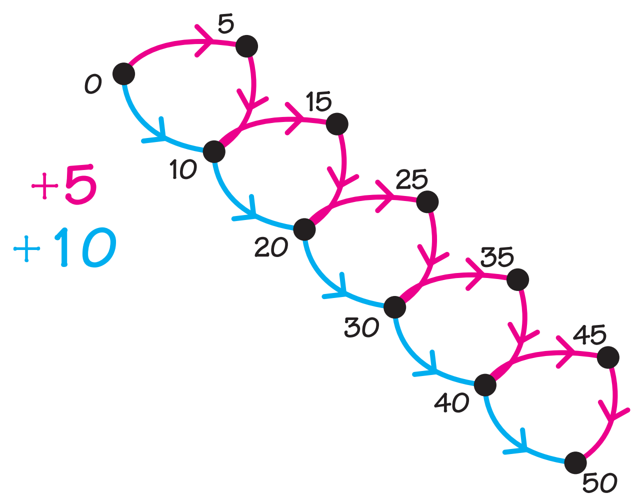
Some students may realize that five dimes make a half-dollar, but others may not be certain. In any case, call the students' attention to the arrow picture once again.

T: ***Let's start again at 0 and draw a blue arrow every time we add a dime. One dime is the same as how many pennies?*** (Ten)

In blue, write +10 near the picture and choose a volunteer to draw the first blue arrow.

T: ***I start with zero cents and I add a dime; do I have 10¢? (Yes) Who can draw a blue arrow starting at 10?***

Call on a volunteer to do so and continue until the last blue arrow has been drawn.



T: ***That makes 50¢ again. How many dimes make a half-dollar?*** (Five) ***How many dimes make one dollar?*** (Ten) ***How do you know?***

S: ***Because 5 + 5 = 10.***

S: ***Because 2 x 5 = 10.***

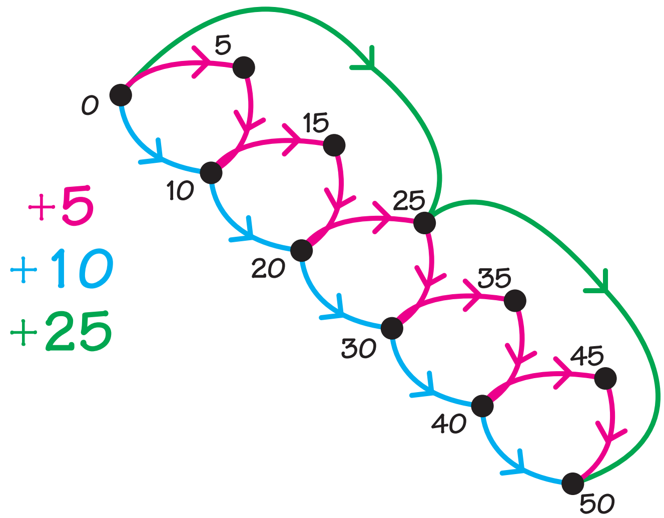
T: ***How many pennies make a quarter?*** (25) ***Yes, a quarter is 25¢. How many quarters make a half-dollar?***

Most likely, many students will be able to answer this last question. In any case, continue.

T: ***Let's begin at 0 again and draw a green arrow each time we add a quarter. How much money is a quarter?*** (25¢)

F143

In green, write +25 near the picture. Call on volunteers to draw green arrows from 0 to 25 and from 25 to 50.



T: ***How many quarter make a half-dollar?*** (Two)
How many quarters make one dollar? (Four)
How do you know?

S: ***Because 2 + 2 = 4.***

S: ***Because 2 x 2 = 4.***

Center Activity

Collect items for a pretend store. Give prices to the items and have some students be shoppers and others, clerks.

Home Activity

Suggest to parents/guardians that they let their child count change from their wallets or pockets each day for a week. Also, suggest they allow their child to pay for small items by counting out coins.

F144.1 ADDITION STORY #6

Capsule Lesson Summary

Pair numbers that are 10-friends to help find the sum of the whole numbers 1 through 10.

Materials

Teacher • Colored chalk

Student • None

Description of Lesson

Begin this lesson by determining, with the class's help, which student will have a birthday next. Then, tell the following story about the birthday student and an adult the students know well, such as the principal of your school.

T: ***Ms. Longfeld has baked a huge birthday cake for Katie's birthday. It is a special cake. Ms. Longfeld didn't write "Happy Birthday" on it; instead she wrote a special message on the top. This is what Ms. Longfeld wrote on Katie's cake.***

Write this addition problem on the chalkboard, allowing the students to comment as you write.

$$1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10 = ?$$

T: ***Ms. Longfeld says that we cannot share the cake until we solve this addition problem.***

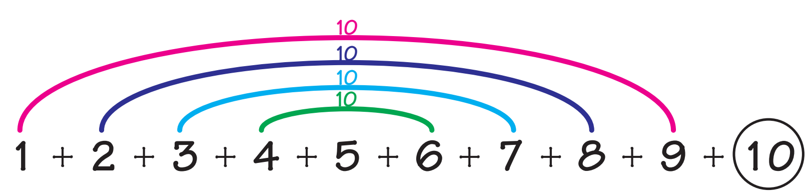
Allow some further discussion, during which some students will probably suggest using the Minicomputer. Accept this as a good suggestion but tell the students that there would be a lot of trades to make because there would be many checkers on the Minicomputer. Encourage the class to look for a quicker way to add these numbers. You may need to make the following suggestion yourself.

T: ***Here's a good idea: We could pair numbers that are 10-friends, because counting tens is easy. Among these numbers, do you see any 10-friends?***

Accept correct suggestions and draw connecting lines between two numbers that are 10-friends. For example, suppose 8 and 2 are suggested as 10-friends.

T: ***8 and 2 are 10-friends. Do you see any other 10-friends?***

Continue until your picture shows these 10-friends. (It is not necessary to use different colors, but students may enjoy and remember the rainbow effect.)



Someone might suggest that a loop be drawn at 5; it is natural that the students will view this drawing as an arrow picture. If this loop is suggested, point out that there is only one 5 in this number story, and two 5s are needed to make 10.

T: ***Let's see how many tens we have in all.***
1 + 9 = 10.

Trace the connection between 1 and 9, and write 10 on the board.

T: ***2 + 8 = 10.***

Trace the connection between 2 and 8, and write +10 next to 10 on the board.

Continue until all four connections have been traced. Point to 10 in the original problem.

T: ***Here is another 10.***
Is that everything?

S: ***No, 5 is left.***

Write + 5 = in your calculation on the board.

$$10 + 10 + 10 + 10 + 10 + 5 =$$

Many of the students may already know the answer, but solve the problem collectively before completing the number sentence.

T: ***10 + 10 = ?*** (20)
… + 10 = ? (30)
… + 10 = ? (40)
… + 10 = ? (50)
… + 5 = ? (55)

Complete the number sentence at the board and congratulate the class for solving such a long problem.

In groups you can repeat the activity using 0 through 9. Ask if the answer will be the same, more, or less. Let groups solve the problem. You may want to have calculators, counters, Unifix® cubes, or other items available.

Reading Activity

Follow the lesson with a book such as *Hippos Go Beserk* by Sandra Boynton and use the technique suggested in the lesson to find how many Hippos are at the party.

F144.2 AREA #1

Capsule Lesson Summary

Find out how many squares of a given size are required to exactly cover various shapes.

Materials

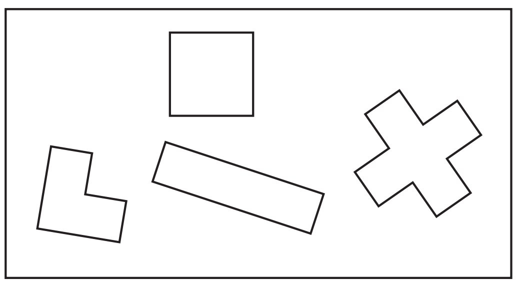
Teacher
- Five 10 cm by 10 cm cardboard squares
- *FG Poster* #6
- Colored chalk

Student
- Worksheets F144.2 * and **
- Ten Tangram squares

Advance Preparation: Cut out five squares (10 cm by 10 cm) from cardboard or heavy paper, such as construction paper.

Description of Lesson

Tape *FG Poster* #6 to the board.



Hold up one of your 10 cm by 10 cm squares and point to the on the poster.

T: ***How many of these squares will it take to cover this shape?***

Let students guess the answer and then call on a volunteer to measure the shape with one 10 cm square. When the class agrees that it takes three squares to cover the shape, demonstrate this with three of your cardboard squares and write 3 inside the on the poster.

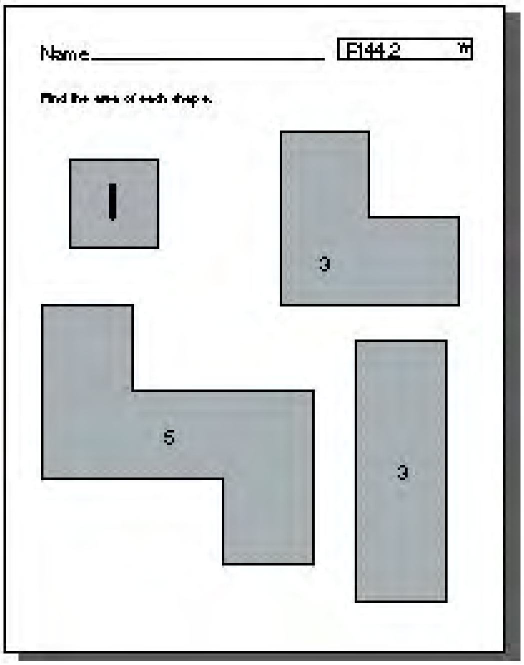
T: ***This shape has an area of three of these squares.***

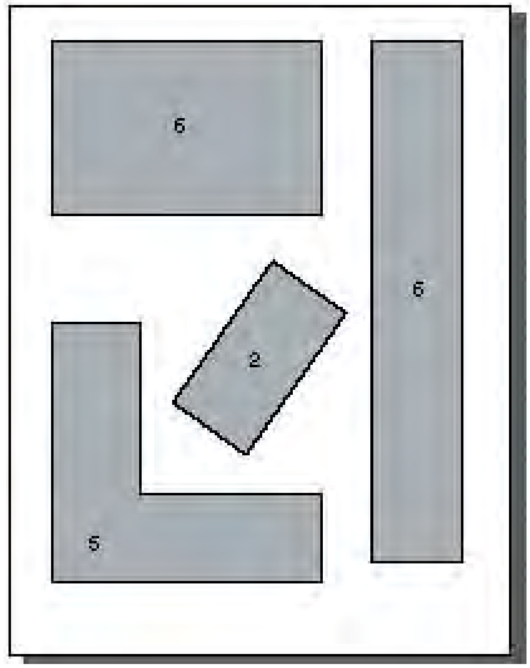
Continue in this way for the rectangle and square shapes on the poster.

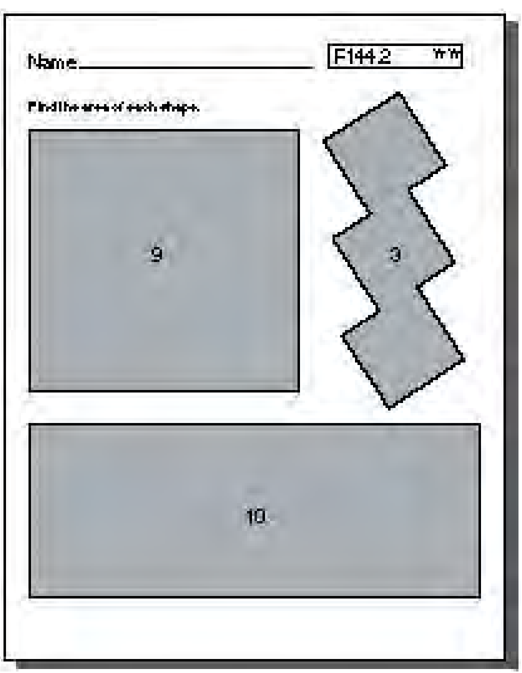
Call on a student to measure the  with one 10 cm square. Then give two students your five cardboard squares to demonstrate that five squares are needed to cover this shape. The first student, measuring with only one square, may see the area as four squares. Tell the students that it is easy to forget to measure part of a shape when only one square is used.

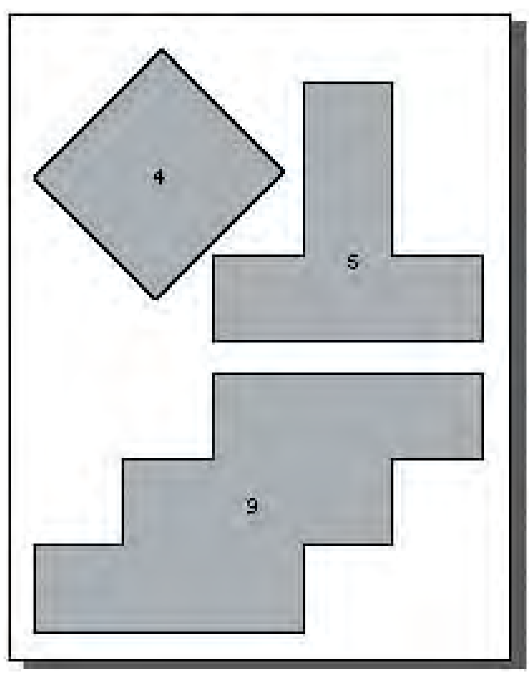
Provide each student with ten Tangram squares and a copy of Worksheet F144.2*. Instruct the students to find how many of the squares are needed to exactly cover each shape and to write the answer inside the shape. Students who have difficulty can be encouraged to actually cover each shape with Tangram squares.

Worksheet F144.2** is available for students who finish quickly.


Name
F144.2
Find the area of each shape.
1
3
5
3


6
6
2
5


Name
F144.2
Find the area of each shape.
9
3
10


4
5
9

F145.1 PLACE VALUE REVIEW

Capsule Lesson Summary

Practice reading and displaying four-digit numbers on the Minicomputer, on a calculator, with base-10 blocks, and with paper and pencil.

Materials

Teacher
- Minicomputer set
- Calculator

Student
- Minicomputer set
- Calculator
- Base-10 blocks
- Paper

Description of Lesson

This lesson should be short (about ten minutes) and brisk. Arrange groups of four students with one using a desk Minicomputer, one a calculator, one base-10 blocks, and one paper and pencil. After each number, instruct students to trade items.

Review place-value names—ones, tens, hundreds, thousands.

T: ***Show any number with a 9 in the ones place.***

Many answers are possible. Suggest students check others in their group; then ask a few students to share their number with the class. Write the number on the board as the student reads it.

Continue asking for a certain digit in the tens, hundreds, and thousands place. Then ask for several specific numbers such as 2,000; 1,400; 1,250; or 1,836.

F145.2 ADDITION ON THE MINICOMPUTER #7

Capsule Lesson Summary

Calculate 35 + 23 and 304 + 205 on the Minicomputer. Observe that these problems can be solved by adding column by column.

Materials

Teacher	• Minicomputer set	**Student**	• Paper

Description of Lesson

Display three Minicomputer boards

T: ***At a school near here, the first and second graders are going on a field trip. Of course, the bus driver needs to know how many students would be going. He was told that there will be 35 first graders and 23 second graders. Can we help him figure out how many students will be going altogether?***

Write this problem on the chalkboard and instruct students to write it on their papers.

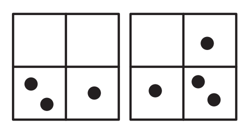
T: ***What number is 35 + 23*** (58)

$$\begin{array}{r} 35 \\ +\ 23 \\ \hline \end{array}$$

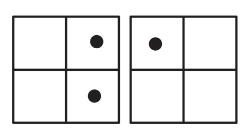
Accept several answers and record them on the chalkboard. Students who answer correctly may be asked later how they obtained this answer.

T: ***Let's do the problem on the Minicomputer.***

Ask one student to put 35 on the Minicomputer and another to add 23.



Choose students to make trades and to write the result below (above) the Minicomputer.



5 8

Then, complete the addition problem on the chalkboard while students do the same on their papers.

$$\begin{array}{r} 35 \\ +\ 23 \\ \hline 58 \end{array}$$

Ask students who knew the solution earlier to explain how they found the answer. If no one thought of adding the numbers in each column separately, present a second problem such as 46 + 23.

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Before accepting answers, however, use a folded sheet of paper to cover the tens column. Ask for the sum of 6 and 3, and write it below the ones column.

$$\begin{array}{r} 6 \\ +\ 3 \\ \hline 9 \end{array}$$

Then, cover the ones' column and ask for the sum of 4 and 2. Write the answer below the tens column.

$$\begin{array}{r} 4 \\ +\ 2 \\ \hline 6 \end{array}$$

Finally, remove the paper to reveal the entire problem.

$$\begin{array}{r} 46 \\ +\ 23 \\ \hline 69 \end{array}$$

To check this result, repeat the calculation using the Minicomputer.

Use this same procedure to solve the following problems on the board and on the Minicomputer.

$$\begin{array}{r} 51 \\ +\ 26 \\ \hline \end{array} \qquad \begin{array}{r} 304 \\ +\ 205 \\ \hline \end{array} \qquad \begin{array}{r} 128 \\ +\ 541 \\ \hline \end{array}$$

F146.1 LENGTH #3

Capsule Lesson Summary

Use hands to measure a line segment that is one meter long. Compare this measurement to those made with hands of different sizes.

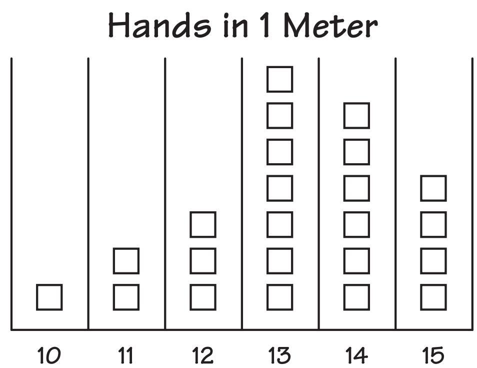
Materials

Teacher
- Meter stick
- Masking tape
- Post-it™ notes

Students
- None

Description of Lesson

Before the lesson begins, place a one meter length of masking tape on the board, on a table, or on the floor. Invite students to measure it with their hands. Demonstrate a procedure for measuring with your hands, as in Lesson F81.2. Instruct students to figure out how many of their hands it takes to make one meter. Direct them to write the number on a Post-it™ note and place it in a class graph. Include yourself in this graph.



Conduct a discussion of the graph, asking some number comparison and measurement questions such as the following:

- Which number of hands did we find most often?
- What was the most number of hands?…least?
- How many more people used 15 hands than 10?
- Why didn't we all use the same number of hands?
- Can you think of someone who might use less than 10 hands? … more than 15 hands?

Choose a person who used 11 hands and one who used 15 hands to observe the relative size of each person's hands.

T: ***Who do you think has the biggest hands in the class?***

S: ***You do.***

T: ***Where do you think my record is in the graph?***

S: ***At 10.***

T: ***Who do you think has the smallest hands in the class?***

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S: ***Charine***

T: ***Where do you think her record is in the graph?***

S: ***At 15.***

Choose a student with hand size between the biggest and the smallest. Let the class observe the hands and predict how many hands this person had in one meter.

F146.2 ELI'S MAGIC PEANUTS #4

Capsule Lesson Summary

Eli arrives home after gathering peanuts and finds that his bag contains only one peanut. Discuss what could have happened.

Materials

Teacher		Student	
	• None		• Worksheets F146.2* and ** • Checkers

Description of Lesson

You may want to let students use Minicomputer checkers to model solutions to the following problem.

T: ***Eli went out to gather peanuts again the other day and it seems that he still hasn't learned the difference between regular peanuts and magic peanuts.***

Eli gathered peanuts all day long but when he got home and opened his bag, he found only one peanut. What could he have put in his bag that day?

S: ***Regular peanuts and magic peanuts.***

T: ***How many regular peanuts and how many magic peanuts?***

Accept suggestions from the class about what Eli could have put into his bag; for example,

S: ***Six regular peanuts and five magic peanuts.***

S: ***Four regular peanuts and three magic peanuts.***

Note: Some students may suggest combinations that leave one magic peanut; for example, three regular peanuts and four magic peanuts. Such combinations are correct as well, but if none are suggested, do not force the class to consider them at this moment.

