Workbooks

WORKBOOKS TABLE OF CONTENTS

WORKBOOKS INTRODUCTION

There are many opportunities for student to work individually during the course of the lessons described in the other content strands. In the Workbooks strand, however, it is this individualized work which becomes the chief end of the majority of lessons. The goal in this strand is to provide students with opportunities

- to review many of the ideas they have met in other content strands;
- to apply their acquired knowledge to new situations requiring various kinds of strategic thinking; and
- to learn how to read and use mathematics workbooks.

The following six workbooks are provided:

- *Collage of Problems #1*
- *Collage of Problems #2*
- *Collage of Problems #3*
- *Collage of Problems #4*
- *Collage of Problems #5*
- *Collage of Problems #6*

...and one storybook.

- *A Very Strange Neighborhood*

Each workbook contains problems of varying levels of difficulty. Approximately the first ten pages of each workbook are easy problems, the next ten to twelve pages are average level difficulty, and the last ten pages are more challenging problems. For each workbook, we suggest that all students start work at the easiest level (i.e., on page 2) and then work through as many pages as they can handle during the two lessons scheduled for that workbook. We estimate that, in a typical class, about two-thirds of the students will correctly finish the first ten pages, about one-third will finish the first twenty pages, and a few will finish all or most of the workbook. These proportions will vary from class to class.

This guide contains an answer key for each workbook. The key follows an introduction to the workbook and a suggested collective lesson. The lesson either presents the workbook to the whole class or provides a warm-up activity, usually on a problem similar to one found in the workbook.

The storybook *A Very Strange Neighborhood* touches some important areas of mathematics with the motivation of a story context. This booklet allow students to become deeply involved in an appealing fantasy as they struggle with difficult mathematics problems. The situations support topics and strategies developed in other strands.

Use of the Workbook Strand for Evaluation Purposes

The workbooks provide an excellent instrument to assess the progress of your students on a regular basis. You may not feel it is necessary to check every page and problem for each student, but you should develop a procedure for checking students' work with which you are comfortable. This may include checking one or more specific pages, discussing some particular mistakes with individual students and letting them correct their work, or just looking carefully at a few pages to be sure the students have understood the general idea of the problems in that particular workbook.

In the Blacklines, you will find a record-keeping tool for each workbook to help you assess student progress in the various strands. This tool may also assist you in parent conferences and in filling out periodic progress reports.

Here are some important points to bear in mind for workbooks.

- Always read the introductory material for each workbook and give the short introductory collective lesson(s).
- All students should start at the beginning of each workbook and progress as far as they can.
- All students should begin a new title on the same day, even if some students have not finished work on the previous title.
- Not all students should be expected to complete a given workbook. Only some students will reach the most challenging problems. Other students may succeed only in doing the easiest problems, although you should not assume this automatically—surprises are not at all uncommon.
- Students should be allowed to use calculators except on pages you specify beforehand.

Note: Some pages in a workbook have problems that are related to calculators or are best attacked with the support of calculators; however, there also are pages for which the use of calculators may not be appropriate. We encourage you to review a workbook before distributing copies of it and to inform the class beforehand on which pages your are not allowing the use of calculators. Certain pages you may wish to use for special evaluation purposes; other pages would not be effective if calculators were allowed, for example, pages that primarily focus on paper-and-pencil computation, "wipe-out" pages that involve subtraction of decimal numbers, pages where using patterns permits students to solve problems from previously solved problems, and pages where the problem is to insert missing decimal points in answers to calculations.

Workbooks

The six *Collage of Problems* workbooks both review and extend many of the ideas introduced in the content strands. The extensions occur through problems which require students to apply the mathematics to new situations or to synthesize their knowledge in new ways.

Lessons: W1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, and 13

A Very Strange Neighborhood

Your students are familiar with many different types of numbers and ways to name them; for example, 73, $\widehat{24}$, ¾, 8.517, and $0.\overset{*}{3}$. The storybook *A Very Strange Neighborhood* introduces a new kind of number, namely the irrational numbers[†]. During the story, students use a number line to explore the ordering and density of decimal numbers.

Lesson: W3

[†] Rational numbers are numbers which have fractional names; for example, ½, −2⅜, and 5.02 (5²⁄₁₀₀) are rational numbers. Irrational numbers do not have fractional names although they are on the (real) number line.

Capsule Lesson Summary

Find or draw sets of line segments of the same length in a picture of intersecting squares without using a ruler to measure. Begin the workbook *Collage of Problems #1*. (This is the first of two lessons using this workbook.)