After several correct suggestions have been offered, continue.

T: ***Suppose Eli put in five regular peanuts but found only one peanut in the bag at the end of the day. How many magic peanuts could he have put into the bag?***

S: ***Four.***

T: ***Five regular peanuts and four magic peanuts would leave one peanut—a regular one. Does anyone know another possibility?***

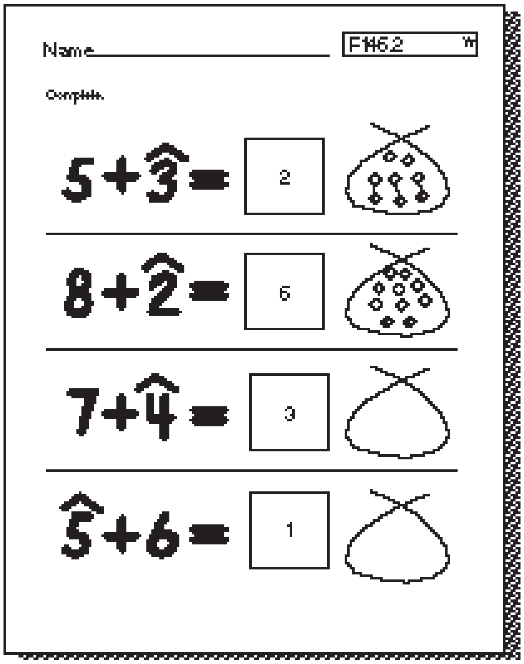
Six magic peanuts is another possible solution (leaving one magic peanut), but do not insist that the students discover this.

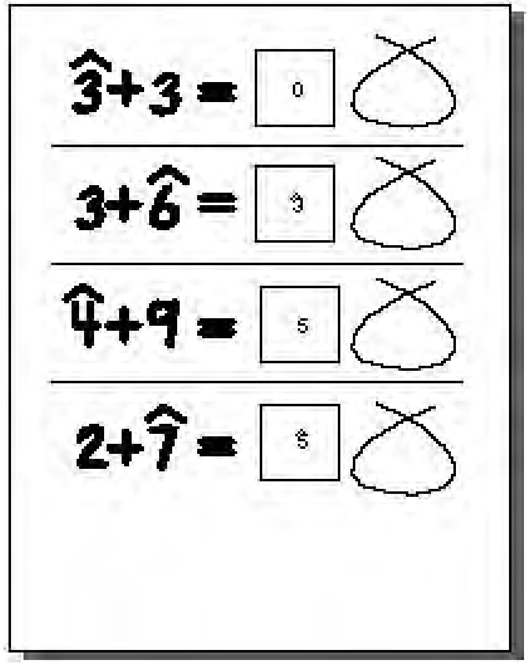
T: ***Suppose Eli put in ten magic peanuts but found only one peanut in his bag at the end of the day. How many regular peanuts could he have put into the bag?***

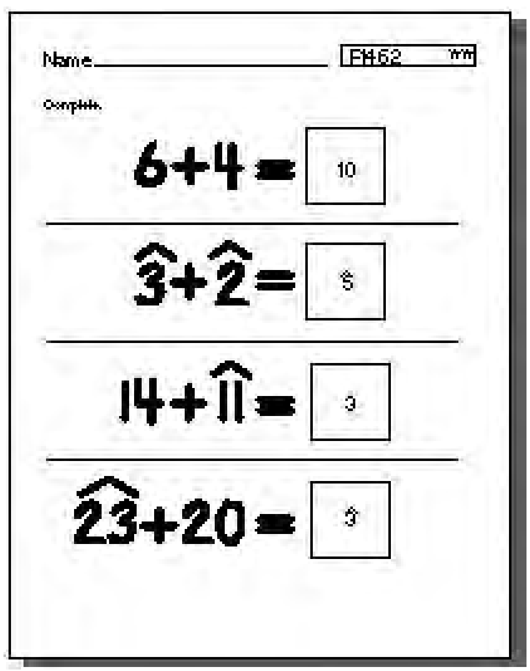
Again there are two possibilities (eleven and nine), but the class may not recognize both.

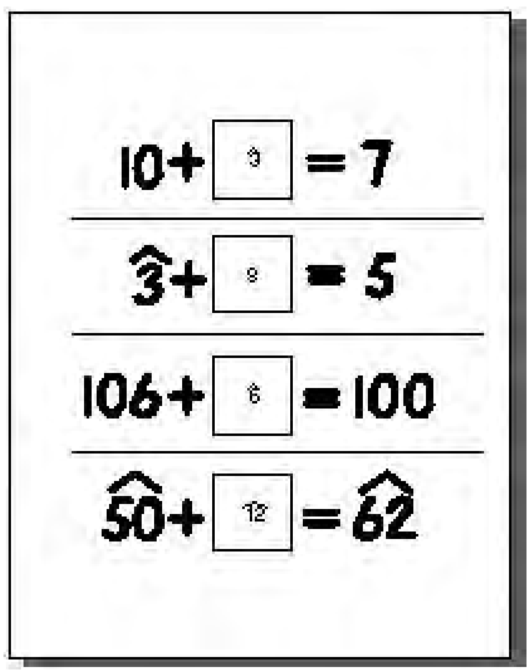
Distribute copies of Worksheet F146.2*. Explain that they contain some stories about Eli, but that part of each story is missing. The students should complete each story. Students might use checkers to help them on the worksheets.

When students complete the one-star worksheet, give them Worksheet F146.2**.









F147.1 ADDITION PATTERNS

Capsule Lesson Summary

Do mental arithmetic sequences such as:

$$2 + 4 = 6$$
$$20 + 40 = 60$$
$$21 + 40 = 61$$

Materials

Teacher	• None	Student	• Paper

Description of Lesson

This activity should be conducted briskly. Although the students will be asked to write down some of the problems, try to maintain a pace similar to that of mental arithmetic activities.

Hold up two fingers of one hand and four fingers of the other hand.

T: ***What number is 2 + 4?***

S: ***6.***

T: ***2 + 4 = 6. What number is 20 + 40?*** (60)
How do you know?

S: ***2 + 4 = 6; so 20 + 40 = 60.***

T: ***20 + 40 = 60. What number is 21 + 40?***
Write this problem on your papers and solve it.

As the students work, write the addition problem on the chalkboard.

When you observe several students with the correct answer, ask one of them to complete the addition problem on the board.

$$\begin{array}{r} 21 \\ +\ 40 \\ \hline 61 \end{array}$$

T: ***Yes, 21 + 40 = 61. How do you know?***

Allow the student to explain but be prepared to help with the verbalization. Ask if anyone used a different method and can explain it to the class.

Repeat this activity with the following sequences of calculations or similar ones more appropriate for your class.

5 + 3 =	3 + 4 =	3 + 2 =	5 + 4 =
50 + 30 =	30 + 40 =	30 + 20 =	50 + 40 =
50 + 32 =	30 + 43 =	35 + 20 =	56 + 40 =

F147.2 INDIVIDUAL MINICOMPUTER ACTIVITY #4

Capsule Lesson Summary

Do addition and subtraction calculations on individual Minicomputers.

Materials

Teacher • Minicomputer set **Student** • Minicomputer set

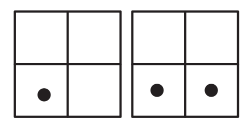
Description of Lesson

Give each student or pair of students two Minicomputer boards (one Minicomputer sheet) and several checkers. Try to keep the pace of this activity brisk, offering assistance as needed. Allow some time for the students to perform the calculation on the demonstration Minicomputer.

Exercise 1

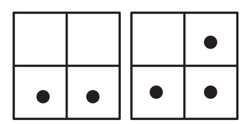
Give the instructions for this exercise verbally.

T: ***Put 23 on your Minicomputers.***



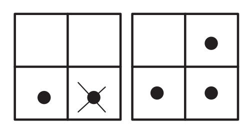
Invite a student to put 23 on the demonstration Minicomputer.

T: ***Add 14 to the number on your Minicomputers.***



Ask a student to add 14 to the number on the demonstration Minicomputer.

T: ***What number is 23 + 14*** (37)
Now, calculate* 37 – 10 *on your Minicomputers.
What number is 37 – 10? (27)



Continue the activity with the following sequence of subtraction calculations.

27 – 2
25 – 20
5 – 5

Exercise 2

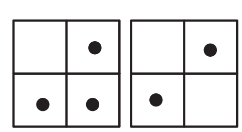
Write each calculation in this exercise horizontally on the chalkboard.

42 + 34

T: ***Calculate 42 + 34 on your Minicomputers.***

Send students to calculate 42 + 34 on the demonstration Minicomputer.

T: ***What number is 42 + 34?*** (76)



Complete the number sentence at the chalkboard. Continue the activity with this sequence of subtraction problems.

76 – 20
56 – 4
52 – 12
40 – 20 (a backward trade is needed)
20 – 20

Exercise 3

Write each calculation in this exercise vertically on the board. Ask students to predict an answer before doing the calculation on their Minicomputers, but do not record these predictions on the board.

T: ***Don't do anything on your Minicomputers yet. What is 45 + 14?***

$$\begin{array}{r} 45 \\ +\ 14 \\ \hline \end{array}$$

Allow the students to predict the answer.

T: ***Now let's do this calculation on our Minicomputers. Add 45 and 14.***

Send a student to add 45 and 14 on the demonstration Minicomputer.

T: ***What number is 45 + 14?*** (59)

Complete the addition problem on the board and then continue the activity with the following sequence of subtraction problems.

$$\begin{array}{r} 59 \\ -\ 11 \\ \hline \end{array} \qquad \begin{array}{r} 48 \\ -\ 40 \\ \hline \end{array} \qquad \begin{array}{r} 8 \\ -\ 4 \\ \hline \end{array} \qquad \begin{array}{r} 4 \\ -\ 4 \\ \hline \end{array}$$

Exercise 4

If your class remains interested, continue with this slightly more difficult exercise. Write each calculation in this exercise vertically on the board. Again ask students to predict an answer before doing the calculation on their Minicomputers.

T: ***What number is 26 + 31?***

$$\begin{array}{r} 26 \\ +\ 31 \\ \hline \end{array}$$

Allow the students to predict the answer.

T: ***Add 26 and 31 on your Minicomputers.***

Send a student to add 26 and 31 on the demonstration Minicomputer.

T: ***What number is 26 + 31?*** (57)

Compliment any students who had correctly predicted the answer and ask them to explain how they obtained it. Complete the addition problem on the board. Follow a similar method to solve the following sequence of subtraction problems.

$$\begin{array}{r} 57 \\ -\ 14 \\ \hline \end{array} \qquad \begin{array}{r} 43 \\ -\ 20 \\ \hline \end{array} \qquad \begin{array}{r} 23 \\ -\ 12 \\ \hline \end{array} \qquad \begin{array}{r} 11 \\ -\ 8 \\ \hline \end{array} \qquad \begin{array}{r} 3 \\ -\ 3 \\ \hline \end{array}$$

F148.1 IS LESS THAN RELATION #2

Capsule Lesson Summary

Draw *is less than* arrows between labeled dots. Non-standard names are given for the numbers in the picture.

Materials

Teacher	• Colored chalk	Student	• Paper • Colored pencils • Worksheet F148.1

Description of Lesson

Distribute copies of Worksheet F148.1 and copy the picture from the worksheet on the chalkboard.

T: ***What is the least number in this picture?***

Encourage students to do mental calculations to find standard names and to check the answer. The class should conclude that 1 + 1 + 1 (i.e., 3) is the least number.

T: ***What is the greatest number in this picture?***

Again, encourage mental calculations to find standard names and to check the answer. The class should conclude that 3 + 5 (i.e., 8) is the greatest number.

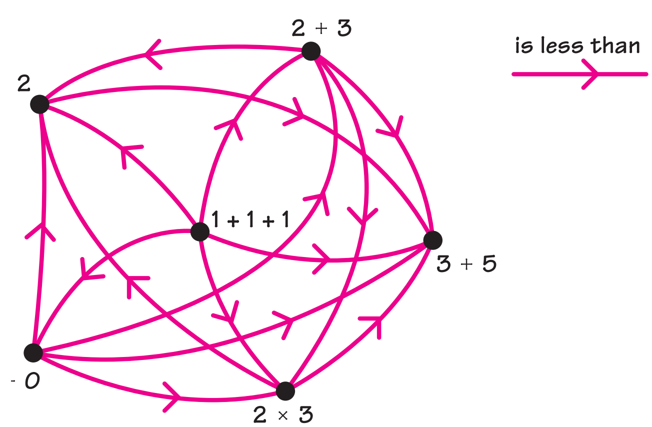
T: ***What is a red arrow for?*** (Is less than) ***Where can we draw an* is less than *arrow for ?***

With the class, decide on one arrow and draw it in the picture on the board. Be sure to read the arrow; for example, "2 + 3 is less than 3 + 5."

T: ***Now, draw as many red arrows as you can on your worksheet.***

For your reference, the completed picture is shown below.

Do not expect or insist that students draw all possible arrows. Students may want to complete number facts in the picture to help them decide where to draw an arrow.



F148.2 CALCULATOR TARGETS

Capsule Lesson Summary

Play a cooperative game with the calculator in which you start with a number on the display, and try to reach a target number. Players can press $\boxed{+}$, $\boxed{-}$, or $\boxed{\times}$ any number, followed by $\boxed{=}$, to reach the target.

Materials

Teacher	• Overhead or class calculator	**Student**	• Calculator

Description of Lesson

Use an overhead calculator or a class calculator and put 37 on the display.

T: ***37 is on the calculator and our target is 100. We are going to work together to reach the target. When you take a turn you can press å, ß, or ∂ any number you want and then ≠. Let's see how quickly we reach the target.***

Call on students one at a time. After each turn, announce where you are and repeat the target as well as the rule. For example,

T: ***Anthony pressed å ∞ ≠ . The number on the calculator is now 42 and our target is 100. The next person can press å, ß, or ∂ any number and then ≠ . Remember, we are trying to reach 100.***

Continue this activity letting different students take turns until the class gets 100 (the target) on the calculator. If appropriate, you may like to keep track of how many turns it takes and challenge the class to reach a second target in fewer steps. For example, start with 56 on the display and set 200 as the target.

If your class enjoys this activity, provide calculators and five similar target problems for the students to work on with a partner. You may challenge some students with targets such as 175 or 231.

F149.1 THREE STRINGS #2

Capsule Lesson Summary

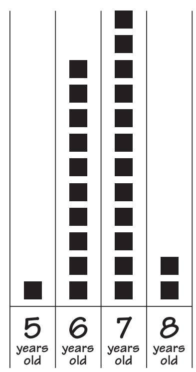
Draw a string picture in which one string is for six year olds, one string is for girls, and one string is for seven year olds. Describe children in terms of these characteristics and put dots in the picture for them. Find and hatch an empty region in the picture.

Materials

Teacher	• Colored chalk	**Student**	• None

Description of Lesson

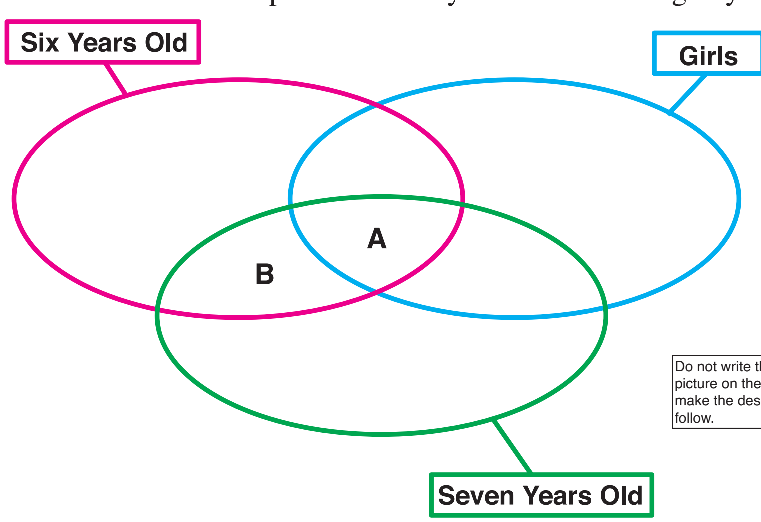
Before the lesson begins, construct an age graph about the students in the class. Each student can put a sticker for themselves in the graph, for example,



On the chalkboard, draw only the red and blue strings from the following illustration.

T: ***The red string is for all six year olds and the blue string is for all girls.***

Call on several students to show where they would draw a dot for themselves and discuss with the class whether or not each dot is placed correctly. Add a third string to your drawing.



Do not write the capital letters in your string picture on the board. They are here just to make the description of the lesson easier to follow.

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T: ***The green string is for all seven year olds.***

Point to each of the eight regions in turn and ask someone to describe who could be there (point to the regions labeled **A** and **B** last).

T (pointing to region **A**): ***Who could be here?***

S: ***A girl who is six years old and seven years old.***

S: ***You can't be six and seven.***

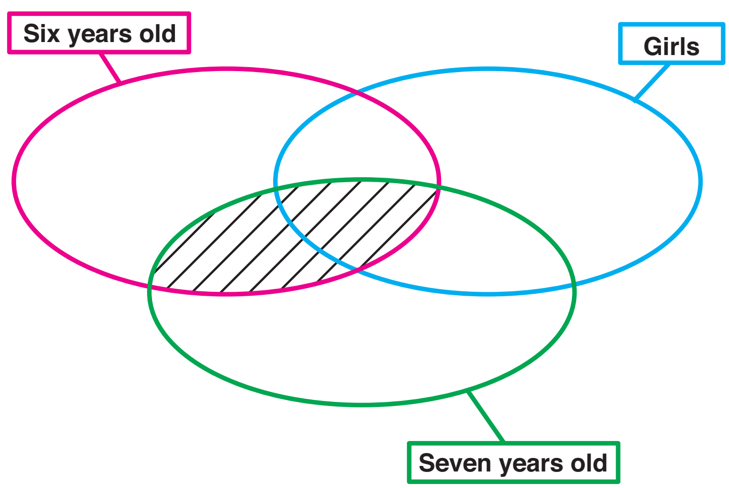
S: ***No one can go there!***

T (pointing to region **B**)***: Who could be here?***

S: ***No one can go there, either.***

T: ***How can we show that nothing can go here (A) or here (B)?***

You may need to remind the class that hatching is used to show a region is empty. Ask a volunteer to add the hatching to the string picture.



T: ***I'm thinking of a child and I would like you to draw a dot for that child in our picture. You may ask me questions about the child, but I will answer only "yes" or "no."***

Answer questions about the child until the class has enough information to place the dot; then ask someone to draw it in the string picture.

Repeat this activity several times, perhaps allowing a student to think of someone and answer questions (in this case, suggest the student describe the child to you first so you can check the student's answers to questions).

You can also point to one of the stickers in the age graph and ask where to draw a dot for that child. The students should realize they need further to determine whether the sticker was placed by a boy or a girl.

F149.2 FROGS IN A POND #2

Capsule Lesson Summary

Find common multiples of 6 and 4 in the context of a story. Two frogs start at the first of a long line of lily pads. The large frog jumps six pads at a time; the small frog jumps four pads at a time. Determine on which pads they will meet.

Materials

Teacher
- Colored chalk

Student
- Worksheet F149.2
- Colored pencils
- Desk number line
- Frog pictures or counters (optional)

Description of Lesson

Note: This activity may be done either with students using their desk number lines and pictures of frogs (or frog counters), or with dots drawn on chart paper on the floor and students acting out the frog jumps. See Lesson F122.2 for other suggestions.

T: ***Several weeks ago we talked about two frogs who lived in a big pond; they hopped on numbered lily pads which stretched from the shore far out into the middle of the pond.***

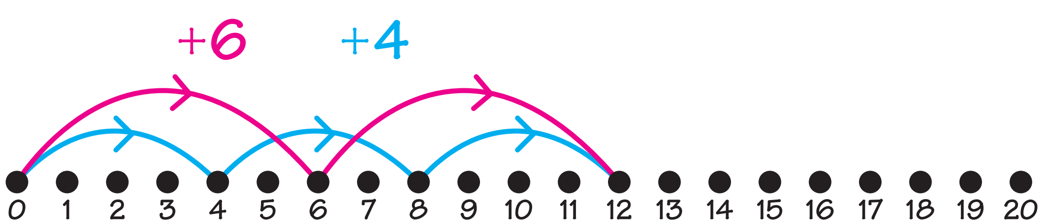
Draw this picture on the board.