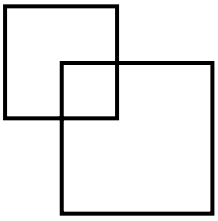
Materials

Teacher
- Colored chalk
- Meter stick

Student
- *Collage of Problems #1* Workbook
- Colored pencils, pens, or crayons
- Compass
- Metric ruler
- Calculator

Description of Lesson

Carefully draw this picture on the board. The intersection of the two squares should also be a square.



T: ***There are three squares in this picture.***

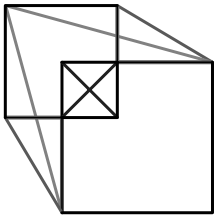
Invite someone to the board to trace the three squares.

T: ***Can someone trace some line segments that have the same length without using a ruler to measure?***

S: ***The four sides of a square are the same length.***

T: ***Yes. Are there any other segments already in the picture or that you could draw in the picture that have the same length?***

As students suggest possibilities, use different colors for different sets of segments. Illustrate several different sets, but do not attempt to find or draw all of the possibilities in the picture. For example, your picture might look similar to this one.



Explain to the class that page 12 of the workbook for today's lesson has a similar activity.

Distribute copies of the workbook *Collage of Problems #1*, and let students work independently for the rest of the class period. If many students are having difficulty with a particular problem, you may wish to have a collective discussion about that problem.

At the end of the class period, collect the workbooks for your review. They will be used again in Lesson W2.

Writing Activity

You may like students to take lesson notes on some, most, or even all their math lessons. The "Lesson Notes" section in Notes to the Teacher gives some suggestions and refers to forms in the Blacklines you may provide to students for this purpose. In this lesson, for example, students may note problems in the workbook they found especially interesting. They may also like to create other problems, similar to ones in the workbook, for their classmates or a family member to solve.

Capsule Lesson Summary

Review divisibility tests by asking which of the whole numbers 2 through 10 are divisors of 58 212. Continue individual work in the workbook *Collage of Problems #1*. (This is the second of two lessons using this workbook.)

Materials

Teacher	• None	Student	• *Collage of Problems #1* Workbook • Colored pencils, pens, or crayons • Compass • Metric ruler • Calculator

Description of Lesson

Write the following information on the board.

58 212

2 3 4 5 6 7 8 9 10

T: ***Which of the whole numbers 2 through 10 are divisors of 58 212? Why?***

As students explain which of the numbers are divisors, circle them in the list. Cross out numbers that are not divisors.

S: ***2, because 58 212 is even.***

S: ***4, because the last two digits of 58 212 are for a multiple of 4. 4 is a divisor of 12.***

S: ***58 212 is not divisible by 5 because its ones digit is not 0 or 5. It also is not divisible by 10 because its ones digit is not 0.***

S: ***3 and 9, because 5 + 8 + 2 + 1 + 2 = 18 and 18 is divisible by 3 and by 9.***

S: ***6, because 58 212 is divisible by 2 and by 3.***

S: ***58 212 is not divisible by 8 because when we divide 58 212 by 4 we get an odd number. Another test is to look at the last three digits, 212, which is not divisible by 8. 200 is a multiple of 8, so 208 and 216 are multiples of 8, but 212 is not a multiple of 8.***

S: ***We do not have an easy test for 7.***

Invite a student to do the division at the board. For example:

8 316	
7) 58 212	
−49 000	7 000
9 212	
−7 000	1 000
2 212	
−2100	300
112	
−70	10
42	
−42	6

Conclude that 58 212 is divisible by 7.

58 212

(2) (3) (4) ~~5~~ (6) (7) ~~8~~ (9) ~~10~~

Distribute students' copies of the workbook *Collage of Problems #1*. Ask students first to correct or complete pages from the previous week's work, and then to continue working in their workbooks. You may wish to have a collective discussion about some problems that were difficult for many students the first week.

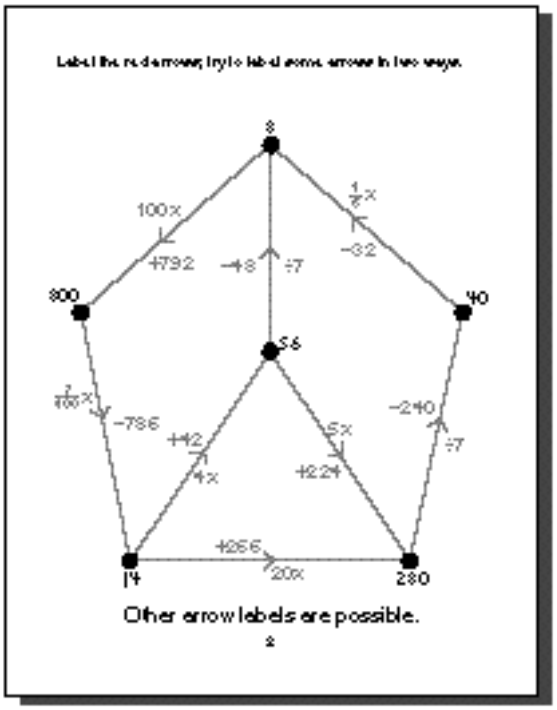
At the end of the class period, collect the workbooks for your review. After checking the workbooks, you may wish to ask some students to work further in their workbooks during a study time or to take them home as an assignment.