T: ***The lily pad 0 is next to the shore and the pads go on and on; I've only drawn some of them. Both frogs have grown a little since we last saw them. The big frog now hops six pads at a time, while the little one hops four pads at a time.***

Near your picture, write +6 (in red) and +4 (in blue).

T: ***They are both sitting at 0 and are going to hop out toward the middle of the pond. What do you think is the number of a lily pad they will both land on so they can eat lunch together?***

Accept several guesses and then ask students to draw red and blue arrows for the frogs' hops. Direct this activity toward finding a meeting place for the frogs. For example, the students might first draw a blue arrow (from 0 to 4), then a red arrow (from 0 to 6), then another blue arrow (from 4 to 8), then another red arrow (from 6 to 12), and finally a blue arrow (from 8 to 12).



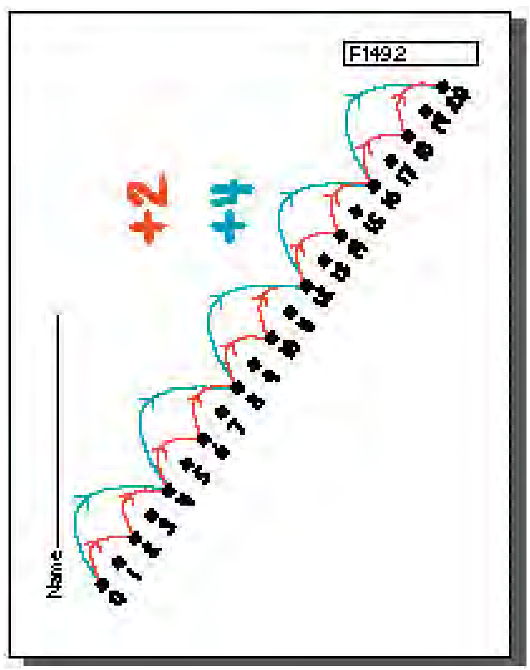
Compliment students who predicted this answer and ask for an explanation.

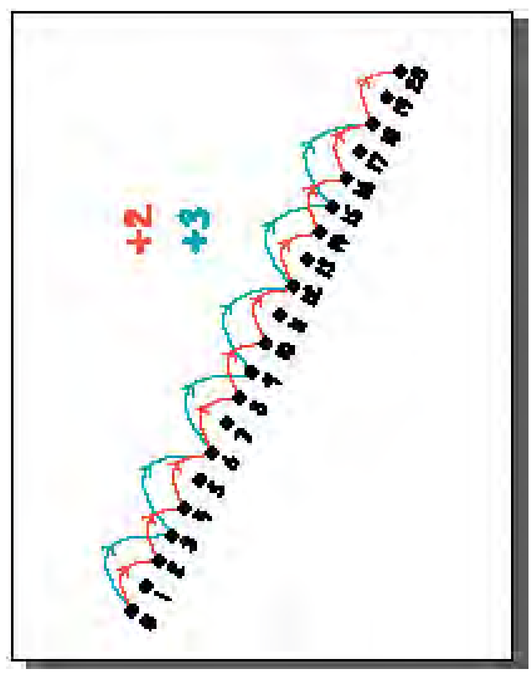
T: ***Suppose the frogs decide to go farther out into the pond … where do you think they will meet next?*** (At 24)

You may wish to ask the class for the number of the frogs' third meeting place. (36)

Distribute copies of Worksheet F149.2. Explain that on the front side of this worksheet, one frog hops two pads at a time and the other frog hops four pads at a time. After showing the frogs' hops (with arrows), the students should circle the pads on which the frogs could meet. Similar instructions apply for the reverse side of the worksheet, except here one frog hops two pads at a time and the other frog hops three pads at a time.

Ask students who finish quickly to list other pads where the frogs could meet, if they continue to hop farther out into the pond.





F150 ADJUSTMENT/ASSESSMENT DAY #14

Note: See Section One, page 1-9, for a full explanation of the purpose of scheduled adjustment days. Worksheet F150 provides for a short, written assessment.

On this day you may wish to repeat an earlier lesson either for a small group of students or for the entire class. Many of the lessons can be made to appear completely different by changing the story and/or the numbers in the lesson. If you omitted exercises or worksheets from an earlier lesson, you may wish to include these. This is also a good time to allow students to work in a center or on a project of your choice.

If your students need more opportunities to compare the values of different coins, F143 *Arrow Road for Money* would be a good lesson to modify and repeat.

To reinforce the students' growing understanding of division, you may wish to modify the story situation in Lesson F139.2 *Story Problem #3* to be a sharing problem and then repeat that lesson.

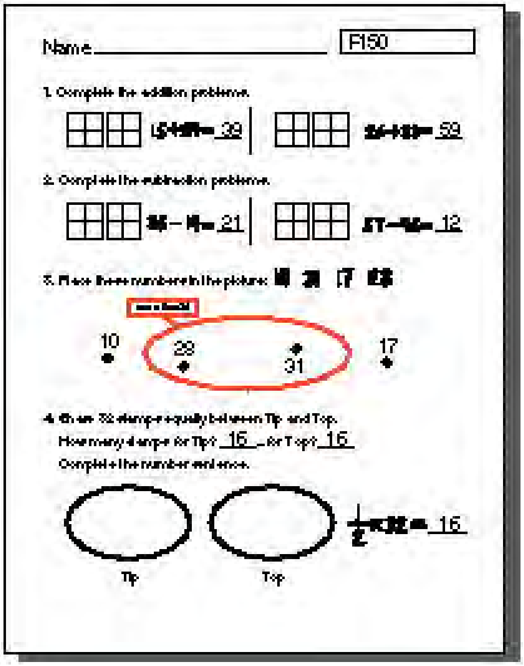
If your class is experiencing little difficulty with the *CSMP* curriculum, you may wish to omit this adjustment day and continue immediately with F151.1 *$^1/_2$ x on the Minicomputer #2*.

Early Warning

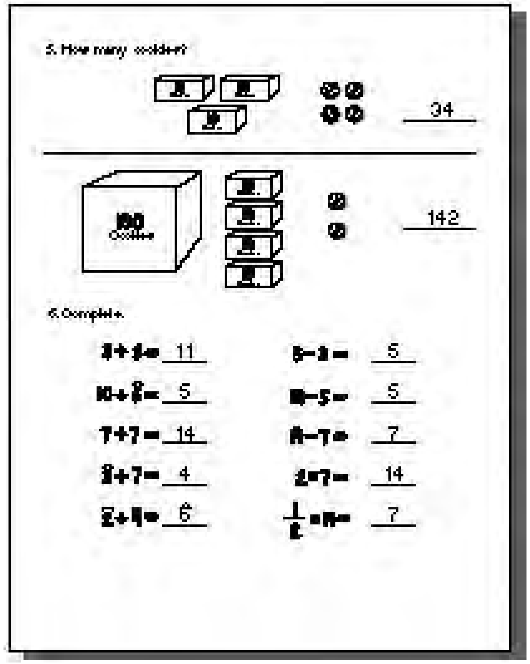
Among the next nine classroom lessons are some that require extra preparation time or make use of materials not included with the *CSMP* Classroom Set. The lessons are listed here for your convenience in preparing for them. A more detailed description of the materials can be found on the first page of each lesson. (Special materials are listed here only once, even if they are needed more often in the nine-day period.)

F156.1 *Mystery Arrows*: Counters
F156.2 *Area #2*: Gridboard; five paper squares; color tiles
F157.1 *Combinatorics with Three Digits #2*: Numeral cards
F159 *Number Cubes Coloring Game*: Dice or number cubes; game sheet
F160.2 *Transforming a Number #2*: Index cards

F150



Name
F150
1. Complete the addition problems.
39
59
2. Complete the subtraction problems.
21
12
3. Place these numbers in the picture:
10
29
31
17
4. Share 32 stamps equally between Tip and Top.
How many stamps for Tip? 16 for Top? 16
Complete the number sentence.
16
Tip
Top



5. How many cookies?
34
100 Cookies
142
6. Complete.
11
5
5
5
14
7
4
14
6
7

F151.1 $\frac{1}{2}$x ON THE MINICOMPUTER #2

Capsule Lesson Summary

Decide how a farmer can share his animals equally between his two children.

Materials

Teacher • Minicomputer set

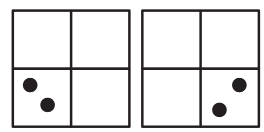
Student • Minicomputer set

Description of Lesson

You may like to pair students and give each pair a desk Minicomputer. Students then can follow the class activity on their individual Minicomputers.

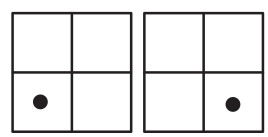
T: ***There was once a farmer who was getting ready to retire; he decided he didn't want to run the farm anymore. He had two children and wanted to give half of his animals to each child. Let me show you how many cows he had.***

Put this configuration on the Minicomputer.



T: ***How many cows?*** (42)
Who can take away half of the cows?

Choose a volunteer to take away half of 42. The student should remove one checker from the 20-square and one checker from the 1-square. If any other checkers are removed, ask how many cows are left and how many were removed; this should lead the class to see that the cows were not shared equally.



T: ***How many cows did each child receive?***

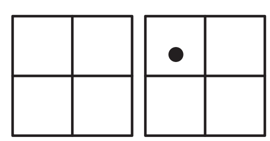
S: ***21.***

Write a number sentence for this on the chalkboard.

$\frac{1}{2} \times 42 = 21$

T: ***The farmer also had eight horses to share between his two children.***

Put this new number on the Minicomputer.

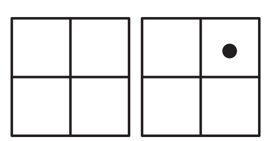


T: ***Who would like to take away half of the horses?***

S: ***We can't; there aren't two checkers.***

S: ***We need to make a backward trade.***

Invite a student to make the 8 = 4 + 4 trade, and call on another student to take away half of 8.



T: ***How many horses did each child receive?***

S: ***Four.***

Write the corresponding number sentence on the chalkboard.

$\frac{1}{2} \times 8 = 4$

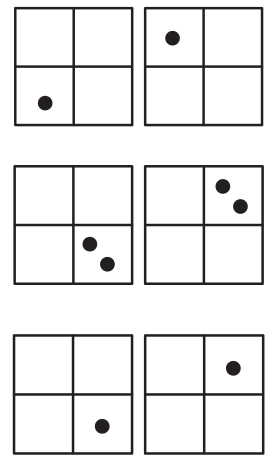
F151

T: ***The farmer also had 28 pigs. If each of his two children were to get half of them, how many pigs would each child get?*** (14)

This time, write the problem on the chalkboard first.

$\frac{1}{2} \times 28 =$

Accept guesses from the class and record them on the board. Then call on a student to put 28 on the Minicomputer.



T: ***Who can take away half of the 28 pigs?***

S: ***We need to make some backward trades first.***

T: ***Can anyone take away half of the pigs now?***

Choose a volunteer to do so.

T: ***How many pigs did each child get?***

S: ***14.***

Complete the number sentence at the chalkboard.

$\frac{1}{2} \times 28 = 14$

If any student gave this answer earlier, ask for an explanation. A good explanation would be something like "$\frac{1}{2}$ x 20 = 10 and $\frac{1}{2}$ x 8 = 4, so $\frac{1}{2}$ x 28 = 14." Do not be concerned, however, if this explanation is not offered or is not well-phrased.

Repeat this process to share 242 chickens. First, write the problem ($\frac{1}{2}$ x 242 =), then ask for guesses, and finally solve the problem on the Minicomputer. Once again, encourage students who guess correctly to explain later how they obtained their answer.

F151.2 THE FUNCTIONS 2x AND $\frac{1}{2}$x #3

Capsule Lesson Summary

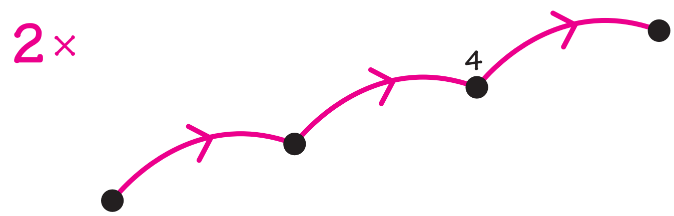
Draw return arrows and label dots in several 2x arrow roads in which the position of a given number varies.

Materials

Teacher	• Colored chalk	Student	• None

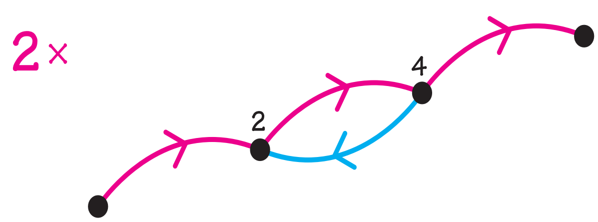
Description of Lesson

Draw this arrow picture near the top of the chalkboard.



T: ***What are these red arrow for?*** (2x)
Which other numbers are in this arrow picture? (1, 2, 8)

Ask students who answer correctly to label the appropriate dots and explain. For example, the student who says that 2 is in the picture might explain that 2 x 2 = 4. Also emphasize that going from 4 to 2 is against the red arrow and draw a blue arrow from 4 to 2.



T: ***What could this blue arrow be for?***

S: ***–2.***

T: ***Yes, it could be for –2 because 4 – 2 = 2; but here this blue arrow is for something different. What else could this blue arrow be for?***

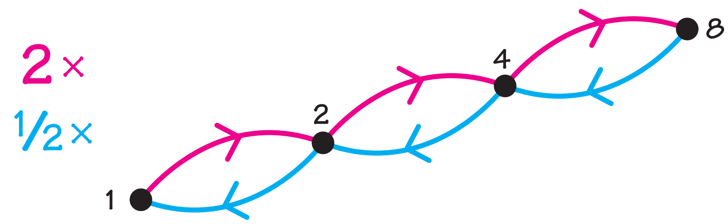
S: ***$\frac{1}{2}$x*** (read as "one-half of")***.***

If necessary, suggest this yourself. In any case, write $\frac{1}{2}$x in blue near the arrow picture. Trace the appropriate arrows as you review the picture.

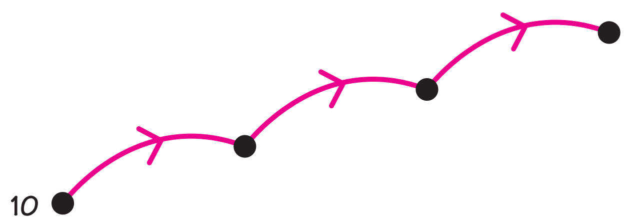
T: ***Yes, 2 x 2 = 4 and $\frac{1}{2}$ x 4 = 2.***

F151

When all the dots have been labeled, ask the class to find where other $\frac{1}{2}$x arrows can be drawn. Continue until the arrow picture is complete.



Below the first arrow picture, draw a second one (with its dots directly below the dots in the first one).



Allow some time for the students to comment on this arrow picture.

T: ***How many people do we need to show ten fingers?***

S: ***One.***

Ask one student to stand and hold up ten fingers. Trace the arrow starting at 10.

T: ***2 x 10. We want to calculate 2 x 10 so we need another ten fingers.***

Ask another student to stand and hold up ten fingers.

T: ***Now we have ten fingers twice (i.e., 2 x 10 fingers). Who would like to count these fingers by tens for us?***

S: ***10; 20.***

T: ***10 + 10 = 20; 2 x 10 = 20.***

Ask a volunteer to label the dot for 20; then trace the arrow starting at 20.

T: ***2 x 20 = …? We have the 20 fingers that we just counted. We want to calculate 2 x 20 so we need another 20 fingers. How many more students do we need to show 20 more fingers?***

S: ***Two more.***

Ask two more volunteers to stand together beside the first two students, and to hold up their fingers.

T: ***Now we have 2 x 20 fingers.***
Who would like to count these fingers by tens for us?

S: ***10; 20; 30; 40.***

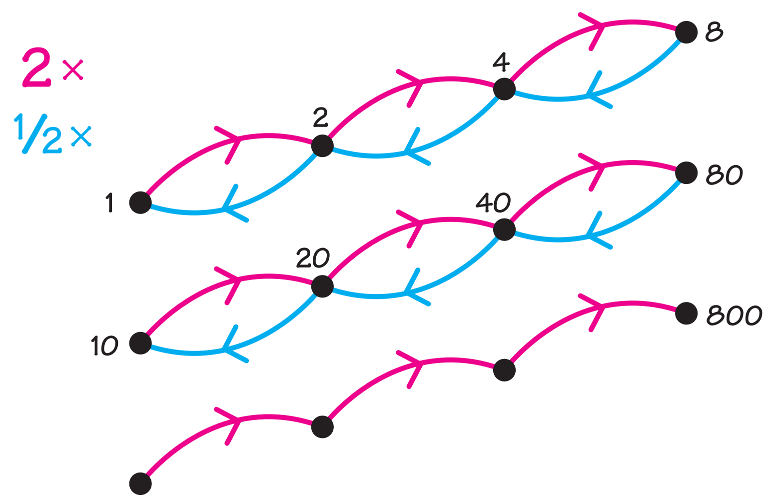
T: ***20 + 20 = 40; 2 x 20 = 40.***

Ask a volunteer to label the dot for 40. Proceed, in a similar manner, to calculate 2 x 40.

T: ***Can we draw some $^1\!/_2$x arrows now?***

As each arrow is drawn, ask the volunteer to tell the corresponding number fact. Continue until the arrow picture is complete.

Draw a third arrow picture below the first two, aligning the dots as much as possible.



Allow the students to comment on the arrow picture. Compliment any student who notices that 8, 80, and 800 are in similar positions.

Point to the dot which precedes the dot for 800.

T: ***We'd like to label this dot. Does anyone have a suggestion?***

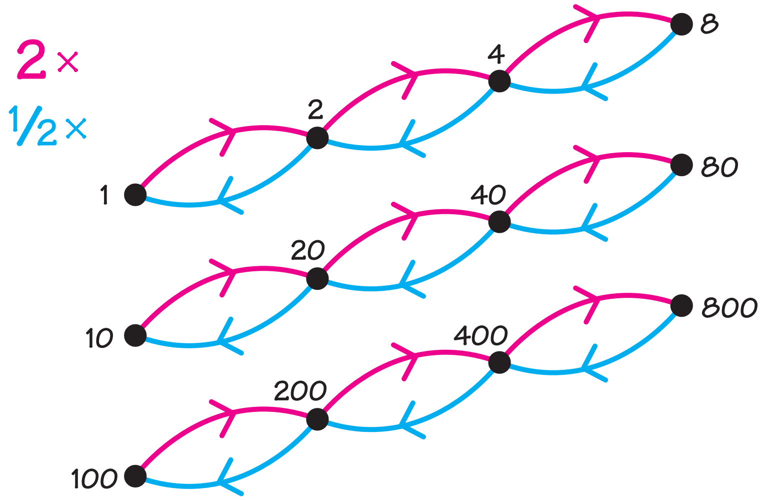
Perhaps a student will suggest drawing a return arrow (for $^1\!/_2$x) from 800 to this dot; but if necessary, suggest this yourself.

Continue until all of the $^1\!/_2$x arrows have been drawn.

T: ***Now, let's follow these blue arrows to label all of the dots. Who can label a dot?***

As each dot is labeled, tell the appropriate number facts yourself. When the dot for 400 is labeled, for example, the appropriate number sentences are $^1\!/_2$ x 800 = 400 and 2 x 400 = 800. Continue in this manner until the arrow picture is complete.

F151



T: ***Do you see any patterns in this arrow picture?***

Encourage the class to recognize that the four numbers in the second and third arrow pictures are each ten times greater than the corresponding number in the arrow picture above it.

F152.1 ELI IS TRICKED

Capsule Lesson Summary

Clarence the Crafty Crocodile plays a trick on Eli while Eli is sleeping; Eli awakes to find some of his peanuts missing. Discuss what Clarence could have done.

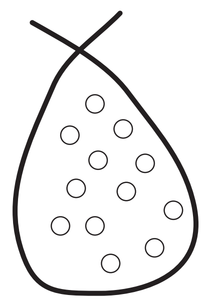
Materials

Teacher	• None	Student	• None

Description of Lesson

T: ***One day Eli was walking in the jungle and carrying twelve regular peanuts in his bag.***

On the board, draw Eli's bag of peanuts.



T: ***Eli walked a long time and became very tired, so he decided to take a nap. As soon as he fell asleep, along came Clarence the Crafty Crocodile. Clarence saw that Eli was asleep and decided to play a trick on him. He opened Eli's bag and did something sneaky, but I won't tell you what. He closed Eli's bag and quietly went away.***

When Eli awoke, he was hungry and opened his bag. He counted his peanuts and discovered that he had only eight regular peanuts. How many peanuts were missing?

S: ***Four.***

T: ***Yes, four peanuts were missing. What do you think Clarence did?***

Allow some time for discussion of this problem. Two possible explanations should emerge, one of which involves taking away some peanuts.

S: ***Clarence took four peanuts out of Eli's bag.***

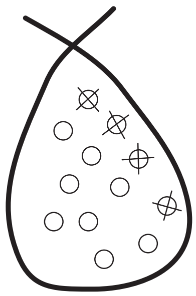
On your picture, cross out four peanuts and write the subtraction calculation below the bag.

A second possibility involves adding some magic peanuts.

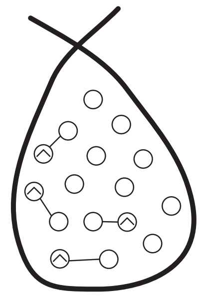
S: ***Clarence put four magic peanuts into Eli's bag.***

Draw a second bag of peanuts (beside the first one). Draw the four magic peanuts, and pair magic peanuts with regular peanuts. Write the addition calculation below the bag.

F152



$12 - 4$



$12 + \widehat{4}$

Some students may suggest more complicated possibilities, for example, that Clarence took out three regular peanuts and put in one magic peanut. Compliment any student who suggests such a combination, but do not bother to draw another picture.

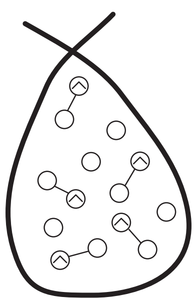
T: ***Even if Eli knew about magic peanuts, could he tell which of these things Clarence did: put in four magic peanuts or take out four regular peanuts?***

S: ***No.***

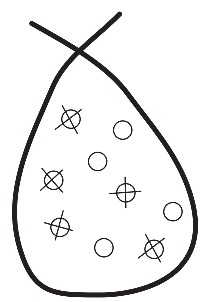
T: ***That's right, both tricks leave the same number of regular peanuts.***

Complete this equality on the board. $12 - 4 = 12 + \widehat{4} = 8$

Tell a similar story about another day when Eli fell asleep with nine regular peanuts and awoke to find only four regular peanuts. For your reference, two pictures and the resulting equality are illustrated below.



$9 + \widehat{5}$



$9 - 5$

$$9 + \widehat{5} = 9 - 5 = 4$$

F152.2 PARADE OF PROBLEMS #3 LESSON ONE

Capsule Lesson Summary

Provide individual practice with the Minicomputer, arrow pictures, counting problems, string pictures, and so on.

Materials

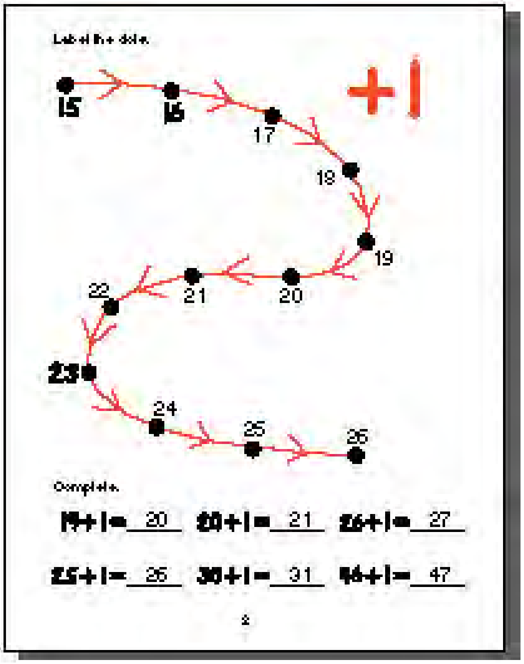
Teacher		Student	
	• None		• *Parade of Problems #3* Workbook • Colored pencils

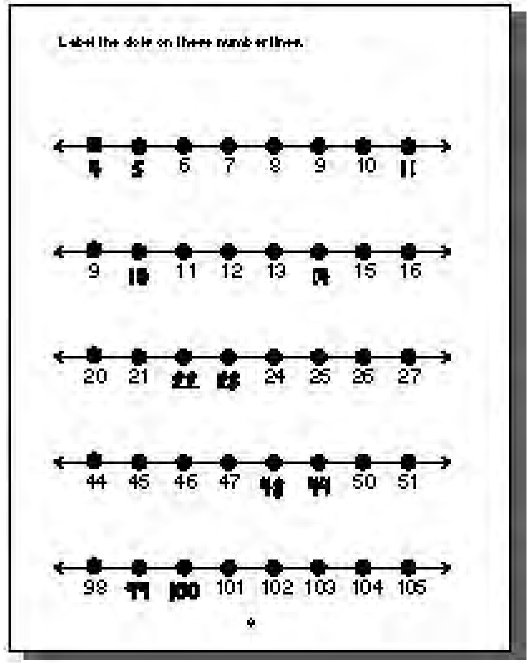
Description of Lesson

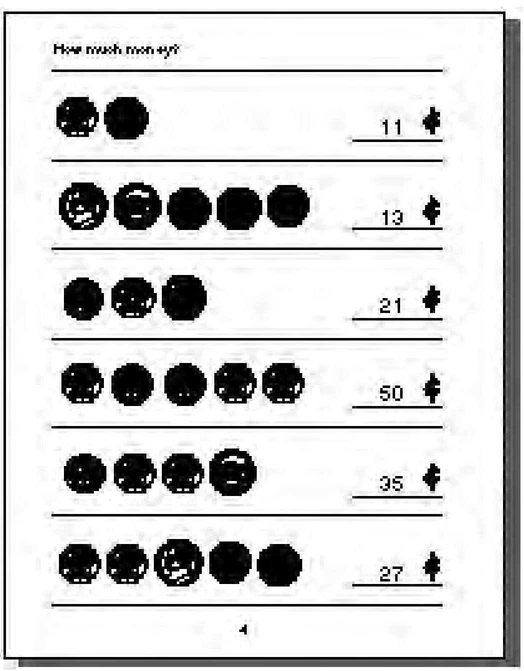
Distribute copies of the workbook *Parade of Problems #3* and allow students to work at their own rate. Circulate among the students to give individual help where it is needed. Encourage the students to work carefully and to check their work.

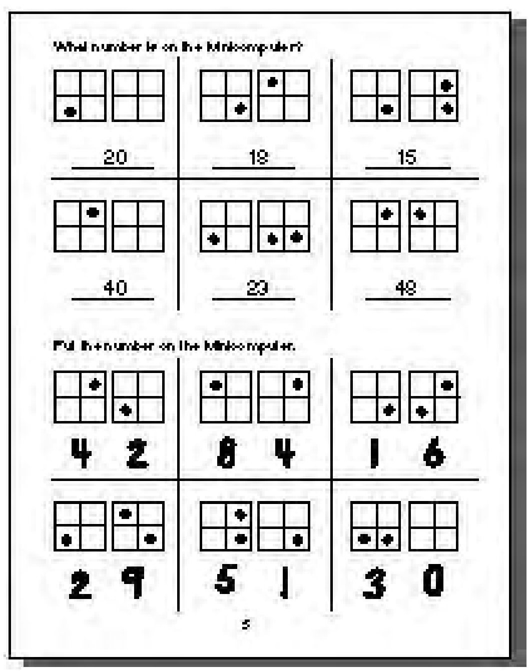
Allow about twenty minutes for this independent work. Because the pages of the workbook increase in difficulty, some students will naturally complete more pages than others. Still, there should be enough exercises so that even your brightest students remain challenged.

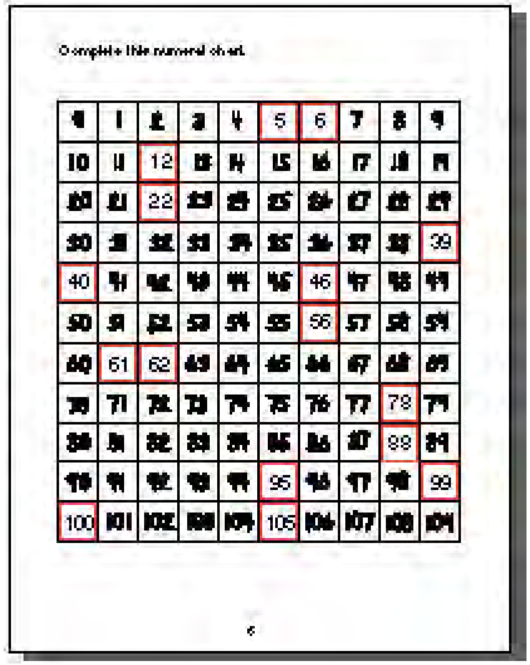
A second lesson is scheduled for this workbook. When the period is over, collect the workbooks for your review. On the workbook cover, you may like to indicate which pages are complete and which pages need some corrections by students when the workbooks are used again (Lesson F158.2).

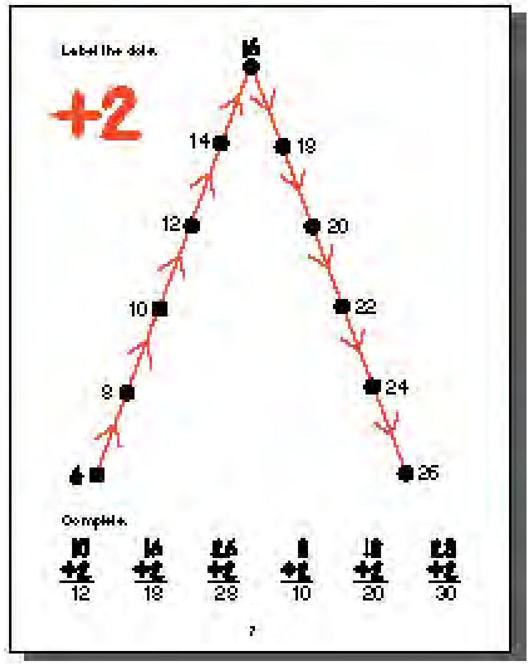

Label the dots.
+1
15 16 17 18 19 20 21 22 23 24 25 26
Complete.
19+1= 20
20+1= 21
26+1= 27
25+1= 26
30+1= 31
46+1= 47
2

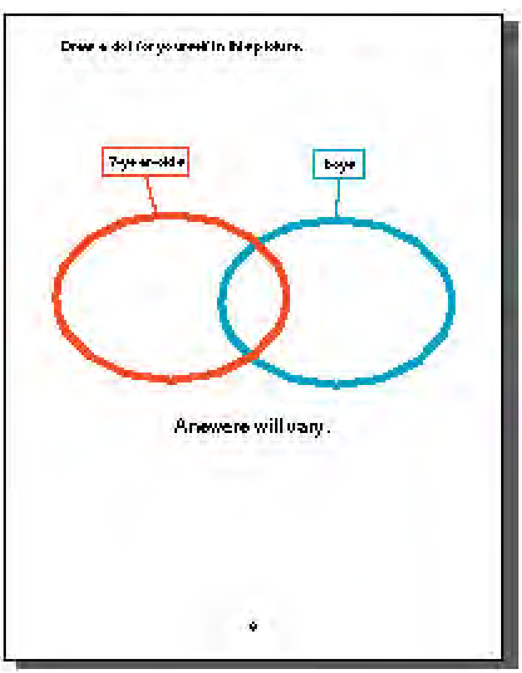

Label the dots on these number lines.
4 5 6 7 8 9 10 11
9 10 11 12 13 14 15 16
20 21 22 23 24 25 26 27
44 45 46 47 48 49 50 51
98 99 100 101 102 103 104 105
3

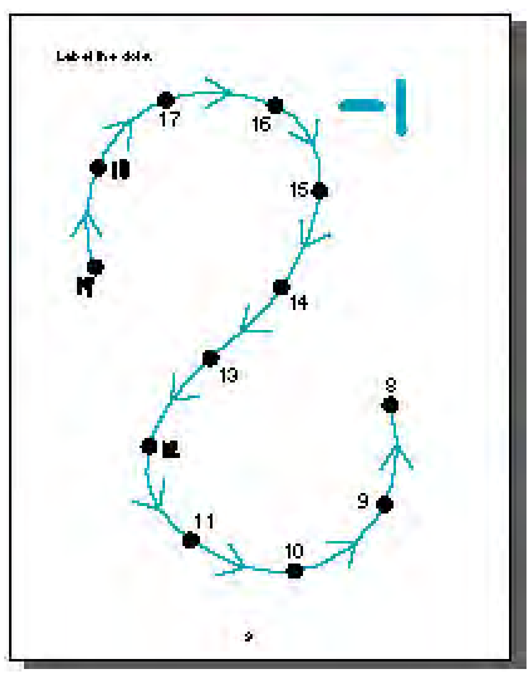

How much money?
11 ¢
13 ¢
21 ¢
50 ¢
35 ¢
27 ¢
4

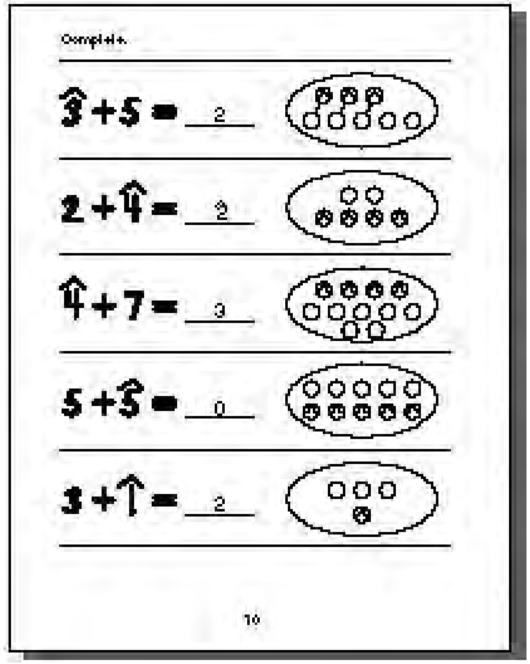

What number is on the Minicomputer?
20
18
15
40
23
48
Put the number on the Minicomputer.
4 2
8 4
1 6
2 9
5 1
3 0
5

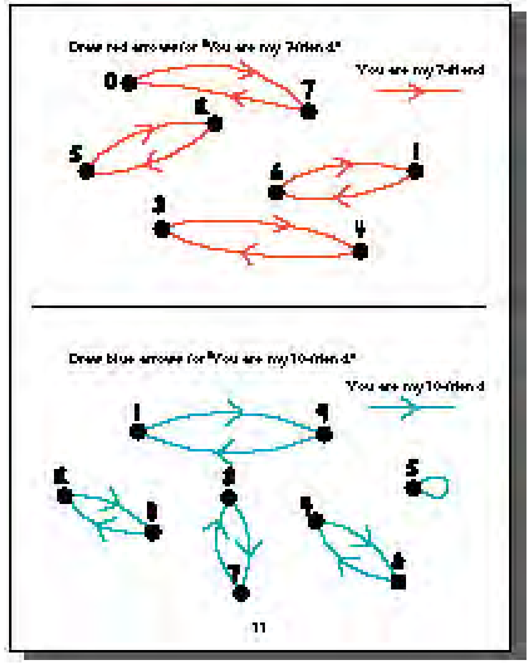

Complete this numeral chart.
5
6
12
22
39
40
46
56
61
62
78
88
95
99
100
105

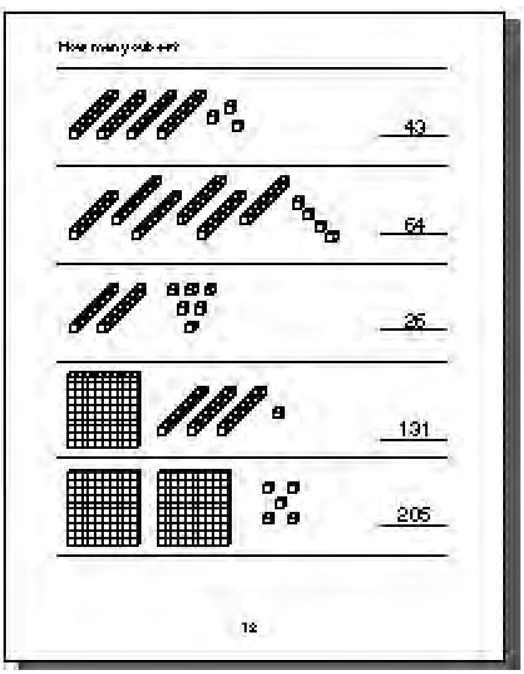

Label the dots.
+2
14
18
12
20
10
22
8
24
26
Complete.
12
18
28
10
20
30

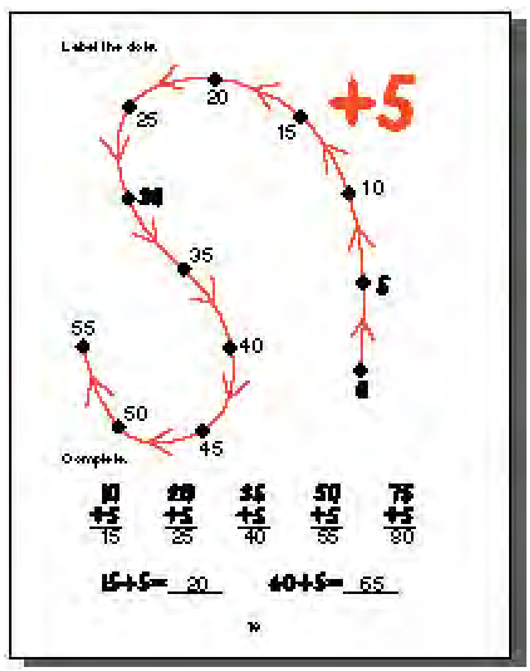

Draw a dot for yourself in this picture.
7-year-olds
boys
Answers will vary.

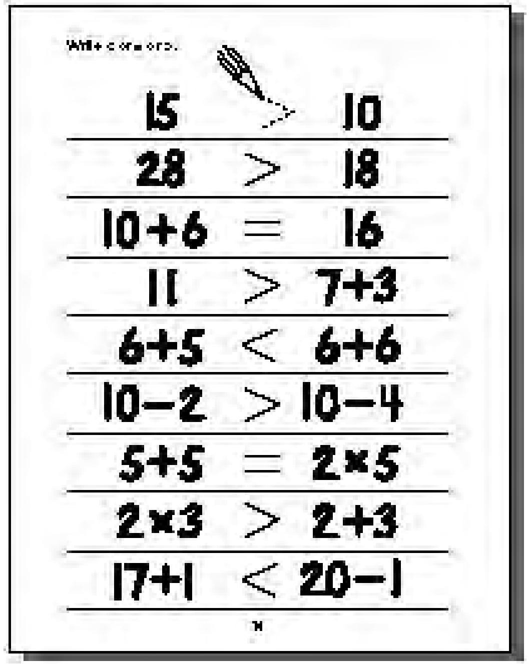

Label the dots.
−1
17
16
15
14
13
11
10
9
8


Complete.
3 + 5 = 2
2 + 4 = 2
4 + 7 = 3
5 + 5 = 0
3 + 1 = 2
10


Draw red arrows for "You are my 7-friend."
You are my 7-friend
Draw blue arrows for "You are my 10-friend."
You are my 10-friend
11

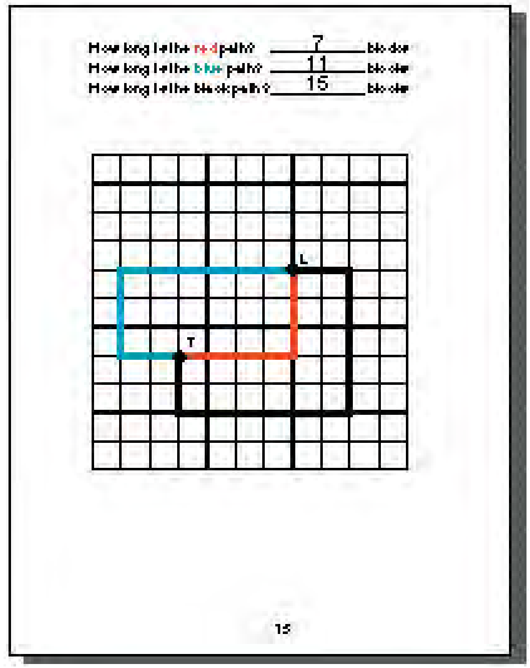

How many cubes?
43
64
26
131
205
12


Label the dots.
+5
20
25
15
10
35
40
55
50
45
Complete.
10 +5 15
20 +5 25
35 +5 40
50 +5 55
75 +5 80
15+5= 20
60+5= 65
13

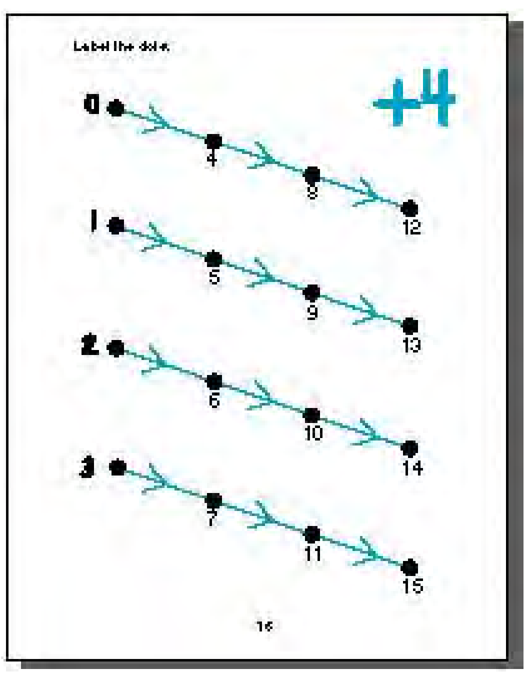

Write <, > or =.

15	>	10
28	>	18
10+6	=	16
11	>	7+3
6+5	<	6+6
10−2	>	10−4
5+5	=	2×5
2×3	>	2+3
17+1	<	20−1

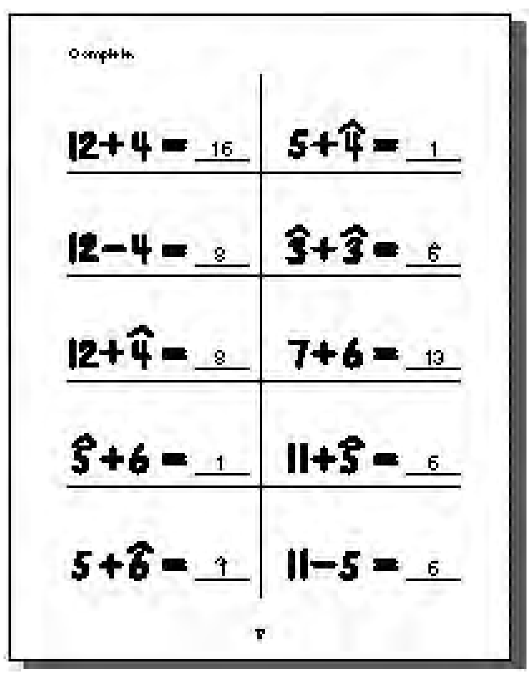
14


How long is the red path? 7 blocks
How long is the blue path? 11 blocks
How long is the black path? 15 blocks

15

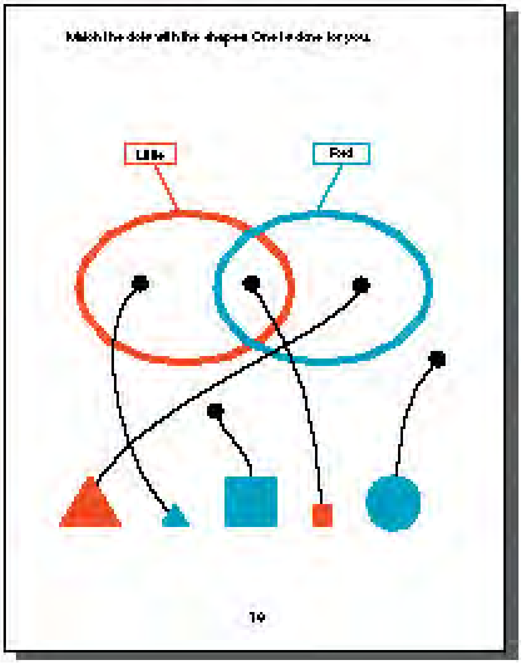

Label the dots.

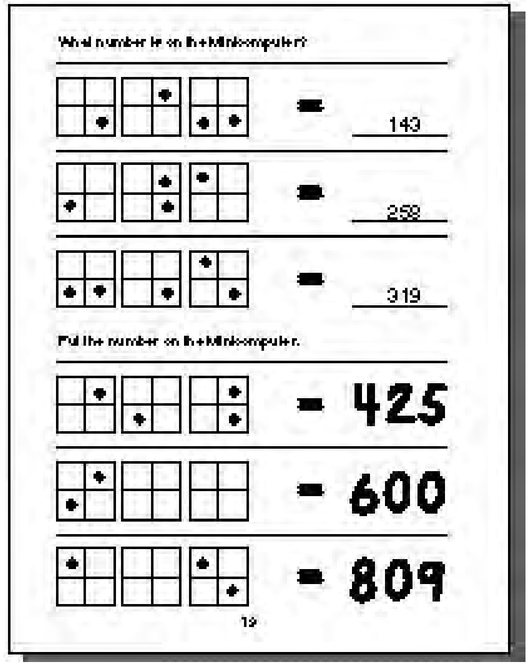
16

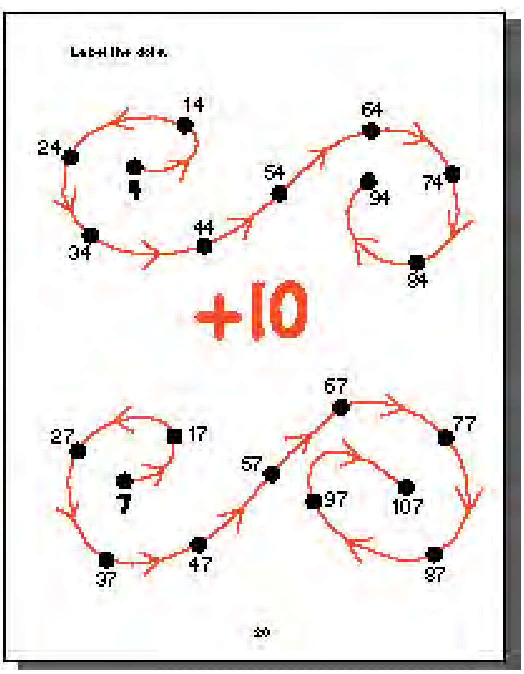

Complete.

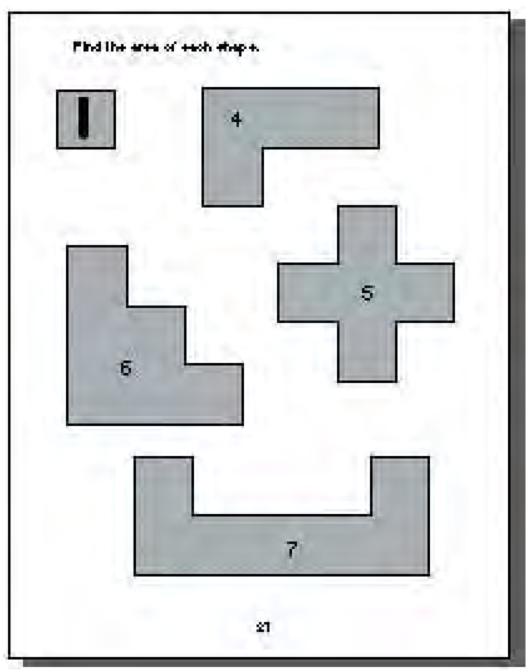
12+4 = 16	$5+\hat{4}$ = 1
12−4 = 8	$\hat{3}+\hat{3}$ = 6
$12+\hat{4}$ = 8	7+6 = 13
$\hat{5}+6$ = 1	$11+\hat{5}$ = 6
$5+\hat{6}$ = 1	11−5 = 6

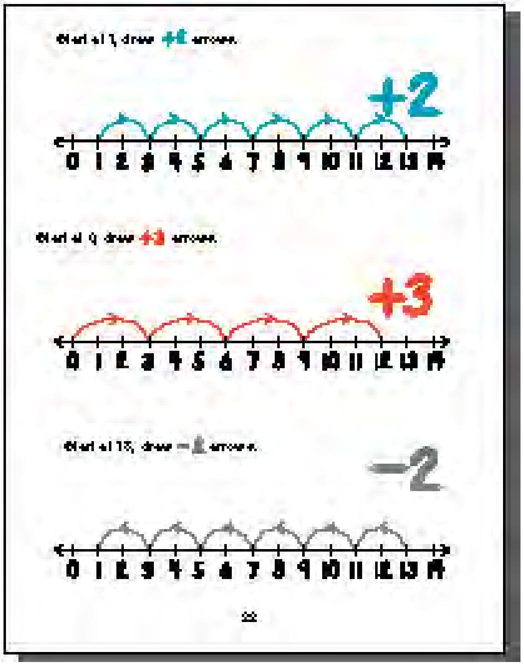
17

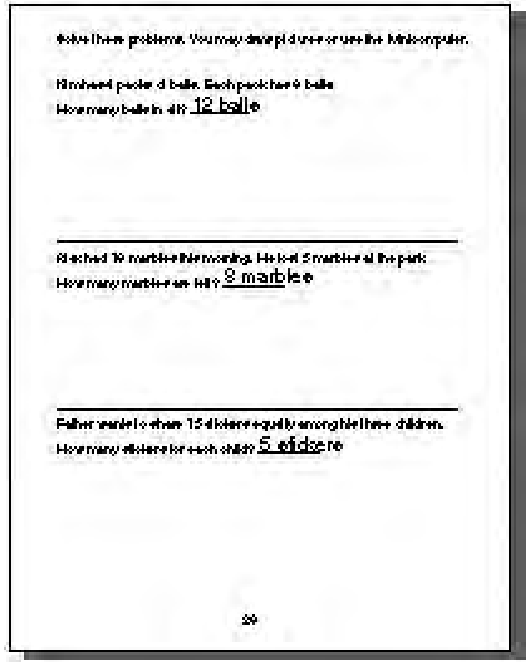

Match the dots with the shapes. One is done for you.
Little
Red
19

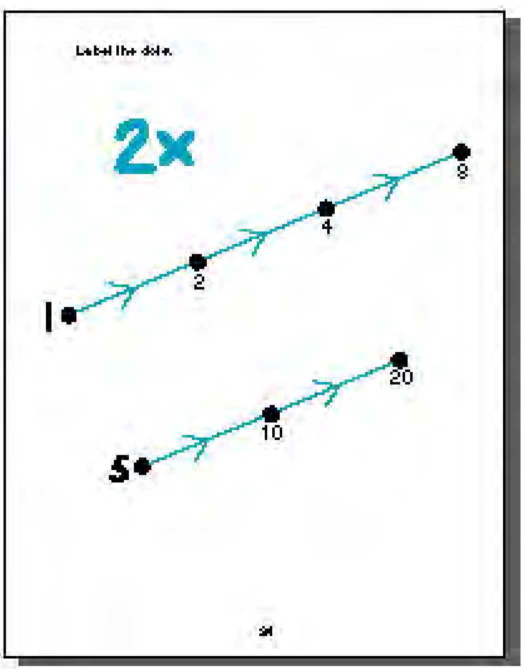

What number is on the Minicomputer?
143
258
319
Put the number on the Minicomputer.
425
600
809
19

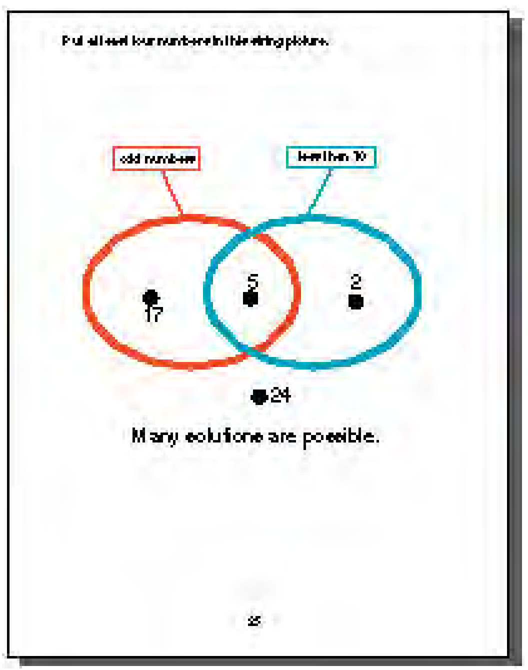

Label the dots.
14
24
4
54
64
74
94
34
44
84
+10
67
27
17
77
7
57
97
107
37
47
87
20


Find the area of each shape.
1
4
5
6
7
21

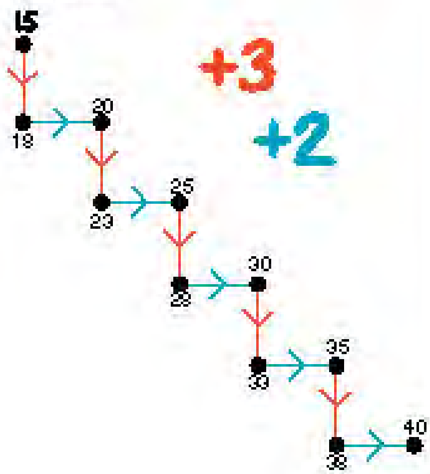

+2
+3
−2
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14


12 balls
8 marbles
5 stickers


2x
1
2
4
8
5
10
20


odd numbers
17
5
2
24
Many solutions are possible.

Label the dots.



Complete.

$34 - 4 =$ 30

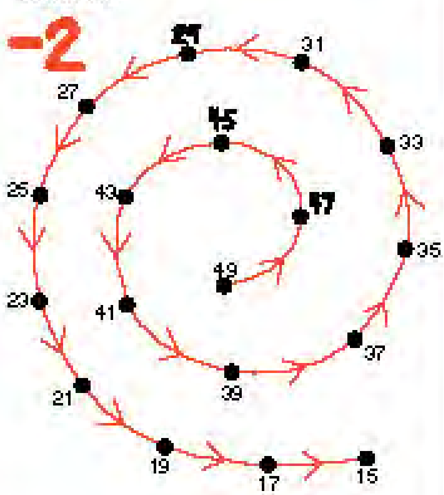
$34 - 10 =$ 24

$69 - 1 =$ 68

$69 - 8 =$ 61

$69 - 20 =$ 49

Label the dots.



Complete.

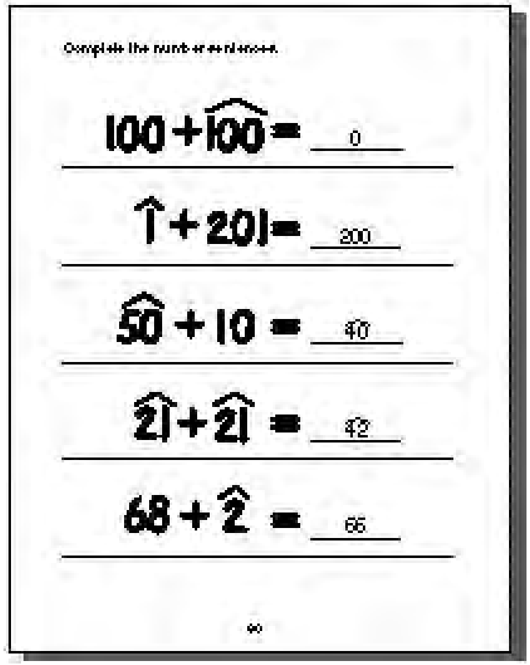
$41 + 18 =$ 59

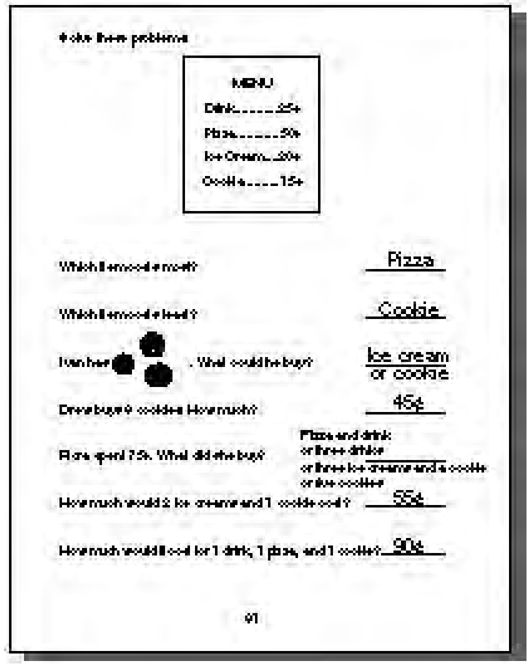
$22 + 15 =$ 37

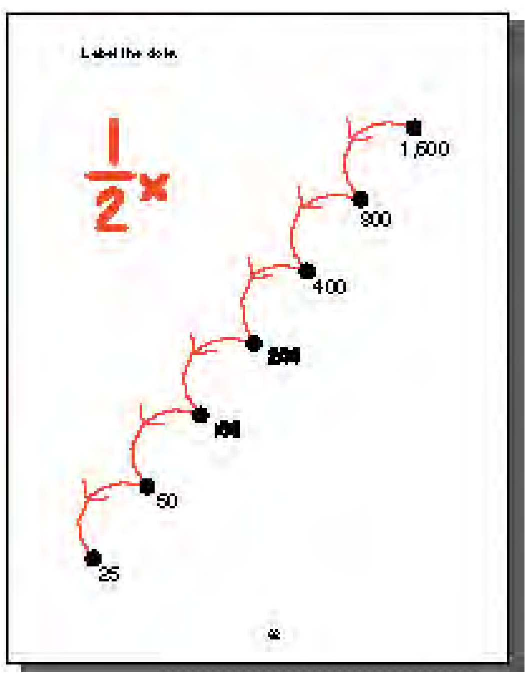
$80 + 17 =$ 97

$51 + 26 =$ 77

$34 + 43 =$ 77


Complete the number sentences.
0
200
40
42
66


MENU
Pizza
Cookie
Ice cream
or cookie
45¢
55¢
90¢
91


Label the dots.
1,600
900
400
50
25

F153 INTRODUCTION TO FRAMES

Capsule Lesson Summary

Fill in a box (frame) with a number to complete a number fact. Notice patterns in the various sequences.

Materials

Teacher		Student	
	• None		• Worksheets F153*, **, ***, and ****

Description of Lesson

Write this expression on the chalkboard.

$$5 + \boxed{} = 6 \qquad 5 \xrightarrow{+\boxed{}} 6$$

This expression (open sentence) is read "five plus box equals six" or "five plus 'what number' equals six."

T: ***This is like an arrow where we don't know how the arrow is labeled. What number should go in this box to make the number fact true?***

S: ***1.***

Write 1 in the box.

$$5 + \boxed{1} = 6 \qquad 5 \xrightarrow{+\boxed{1}} 6$$

Write a second open sentence on the chalkboard.

$$5 + \boxed{} = 7 \qquad 5 \xrightarrow{+\boxed{}} 7$$

When a student suggests that 2 goes in the box, complete the number fact. Continue this process, each time writing open sentences and arrows, until you run out of space at the board.

$$\boxed{1} = 6 \qquad 5 \xrightarrow{+\boxed{1}} 6 \qquad\qquad 5 + \boxed{4} = 9 \qquad 5 \xrightarrow{+\boxed{4}} 9$$

$$\boxed{2} = 7 \qquad 5 \xrightarrow{+\boxed{2}} 7 \qquad\qquad 5 + \boxed{5} = 10 \qquad 5 \xrightarrow{+\boxed{5}} 10$$

$$\boxed{3} = 8 \qquad 5 \xrightarrow{+\boxed{3}} 8 \qquad\qquad 5 + \boxed{6} = 11 \qquad 5 \xrightarrow{+\boxed{6}} 11$$

F153

T: ***Do you see any patterns in these number facts?***

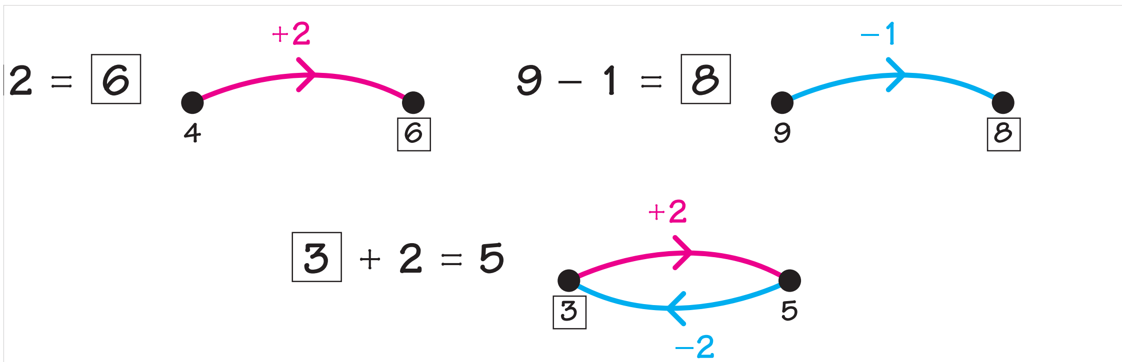
S: ***They all start with 5.***

S: ***The numbers in the box go 1, 2, 3, 4, 5, and so on.***

S: ***The numbers on the right go 6, 7, 8, 9, 10, and so on.***

T: ***There are other places where we might put the box in an open sentence.***

Do these examples with the class.



In the last example, you may want to use an opposite arrow (–2) to find the number to go in the box.

Erase the board and write 10 = 10 + ☐ on the board.

T: ***What number should go in the box to make this number sentence true?***

S: ***0.***

Write 0 in the box. Continue this activity until you complete four or five number facts.

$$10 = 10 + \boxed{0}$$
$$10 = 9 + \boxed{1}$$
$$10 = 8 + \boxed{2}$$
$$10 = 7 + \boxed{3}$$
$$10 = 6 + \boxed{4}$$

T: ***Do you see any patterns?***

If necessary, direct the students' attention to each of the three columns and to how the numbers in each change or remain unchanged.

Continue this lesson with the following sequences or similar ones appropriate for the abilities of your students.

2 x 0 = $\square$ 2 x 1 = $\square$ 2 x 2 = $\square$ 2 x 3 = $\square$ 2 x 4 = $\square$	1 + 1 = $\square$ 10 + 10 = $\square$ 100 + 100 = $\square$ 1,000 + 1,000 = $\square$
$\square$ + 2 = 3 $\square$ + 2 = 5 $\square$ + 2 = 7 $\square$ + 2 = 9 $\square$ + 2 = 11	10 – 2 = $\square$ 10 – 4 = $\square$ 10 – 6 = $\square$ 10 – 8 = $\square$ 10 – 10 = $\square$

Worksheets F153 *, **, ***, and **** are available for individual work.

Name________________ F153 ☆

Complete.

$1 + 1 = \boxed{2}$
$2 + 1 = \boxed{3}$
$3 + 1 = \boxed{4}$
$4 + 1 = \boxed{5}$
$5 + 1 = \boxed{6}$

$1 + 1 = \boxed{2}$
$2 + 2 = \boxed{4}$
$3 + 3 = \boxed{6}$
$4 + 4 = \boxed{8}$
$5 + 5 = \boxed{10}$

$10 + 1 = \boxed{11}$
$10 + 2 = \boxed{12}$
$10 + 3 = \boxed{13}$
$10 + 4 = \boxed{14}$
$10 + 5 = \boxed{15}$

$10 - 1 = \boxed{9}$
$10 - 2 = \boxed{8}$
$10 - 3 = \boxed{7}$
$10 - 4 = \boxed{6}$
$10 - 5 = \boxed{5}$

Name________________ F153 ☆☆

Complete.

$6 + 6 = \boxed{12}$
$7 + 7 = \boxed{14}$
$8 + 8 = \boxed{16}$
$9 + 9 = \boxed{18}$
$10 + \boxed{10} = 20$

$6 + 5 = \boxed{11}$
$7 + 5 = \boxed{12}$
$8 + 5 = \boxed{13}$
$9 + 5 = \boxed{14}$
$10 + \boxed{5} = 15$

$6 + 1 = \boxed{7}$
$6 + \boxed{2} = 8$
$6 + \boxed{3} = 9$
$6 + \boxed{4} = 10$
$6 + 5 = \boxed{11}$

$8 + \boxed{2} = 10$
$8 + \boxed{4} = 12$
$8 + \boxed{6} = 14$
$8 + 8 = \boxed{16}$
$8 + 10 = \boxed{18}$

Name________________ F153 ☆☆☆

Complete.

$14 - 4 = \boxed{10}$
$13 - 3 = \boxed{10}$
$12 - \boxed{2} = 10$
$11 - \boxed{1} = 10$
$\boxed{10} - 0 = 10$

$10 + 5 = \boxed{15}$
$20 + 5 = \boxed{25}$
$30 + \boxed{5} = 35$
$40 + \boxed{5} = 45$
$\boxed{50} + 5 = 55$

$7 - 3 = \boxed{4}$
$7 - 4 = \boxed{3}$
$7 - 5 = \boxed{2}$
$7 - \boxed{6} = 1$
$7 - \boxed{7} = 0$

$\boxed{20} = 10 + 10$
$\boxed{40} = 20 + 20$
$60 = 30 + \boxed{30}$
$80 = \boxed{40} + 40$
$100 = 50 + \boxed{50}$

Name________________ F153 ☆☆☆☆

Complete.

$100 + \boxed{100} = 200$
$101 + 101 = \boxed{202}$
$102 + 102 = \boxed{204}$
$103 + \boxed{103} = 206$
$\boxed{104} + 104 = 208$

$\boxed{100} = 50 + 50$
$\boxed{102} = 51 + 51$
$104 = \boxed{52} + 52$
$106 = \boxed{53} + 53$
$108 = 54 + \boxed{54}$

$\boxed{100} = 100 + 0$
$100 = 98 + \boxed{2}$
$100 = 96 + \boxed{4}$
$100 = 94 + \boxed{6}$
$100 = \boxed{92} + 8$

$5 + \boxed{5} = 10$
$15 + 15 = \boxed{30}$
$25 + \boxed{25} = 50$
$35 + 35 = \boxed{70}$
$45 + 45 = \boxed{90}$

F154.1 THE FUNCTION +10

Capsule Lesson Summary

Read the numbers in some of the columns of the 0–109 numeral chart and notice patterns. Use a +10 arrow picture as a visual aid to do repeated addition. Ask where those numbers occur in the chart.

Materials

Teacher	• 0–109 numeral chart • Colored chalk	Student	• 0–109 numeral chart

Description of Lesson

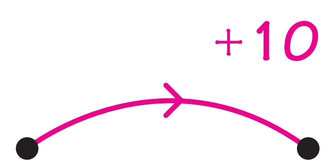
The 0–109 numeral chart should be prominently displayed during this lesson. If it is difficult for the students to reach the chart, let them use a pointer. You may also like students to have their own copies of the 0–109 numeral chart.

Ask volunteers to read the following portions of the 0–109 numeral chart:

- the first row
- the last row
- the third row
- the first column
- the last column
- the fourth column

When a volunteer finishes reading the fourth column ask the students if they see any patterns in those numbers. The students will probably observe that every number has 3 as the ones digit, while the tens digits increase by one: 1, 2, 3, and so on.

Draw this arrow picture on the chalkboard.



T: ***What is the red arrow for?*** (+10)
Which number is greater, at the left or right dot? (At the right)

Point to the dot on the left. As you ask each of the following questions, trace the arrow from left to right and point to the dot on the right. Do not label the dots.

T: ***If this number were 0, what would this number be?*** (10)
If this number were 10, what would this number be? (20)
If this number were 20, what would this number be? (30)

Continue in this manner until you reach 60 or 70.

T: ***Where are these numbers in our numeral chart?***

S: ***They are the numbers in the first column.***

T: ***If we read down the first column, how are we counting?***

S: ***By tens.***

Repeat the process of adding 10, but begin with 5 rather than 0. Point to the dot on the left, trace the arrow, and point to the dot on the right.

T: ***If this number were 5, what would this number be?*** (15)
If this number were 15, what would this number be? (25)
If this number were 25, what would this number be? (35)

Continue in this way until you reach 65 or 75.

T: ***Where are these numbers in our numeral chart?***

S: ***They are the numbers in the sixth column.***

T: ***If we read down this column, how are we counting?***

S: ***By tens.***

Point to the dot on the left in the arrow picture. Assign any number from 0 to 90 to this dot and ask the students what number is at the dot on the right. Repeat this activity several times. Occasionally, ask students who answer correctly to explain how they knew the answer.

If your class experiences difficulty with this activity, ask a student helper to locate the first number (assigned to the dot on the left) in the 0–109 numeral chart. Encourage the idea that when you add 10 to a number on the chart, you obtain the number immediately below it on the chart.

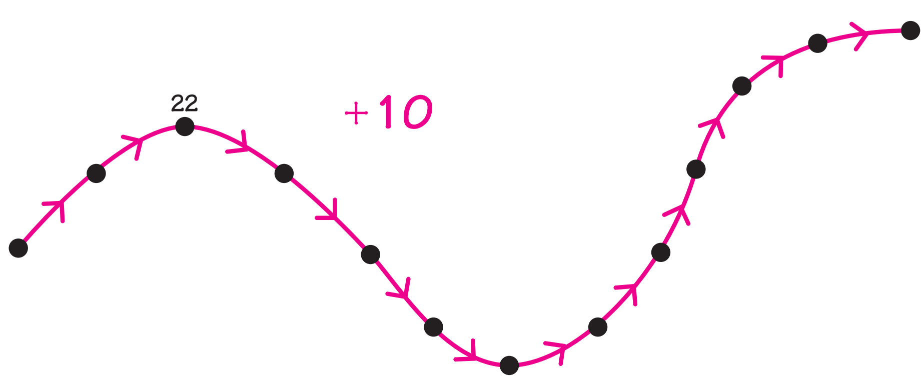
On the 0–109 numeral chart, point to any number less than 90. Ask the class what number equals this number plus 20. For example, point to 56 and ask,

T: ***What number is 56 + 20?*** (76) ***How do you know?***

S: ***I added 10 twice; 56 + 10 = 66 and 66 + 10 = 76.***

Repeat this activity several times. Compliment students who recognize that, on the numeral chart, the number which is 20 larger is located two rows below the given number.

Draw this +10 arrow picture on the board.



Ask volunteers to label the dots. The students may have difficulty labeling the last two dots for 112 and 122. If so, count by ones with the students from 102 to 112 and from 112 to 122. Continue until the arrow picture is complete. Then, lead the class counting by tens in unison, starting at 2 and referring to the arrow picture.

F154.2 MULTIPLICATION ON THE MINICOMPUTER #3

Capsule Lesson Summary

Use the Minicomputer to decide how many glasses three bottles of cider will fill, if each bottle fills 23 glasses. Decide how many doughnuts there are in five boxes, if each box holds one dozen doughnuts.

Materials

Teacher	• Minicomputer set	Student	• Worksheets F154.2* and ** • Minicomputer set (optional)

Description of Lesson

T: ***I am having a party so I bought apple cider and doughnuts to serve at the party. I bought three big bottles of cider and each bottle will fill 23 glasses. What calculation will tell us how many glasses I can fill in all?***

S: **23 + 23 + 23.**

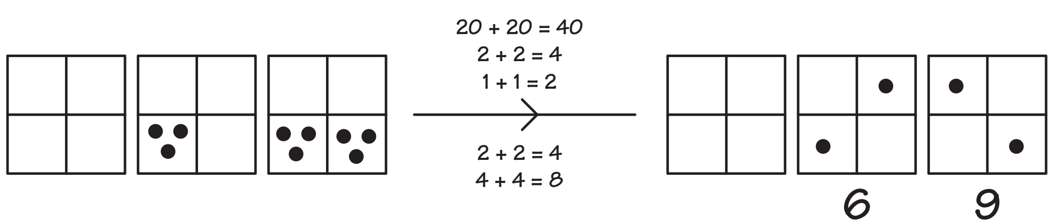
T: ***Who knows a calculation using times?***

S: **3 x 23.**

Write this problem on the chalkboard. $3 \times 23 =$

T: ***What number is 3 x 23?***

Accept and record several estimates. Then choose volunteers to put 23 on the Minicomputer three times, to make trades, and to write the answer below (above) the boards.



Complete the problem on the chalkboard. $3 \times 23 = 69$

If students predicted this answer, ask them how they knew. Compliment students who suggest 3 x 20 = 60 and 3 x 3 = 9, so 3 x 23 = 60 + 9 = 69.

T: ***I also bought five boxes of doughnuts. There were 12 doughnuts in each box. What calculation will tell us how many doughnuts I have in all?***

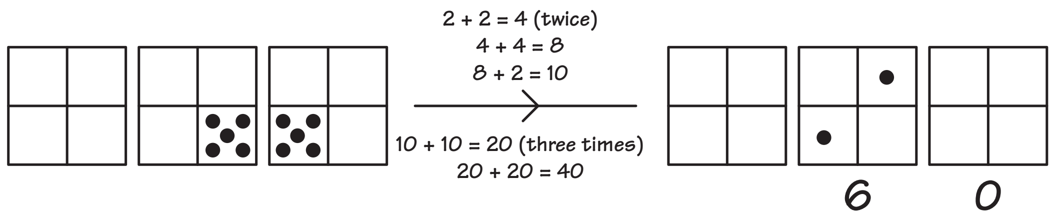
S: **12 + 12 + 12 + 12 + 12.**

S: **5 x 12.**

Write this problem on the chalkboard. $5 \times 12 =$

F154

Once again ask for and record guesses. Then, choose volunteers to put 12 on the Minicomputer five times, to make trades, and to write the answer below (above) the boards.



Complete the problem on the chalkboard.

$$5 \times 12 = 60$$

If students predicted this answer, ask them for an explanation. Compliment students who suggest 5 x 10 = 50 and 5 x 2 = 10, so 5 x 12 = 50 + 10 = 60.

Distribute Worksheets F154.2* and **. Allow students to use individual Minicomputers if they wish.

Name________________ F154.2

Complete the number sentences.

20 + 5 = 25

11 + 8 = 19

12 + 4 = 16

20 + 14 = 34

44 + 10 = 54

12 + 24 = 36

41 + 18 = 59

22 + 15 = 37

80 + 17 = 97

51 + 26 = 77

34 + 43 = 77

Name________________ F154.2

Complete the number sentences.

24 + 15 = 39

25 + 41 = 66

42 + 33 = 75

24 + 35 = 59

21 + 49 = 70

2 × 14 = 28

3 × 12 = 36

2 × 23 = 46

3 × 22 = 66

4 × 12 = 48

5 × 13 = 65

F155 THE WEIRD STORY OF 24

Capsule Lesson Summary

Read and discuss the storybook *The Weird Story of 24*.

Materials

Teacher		Student	
	• The *Weird Story of 24* Storybook • Minicomputer set		• *The Weird Story of 24* Storybook (one copy for every two students.)

Description of Lesson

Although *The Weird Story of 24* involves representation of numbers on the Minicomputer, it is also a story and may be presented that way to the class. Distribute the storybooks before starting the lesson so that your students (in pairs) can follow along with you as you read. Tell the students not to turn the pages of the book until you tell them to (most pages of the storybook that pose a question are followed by a page containing an answer). Then, read the story as you would read any story to your class.

Here are some specific suggestions as you progress through the storybook.

Page 7

Ask a student to read the number on the Minicomputer.

Page 11

Put two blue checkers on the 8-square of the Minicomputer, asking a student to place a third blue checker and to explain why it belongs there. Ask students to make trades to check that the number on the Minicomputer is 24.

Page 19

Put one red checker on the 8-square and one on the 4-square of the Minicomputer. Give two more red checkers to a volunteer who should place them similarly. Ask why these additional checkers belong there. Make trades to check that the number is 24.

Page 25

Put a checker on the 8-square and a checker on the 2-square of the Minicomputer. Give a volunteer three checkers, which should be placed on the 8-square, the 4-square, and the 2-square, respectively. Ask why these new checkers belong there. Make trades to check that the number on the Minicomputer is 24.

Pages 28 and 29

Discuss why 24 is driving this particular train. If necessary, give hints to help point out that there are four cars with six soldiers each; so there are 24 soldiers on the train.

F155

Page 31

Ask who sent the letter. (24, because 4 x 6 = 24)

When you finish reading the story, allow some time for the class to discuss it. In particular, you may want to discuss what the cat does in the story and how it is affected by 24's antics.

Writing Activity

Let students choose any number from 2 to 23 and write their own *Weird Story of* __. These may be illustrated and shared.

F156.1 MYSTERY ARROWS

Capsule Lesson Summary

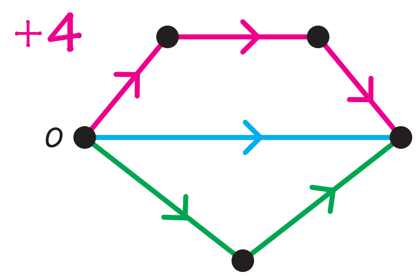
Given an arrow picture in which red arrows are for +4 and only one dot is labeled, decide what the blue arrows and the green arrows are for, and label the other dots.

Materials

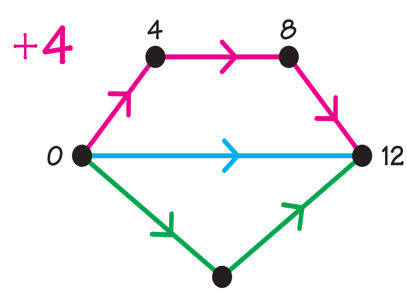
Teacher	• Colored chalk	Student	• Counters

Description of Lesson

Draw this arrow picture on the board.



Invite volunteers to label the dots. At this point, of course, you would only expect dots connected by red arrows to be labeled. If a student labels the bottom dot ask, "How do you know that this number is _____?" The students may agree that it would be best to wait until they learn what a green arrow is for before labeling that dot. When the four upper dots have been labeled, continue.



T: ***What could the blue arrow be for? How do you know?***

S: ***+12, because 0 + 12 = 12.***

Note: The blue arrow could be for other relations such as "is less than." If this is suggested, respond that the suggestion is accurate but here the blue arrow is for +12.

Write +12 in blue near the arrow picture.

T: ***What could the green arrows be for? How do you know?***

Allow students to work with a partner and to use counters to solve this problem.

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It may be difficult for your students to explain why they think the green arrows are for +6. If +6 is not suggested, you may need to guide the discussion as follows.

T: ***We go from 0 to 12 with two green arrows.***

S: ***The green arrows could be for +10 and +2.***

T: ***10 + 2 = 12; however, both green arrows are for the same thing.***

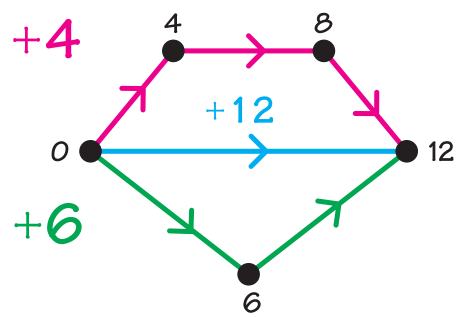
S: ***The green arrows could be for +5.***

T: ***0 + 5 =...?*** (5) ***5 + 5 = ... ?*** (10)
But this dot is for 12, so the green arrows can't be for +5. With +5, the ending number would be 10 not 12.

S: ***They could be for +6.***

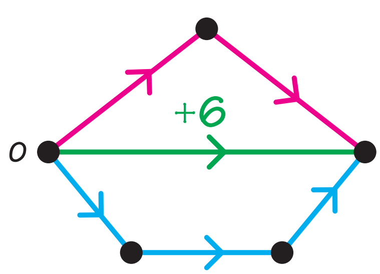
T: ***0 + 6 = ...?*** (6) ***And 6 + 6 = ... ?*** (12)
Yes; the green arrows are for +6.

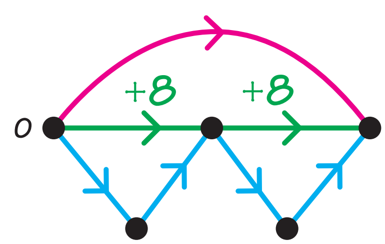
Ask a volunteer to label the lower dot *6* before concluding the lesson.



Center Activity

Laminate task cards with other mystery arrow problems; for example,





Capsule Lesson Summary

Look at shapes drawn on a grid board and ask how many grid squares each covers. Some shapes cover only half of certain grid squares.

Materials

Teacher
- Grid board or Robot Walk grid sheet
- Five paper squares sized to fit the grid
- Colored markers

Student
- Worksheets F156.2 (no stars), *, **, and ***
- Color tiles
- Colored pencils

Description of Lesson

Begin the lesson by inviting students to cover five squares on your grid with the paper squares.

T: ***How many squares are covered?*** (5)

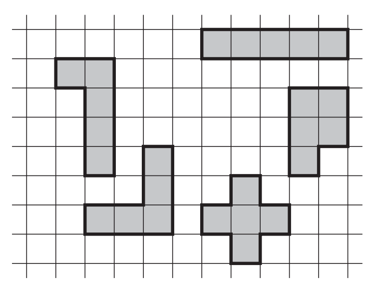
Then color the covered squares as you remove the paper squares and point out coloring a shape that covers five squares.

Distribute copies of Worksheet F156.2 (no stars).

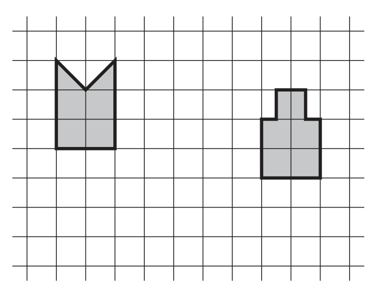
T: ***On the front of your papers, color a shape that covers exactly five squares. On the back, color a different shape that covers exactly five squares.***

Note: You may want students to use five paper squares or color tiles to cover the shape first before coloring.

Allow enough time for the students to do this and then collect the sheets. Collect several examples and draw them on the grid board or grid sheet. Some possibilities are illustrated below; ask the students if they agree that each shape covers exactly five squares.



It is likely that no one will have colored a shape making use of "half-squares"; if not, draw two such shapes on the grid board.



T: ***How many squares do each of these shapes cover?***

The students may answer "six." If so, point to one of the shapes, count its four complete squares aloud, and then point to the two half-squares.

T: ***Four squares, plus these. Are these whole squares?***

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S: ***No, they're half-squares.***

T: ***If we put two half-squares together, what would we get?***

S: ***One whole square.***

T: ***So how many squares do these shapes cover?***

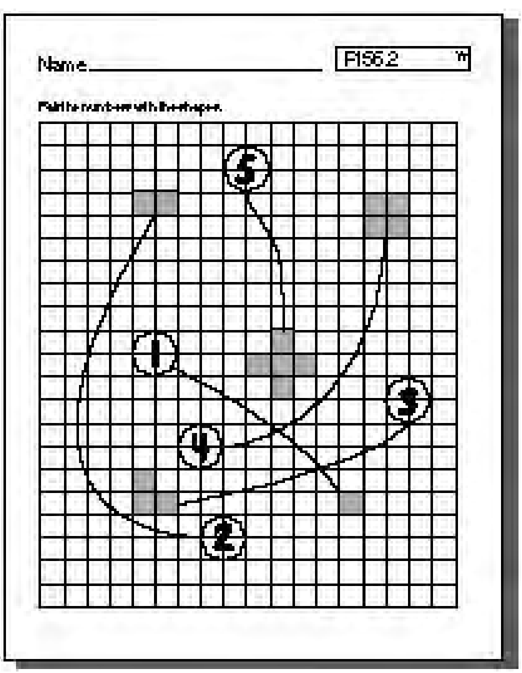
S: ***Five.***

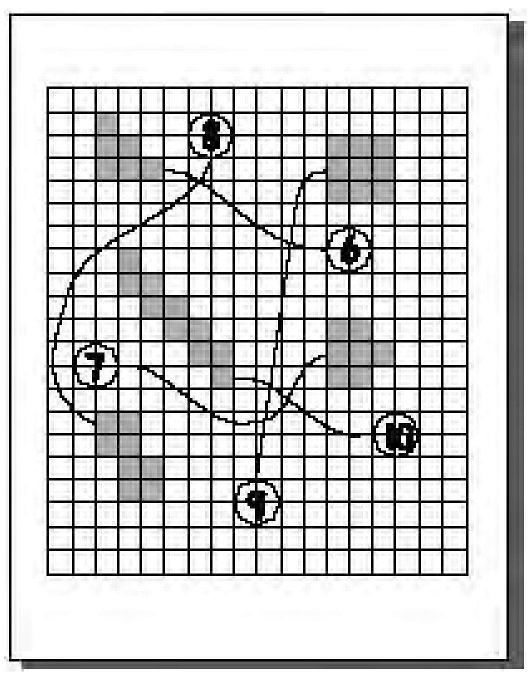
This discussion may be difficult for some of your students, but it will be needed by those students who reach the more difficult worksheets of this lesson. In other words, you need not insist that everyone fully grasp this concept.

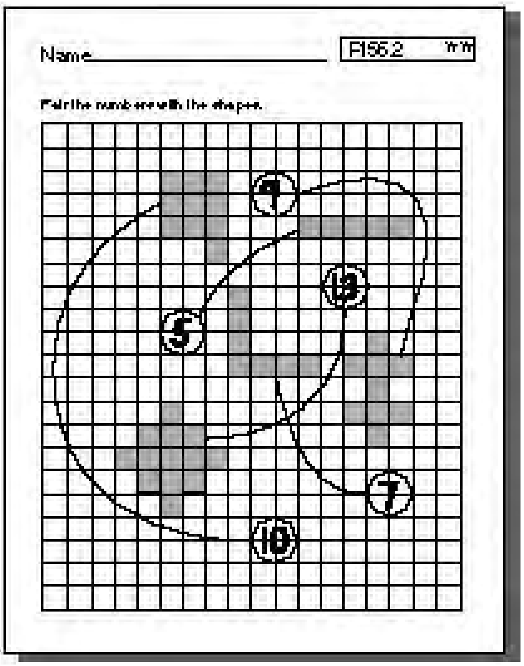
Distribute copies of Worksheet F156.2*.

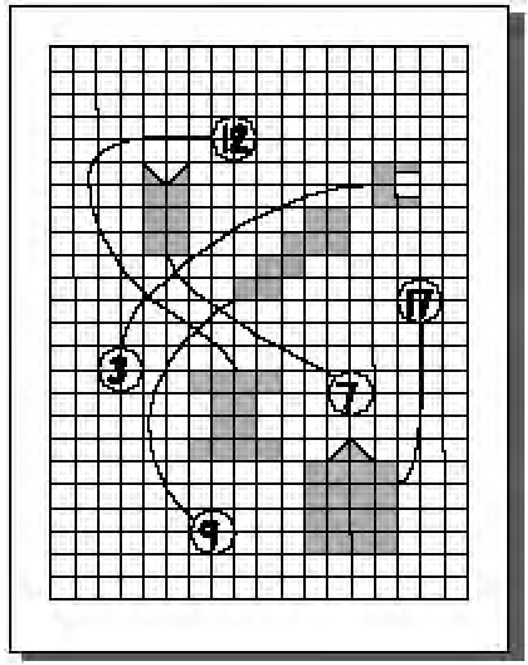
T: ***On this page there are shapes and numbers. This shape is connected to 1*** (trace the curve) ***because it covers one square. You must connect the other shapes to the numbers that tell how many squares the shapes cover.***

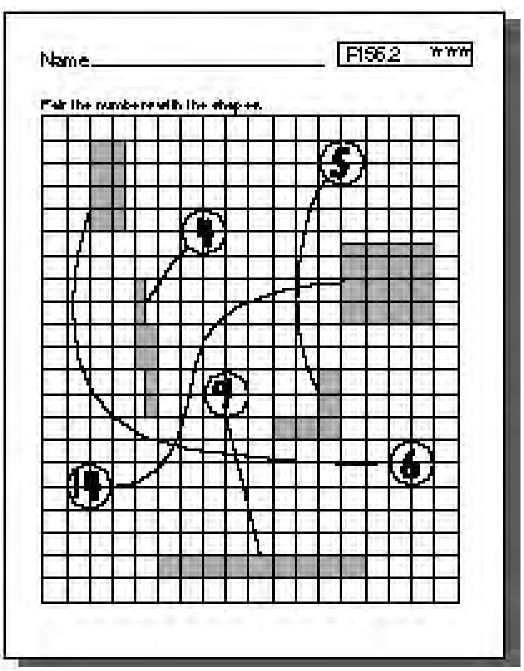
As students complete the one-star worksheet, provide the two-star, and then the three-star worksheets.

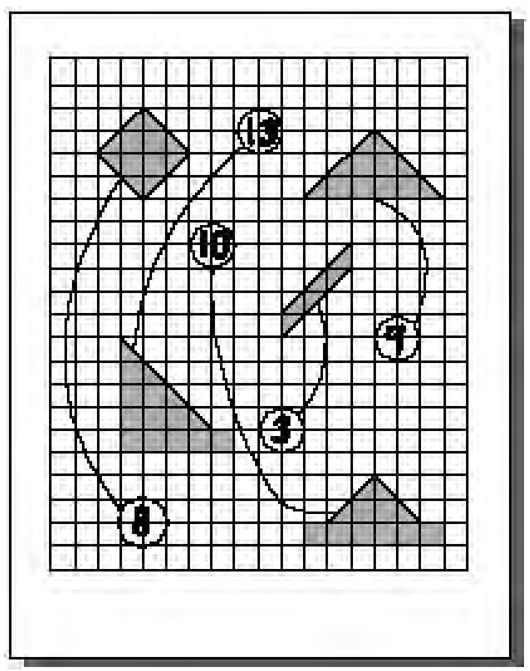





Name
F156.2
Pair the numbers with the shapes.
9
13
5
7
10


12
17
3
7
9


Name
F156.2
Pair the numbers with the shapes.
5
4
9
14
6


13
10
9
3
8

F157.1 COMBINATORICS WITH THREE DIGITS #2

Capsule Lesson Summary

Using numeral cards, discover the six possible three digit numbers which have 4, 7, and 9 as digits. Ask which of these numbers is the greatest and which is the least.
Optional: Conduct a similar activity with four-digit numbers .

Materials

Teacher
- Demonstration numeral card set
- Minicomputer set

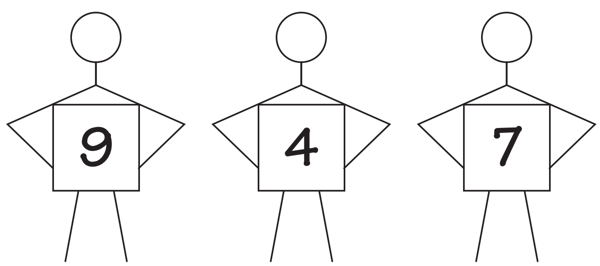
Student
- Numeral cards
- Paper
- Pencil

Advance Preparation: Make numeral cards on index cards, enough so each group of three students has one $\boxed{4}$, $\boxed{7}$, and $\boxed{9}$. If you do the optional Exercise 2, they will need $\boxed{0}$, $\boxed{5}$, $\boxed{6}$, and $\boxed{8}$ as well.

Description of Lesson

Exercise 1

Hold up the 4, 7, and 9 cards from the demonstration numeral card set. Ask three students to come to the front of the class and give each of them a numeral card. The order in which the students stand initially is not important. Here is one possible arrangement of the cards.



T: ***We have shown a number with these numeral cards. What number is it?***

S: ***947.***

Write 947 on the chalkboard.

T: ***What other numbers can we get with these numeral cards?***

Put students in groups of three with each group having a 4, 7, and 9 numeral card. Ask each group to make a list of all the possible arrangements. You may want to tell them that there will be six possibilities.

Record the six possibilities on the chalkboard.

947	974
497	794
479	749

F157

T: ***Which of these numbers is the greatest?*** (974)
Which number is next to the greatest? (947)
Which number is the least? (479)
Which number is next to the least? (497)

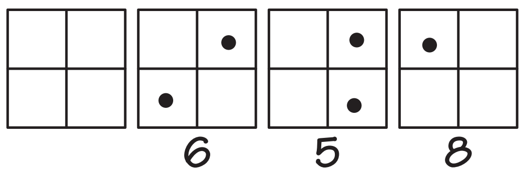
Continue by asking groups to list the numbers from greatest to least.

Exercise 2 (optional)

If Exercise 1 was quite easy for your class, hold up the 0, 5, 6, and 8 numeral cards. Repeat Exercise 1 with these four digits.

Continue this activity until five or six new numbers are found and recorded on the board.

Perhaps some group will list a three-digit number, such as 658. The students will probably disagree about where to place the 0 card. Display four Minicomputer boards and ask a volunteer to put 658 on the Minicomputer. Ask another volunteer to write the number below (above) the Minicomputer.



T (pointing to the thousands board): ***What number could be written below this board?***

S: ***0.***

T: ***Yes; if we want to show this number using all four numeral cards, we should put the* 0 *card on the left.***

$\boxed{0}$ $\boxed{6}$ $\boxed{5}$ $\boxed{8}$

If no group suggests such a number, you need not mention it.

F157.2 STRING GAME WITH A-BLOCKS #5

Capsule Lesson Summary

Play the String Game with A-blocks.

Materials

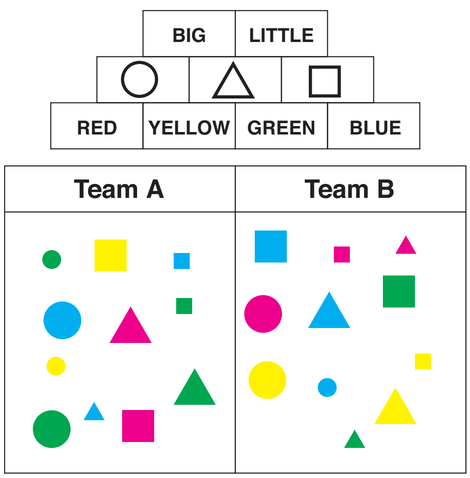
Teacher
- A-Block String Game kit
- Colored chalk

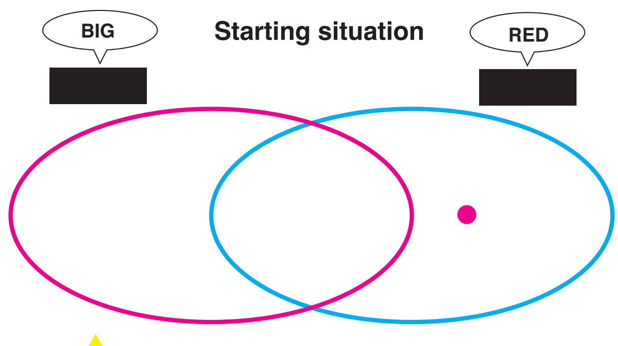
Student
- None

Description of Lesson

Prepare to play the String Game with A-blocks in the usual way. A suggested game with starting clues is provided below. Although the picture below shows only two teams, you can play the game with several teams. The second illustration shows the correct placement of all pieces and may aid you in judging.

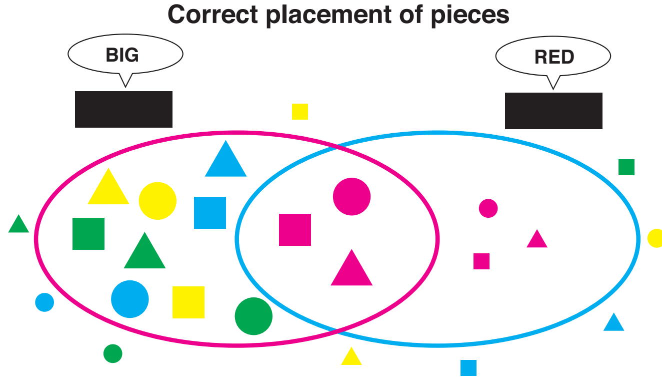
Note: You may prefer to include the possibility of **NOT** labels in your game, in which case use Version B of the String Game poster above the team board.



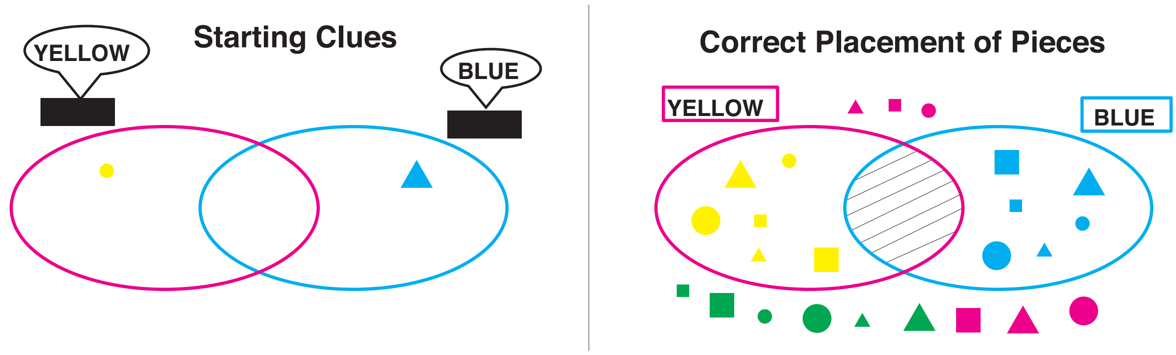


Starting situation

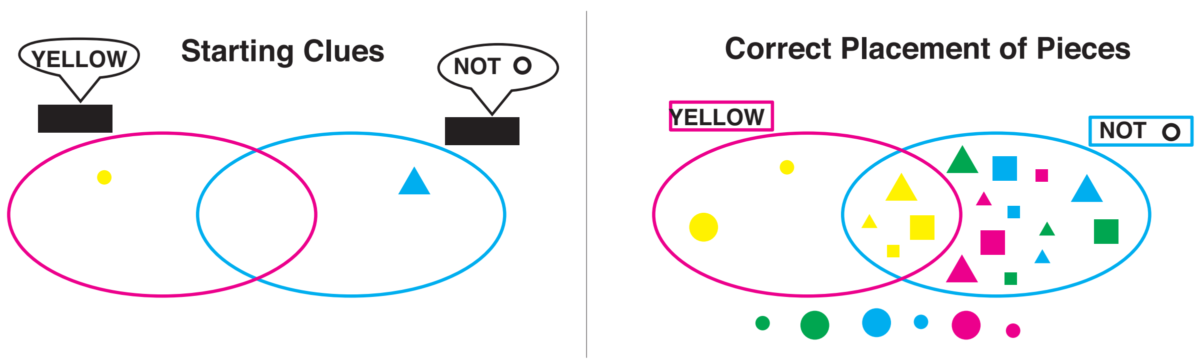
Correct placement of pieces



If some time remains and the class is interested, play a second game using the starting clues and correct placement of pieces as shown below. If some students suggest hatching the empty center region, do so.



If you believe your class is ready for a more challenging string game, try the following.



F158.1 ELI'S MAGIC PEANUTS #5

Capsule Lesson Summary

Use a $+\hat{2}$ arrow picture to describe what happens to Eli's peanut supply when he picks two magic peanuts at a time.

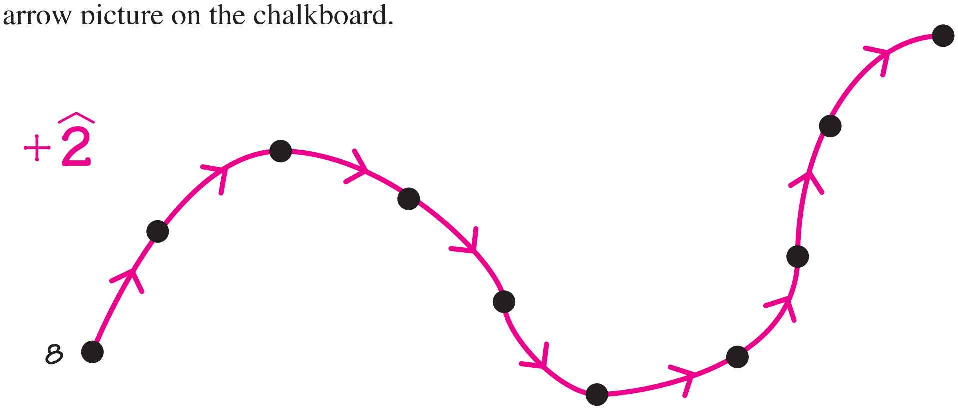
Materials

Teacher
- Colored chalk
- Number line
- Minicomputer checkers

Student
- Individual Minicomputer checkers

Description of Lesson

Draw this arrow picture on the chalkboard.



T: ***One day, Eli the elephant goes for a walk. He starts with eight regular peanuts in his bag and goes walking to gather peanuts, but something strange happens. Every bush he comes to has two peanuts on it, and they are both magic peanuts! Each time, Eli puts both magic peanuts in his bag.***

Eli starts with eight regular peanuts (point to 8) ***and adds two magic peanuts*** (trace the arrow starting at 8). ***How many peanuts does he have now?***

You may like to let students act out this story using Minicomputer checkers for the peanuts.

S: ***Six regular peanuts.***

T: ***Right. Two magic peanuts and two regular peanuts disappear, so there are six regular peanuts left.***

Label the second dot 6 and then point to it.

T: ***Eli has six regular peanuts. At the next bush, he adds two magic peanuts to the bag*** (trace the second arrow)***. How many peanuts does he have now?***

S: ***Four regular peanuts.***

T: ***Yes, there were six regular peanuts, but the two magic peanuts and two more regular peanuts disappear.***

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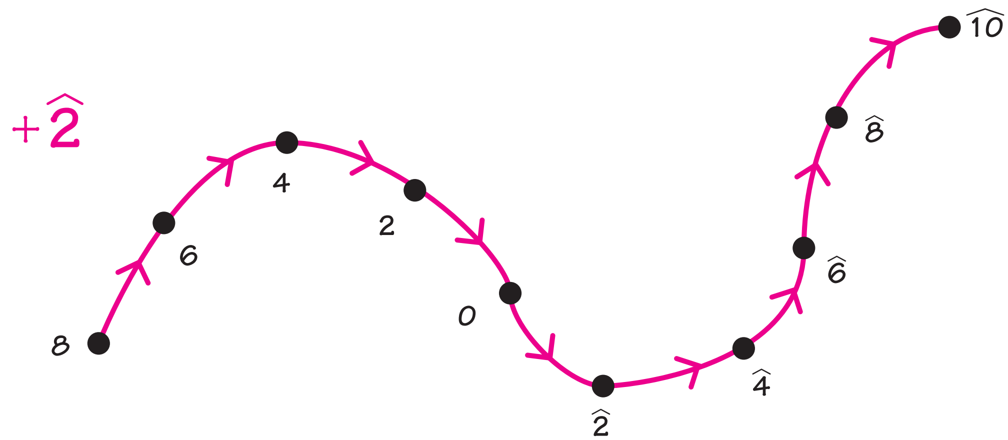
Label the third dot 4.

T: ***Who can label the next dot?***

Choose a volunteer to label the dot (2) and to explain what has happened to leave Eli with only 2 peanuts. Continue until all the dots are labeled. If students make mistakes, other students should point them out. For your reference, the completed picture is shown below.

Follow the arrow picture starting at 8 and pointing to corresponding numbers on the number line.



F158.2 PARADE OF PROBLEMS #3 LESSON TWO

Capsule Lesson Summary

Continue working in the workbook *Parade of Problems #3*. This is the second of two lessons using this workbook.

Materials

Teacher
- None

Student
- *Parade of Problems #3* Workbook
- Colored pencils

Description of Lesson

Note: This is the second of two lessons using the *Parade of Problems #3* Workbook. The first lesson was Lesson F152.2.

Distribute the students' copies of *Parade of Problems #3*. Instruct students to begin by correcting or completing those pages you have indicated on the workbook cover. Demonstrate this by discussing your method of checking and turning to a page which requires corrections or completion. When students have finished correcting or completing these pages, they should continue working in the workbook for the remainder of the period.

Collect and check the workbooks†. This is the last time this workbook is scheduled for use, but at a later time you may want to allow students to work on pages which require corrections. If so, be aware that not all students should be required to complete the workbook. As mentioned earlier, the difficulty of the problems increases and students who are pushed beyond their abilities may become frustrated. In an average class, about two-thirds of the students should complete through page 10, about one-third should complete through page 20, and only a few may finish the entire workbook.

†The answer key for this workbook follows Lesson F152.2.

F159 NUMBER CUBES COLORING GAME

Capsule Lesson Summary

Note all the possible outcomes when rolling two dice (or number cubes) and record them as pairs as well as sums. Practice addition facts in a game rolling two dice (number cubes) and observe which sums occur more or less often.

Materials

Teacher
- Dice or number cubes
- Blackline F159(a) or (b)

Student
- Dice or number cubes
- Game sheet
- Colored pencils

Advance Preparation: Number cubes should have the numbers from 1 to 6 on their faces. Prepare game sheets using Blackline F159 (a) or (b) or make your own.

Description of Lesson

Organize the class in pairs and provide each pair with two different colored dice or number cubes. (The remainder of the lesson description will use dice but you may easily substitute number cubes.)

Begin the lesson by asking students to examine the dice. Collectively answer questions such as:

- How many faces does a die have? (Six)
- What is on the faces? (Dots from 1 to 6)
- Are both dice the same? (Yes, except for color)
- When you toss a die, what do you look at to announce the result? (The number on the top face)

Ask each pair to shake and toss both dice on their table. Then allow the pairs to announce their results.

Some students may announce separate numbers on the two dice, in which case record the result always writing the number on the same die (red, for example) first. Other students may announce their result as a sum, in which case compliment the students but ask also for the separate numbers. Record results on the chalkboard; for example,

		3 and 1			6 and 1
			4 and 2		
	2 and 3	3 and 3		5 and 3	
1 and 4		3 and 4			6 and 4
	2 and 5		4 and 5	5 and 5	

T: ***What other combinations could come up when we roll two dice?***

Your organization of results from actual tosses may suggest other combinations to the students.

S: ***1 and 1.***

S: ***5 and 2.***

Allow students to continue and record the combinations on the board. Your systematic recording will help students find all the combinations by completing the pattern.

1 and 1	2 and 1	3 and 1	4 and 1	5 and 1	6 and 1
1 and 2	2 and 2	3 and 2	4 and 2	5 and 2	6 and 2
1 and 3	2 and 3	3 and 3	4 and 3	5 and 3	6 and 3
1 and 4	2 and 4	3 and 4	4 and 4	5 and 4	6 and 4
1 and 5	2 and 5	3 and 5	4 and 5	5 and 5	6 and 5
1 and 6	2 and 6	3 and 6	4 and 6	5 and 6	6 and 6

T: ***Some of you suggested we look at the result of tossing two dice as a sum. You added the numbers on the two dice together.***

Select several results in your list above, erase the "and" and replace it with "+." Then complete the addition facts. Next, invite the pairs to roll their dice again, to find their result in your list, and to change it to an addition fact.

T: ***We are going to play a game where you will roll the two dice and record results as sums.***

Distribute a game sheet (picture) and colored pencils to each pair of students. Describe the game as follows:

Step 1. One student rolls the dice and announces the result as a sum, adding the numbers on the top faces together.
Step 2. The second student colors in a space on the game sheet for that sum.
Step 3. The first student takes five turns tossing the dice while the second student colors. Then they switch roles and the second student takes five turns tossing the dice while the first student colors.
Step 4. If all spaces with a particular sum are colored, then nothing more is colored on that turn.

After all pairs complete their ten rolls (five for each student), collectively compare the pictures on the game sheets. Lead a discussion to observe that some sums occur more often than others. Encourage students to explain why 6, 7, or 8 are easier to get than 2 or 12.

If you like, allow the pairs to continue playing the game and coloring their picture until it is completely colored. If appropriate, ask some student pairs to note how many rolls of the dice they need to completely color the picture and compare among pairs.

Center Activity

Place other game sheets and dice in a center for students to work on individually or with a partner. You can design different game sheets from coloring books or use designs.

Extension Activity

Play a similar game using subtraction rather than addition facts. You will need to create other game sheets and agree to subtract the smaller from the larger number.

F160.1 ½ x ON THE MINICOMPUTER #3

Capsule Lesson Summary

Using the Minicomputer, find how many fish a fishing boat crew receives if each day they get one-half of the day's catch.

Materials

Teacher • Minicomputer set **Student** • None

Description of Lesson

T: ***Do you know what they pay people working on big fishing boats sometimes? They receive some of the fish that are caught each day and then they can sell the fish. Suppose that one day 80 codfish are caught and the crew gets one-half of the fish to share among themselves.***

Write this problem on the chalkboard.

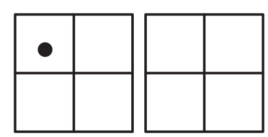
$\frac{1}{2} \times 80 =$

T: ***How many fish does the crew get?***

Accept several guesses and record them on the chalkboard.

T: ***Let's calculate*** **½ x 80** ***on the Minicomputer.***

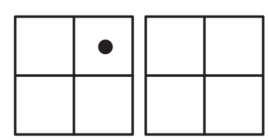
Ask a volunteer to put 80 on the Minicomputer.



T: ***Who can take away one-half of 80?***

S: ***We need a backward trade first.***

Call on students to make the backward trade (80 = 40 + 40), to take away one-half of 80, and to write the answer below (above) the boards.



4 0

T: ***The crew members receive 40 codfish to share among themselves, because ½ x 80 = 40.***

Complete the number sentence on the board.

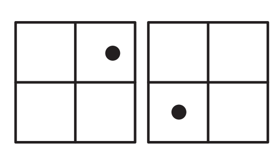
$\frac{1}{2} \times 80 = 40$

T: ***The next day, 42 tuna fish are caught and the crew gets one-half of the tuna fish.***

Write this new problem on the chalkboard.

$\frac{1}{2} \times 42 =$

Again, let students predict how many fish the crew receives and ask a volunteer to put 42 on the Minicomputer.



T: ***Who can take away one-half of 42?***

S: ***We need to make backward trades.***

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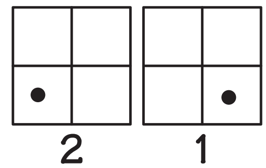
Call on students to make the two backward trades (2 = 1 + 1 and 40 = 20 + 20), and then to take away one-half of 42.



T: ***The crew receives 21 tuna fish to share, because ½ x 42 = 21.***

$\frac{1}{2}$ x 42 = 21

Complete the number sentence on the board. If the students remain interested, tell a third story and calculate the crew's share of 248 mackerel (½ x 248); three backward trades (200 = 100 + 100; 40 = 20 + 20; and 8 = 4 + 4) are needed.

F160.2 TRANSFORMING A NUMBER #2

Capsule Lesson Summary

Estimate a number on the Minicomputer in a configuration with many checkers. Move checkers in various ways, each time observing whether this makes the number more, less, or the same as before. Make trades to decide what number is on the Minicomputer and compare it to the estimates.

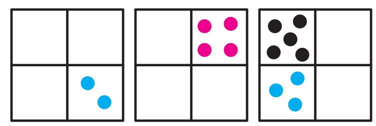
Materials

Teacher	• Minicomputer set	Student	• Three index cards

Advance Preparation: Before the lesson, ask students to write **More**, **Less**, and **Same** on three separate cards. You may have saved these cards from Lesson F93.1.

Description of Lesson

Put this configuration of checkers on the Minicomputer.



T: ***What number did I put on the Minicomputer?***

Students might reply that they need to make some trades before telling you what number this is.

T: ***Yes, trades would make the number easier to read, but can we estimate it without making trades? Is this number more than 100? How do you know?***

S: ***Yes, because there are two checkers on the 100-square and that's 200.***

T: ***Is this number more than 200? How do you know?***

S: ***Yes, because there are other checkers besides the two on the 100-square.***

T: ***Is this number more than 300?***

Some of your students may be able to recognize and demonstrate that the number is more than 300. If not, conclude simply that the class is uncertain whether or not the number is more than 300.

Write these three words on the board and refer the students to their cards.

More Same Less

T: ***Watch very carefully. I am going to do something with these checkers. You will hold up the card that describes what happens to the number.***

Very obviously, move a checker from the 2-square to the 4-square. Students should hold up their **More** cards because the new number is 2 more than the original number. If many students seem unsure, make the move again and give the students another opportunity to respond. Ask students who answer correctly to explain why the new number is more than the beginning number.

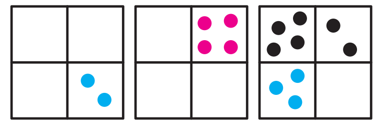
S: ***The number is 2 more than before because you moved the checker from the 2-square to the 4-square, and 4 is 2 more than 2.***

F160

T: ***I'll move the checker back to the 2-square so the number is the same as before.***

Being as obvious as possible, make an 8 = 4 + 4 trade. Ask students to signal with a card. If many students do not realize that the number is the same, make the trade again and give the students another opportunity to respond. Ask a student who answers correctly to explain why the number is the same as before.

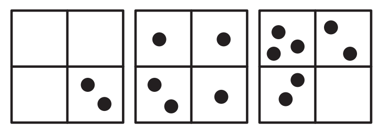
T: ***The trade I made didn't change the number, so this is the same number as before. I'll leave the checkers here.***



Continue this activity with the moves suggested below. Whenever the suggested move changes the number, ask how much more or less the new number is and return the checker(s) to the previous position before you continue.

- Move a checker from the 4-square to the 10-square. (6 more)
- Add a checker to the 100-square. (100 more)
- Make a 40 = 20 + 20 trade. (Same)
- Move a checker from the 4-square to the 1-square. (3 less)
- Make an 8 + 2 = 10 trade. (Same)
- Move a checker from the 20-square to the 10-square. (10 less)
- Make a 40 + 40 = 80. (Same)

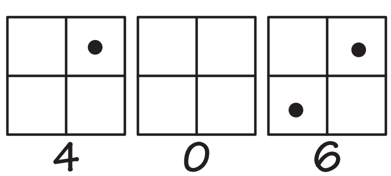
T: ***Do we still have the same number we started with?*** (Yes)
I've moved some of the checkers, but we were very careful not to change the number.
Is this number more than 300? (Yes)
Can you point to the checkers which make 300?



A student should point to two checkers on the 100-square, one checker on the 80-square, and one checker on the 20-square. Ask the class to estimate what the number is and record their estimates on the board. Students should object to any estimate less than 300, so do not record such a guess.

T: ***Let's make some trades to find out what this number is. Be sure that the trades you make do not change the number.***

Encourage the students to make 8 + 2 = 10 and 80 + 20 = 100 trades whenever possible. When you obtain the standard configuration, ask a student to write the number below (above) the Minicomputer.



Observe that this number is indeed more than 300. Compare the number to the students' estimates and decide which was closest.

Appendix

FIRST GRADE SUGGESTED BOOKS

Counting and Place Value

Annie's One to Ten by Annie Owen
Anno's Counting Book by Mitsumasa Anno
Billions of Bugs by Haris Petie
Mouse Numbers and Letters by Jim Aronsky
Numbers of Things by Helen Oxenbury
1, 2, 3 to the Zoo by Eric Carle
Over in the Meadow by Ezra Jack Keats
Ten Black Dots by Donald Crews
Ten, Nine, Eight by Molly Bang
Ten What? A Mystery Counting Book by Russell Hoban
The Very Hungry Caterpillar by Eric Carle
Two Ways to Count to Ten by Dee

Large Numbers

Counting Wildflowers by Bruce McMillan
How Much is a Million? by David Schwartz
Hundreds and Hundreds of Pancakes by Audrey Chalmers
Millions of Cats by Wanda Gag
People by Peter Spier
The 500 Hats of Bartholomew Cubbins by Dr. Seuss

Estimation

Moira's Birthday by Robert Munsch
Really Eager and the Glorious Watermelon Contest by Richard Cheney
The Great Big Enormous Turnip by Alexei Tolstoy

Measurement

How Big is a Foot? by Rolf Myller
Inch by Inch by Leo Lionni
So What? by Miriam Cohen
The Carrot Seed by Ruth Krauss
The Line Up Book by Marisabina Russo

Position/Size

Big World, Small World by Jeanne Titherington
How Big is Big? by Herman and Nina Schneider
Is it Larger? Is it Smaller? by Tana Hoban
Left and Right by Jeanne Oppenheim
Over, Under, and Through by Tana Hoban
Rosie's Walk by Pat Hutchins
The Biggest House in the World by Leo Lionni
The King's Flower by Mitsumasa Anno
There's No Such Thing as a Dragon by Jack Kent
The Very Little Girl by Phyllis Krasilousky

Shape

A Fishy Shape Story by Jeanne and David Wylie
A Holiday for Mr. Muster by Arnold Lobel
A Kiss is Round by Blossom Budney
Circles, Triangles, and Squares by Tana Hoban
Do You See What I See? by Helen Borten
Look at Annette by Marion Walter
Make a Bigger Puddle, Make a Smaller Worm by Marion Walter
Shapes and Things by Tana Hoban
Tatum's Favorite Shape by Dorothy Thole
The Mirror Puzzle Book by Marion Walter
The Shape of Me and Other Things by Dr. Seuss
The Wing on a Flea by Ed Emberley

Money

A Bargain for Francis by Russell Hoban
Alexander, Who Used To Be Rich Last Sunday by Judith Viorst
Arthur's Funny Money by Lillian Hoban
Berenstein Bears, Trouble with Money by Stan and Jan Berenstein
Don't Count Your Chicks by Ingri and Edgar D'Aulaise
Gia and One Hundred Dollars Worth of Bubble Gum by Frank Asch
26 Letters and 99 Cents by Tana Hoban

Time

All In a Day by Mitsumasa Anno
Around the Clock by Tasha Tudor
Around the Year by Tasha Tudor
Chicken Soup with Rice by Maurice Sendak
Clocks and More Clocks by Pat Hutchins
Mouse Days by Leo Lionni
Over and Over by Charlotte Zolotow
Rooster's Off to See the World by Eric Carle
The Grouchy Ladybug by Eric Carle
The Scarecrow Clock by George Mendoza
The Ten-Alarm Camp Out by Cathy Warren

Pattern

A Giraffe and a Half by Shel Silverstein
Bonnie McSmithers, You're Driving Me Dithers by Sue Ann Alderson
Hurry Up Bonnie by Sue Ann Alderson
Just For You by Mercer Mayer
The Enormous Turnip by Kathy Parkinson

Classifications

Anno's Flea Market by Mitsumasa Anno
Anno's Math Games by Mitsumasa Anno
Boxes by M. Jean Craig
Crash! Bang! Boom! by Peter Spier
Gobble, Growl, Grunt by Peter Spier
I Can Count the Petals of a Flower by John and Stacy Wahl
Is it Red? Is it Yellow? Is it Blue? by Tana Hoban
*Odds and Even*s by Thomas O'Brien
Square as a House by Karla Kuskin
The Baby's Catalogue by Janet and Allan Ahlberg
What Comes in 2's, 3's, and 4's? by Suanne Aher

Addition, Subtraction, Multiplication, Division

Anno's Counting House by Mitsumasa Anno
Blueberries for Sal by Robert McClosky
Bunches and Bunches of Bunnies by Louise Matthews
Cat Count by Betsy Lewin
Eating Fractions by Bruce McMillan
Gator Pie by Louise Matthews
Henny Penny by Paul Galdone
Hippos Go Berserk by Sandra Boynton
Pancakes for Breakfast by Tomie de Paola
Pezzettino by Leo Lionni
Pigs Plus by John Burningham
Ride Off by John Burningham
The Doorbell Rang by Pat Hutchins
The Great Big Enormous Turnip by Alexei Tolstoy
Who Sank the Boat? by Pamela Allen

Other

First Day of School by Helen Oxenbury
Horton Hatches the Egg by Dr. Seuss
If You Give a Mouse a Cookie by Numeroff
I Love You Mary Jane by Loma Balian
Miss Flora McFlimsey's May Day by Mariana
My Teacher Sleeps at School by Leatie Weiss
Sixes and Sevens by John Yeoman
Swimmey by Leo Lionni
Teachers from the Black Lagoon by Mike Thaler
The Alphabet Tale by Jan Garten
The Flower Mother by Mary Calhoun
The King, the Mice and the Cheese by Nancy and Eric Gurney
The Mystery of the Missing Peanuts by Walt Disney Productions
The Puppy Who Wanted a Boy by Jane Thayer
Visit to the Zoo by Sylvia Tester
When Shoes Eat Socks by Barbara Klimowicz
Who Lives at the Zoo? by Lisa Bonforte