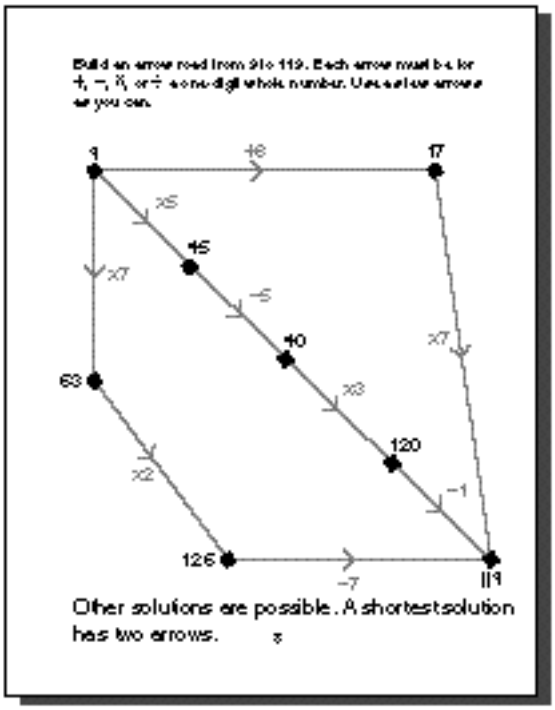
Assessment Activity

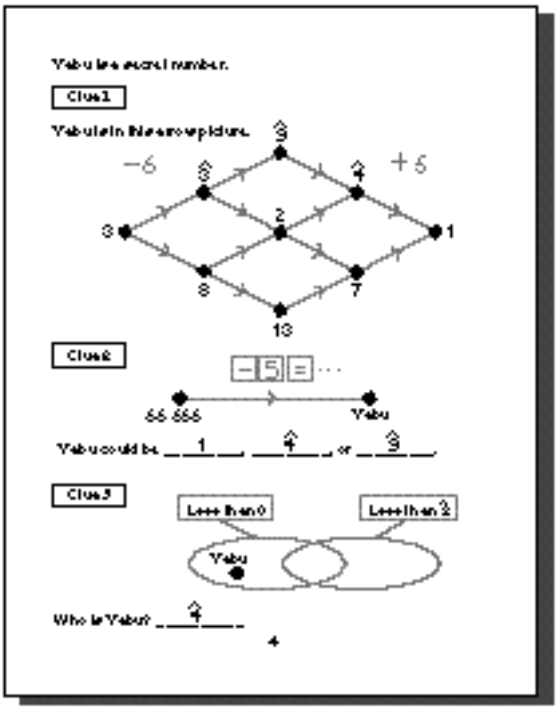
An individual student progress record for this workbook is available on Blackline W2(a). You may like to use this form to monitor student work.

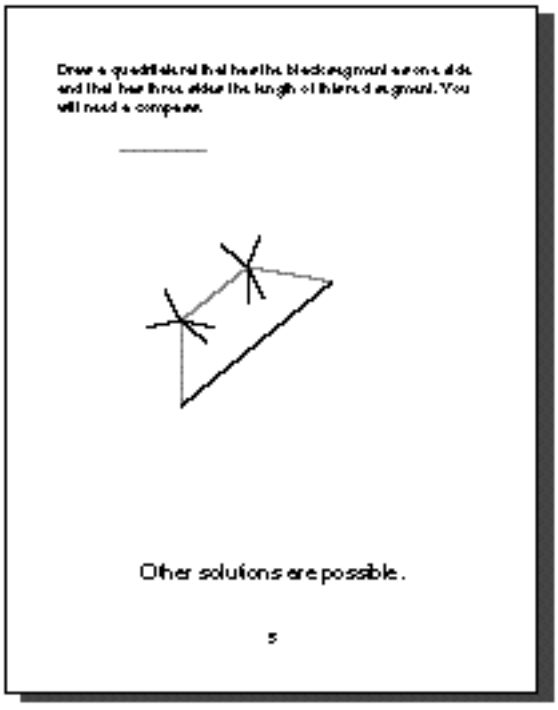
Home Activity

If you choose to send workbooks home with students, you may want to include a letter to parents/guardians about the workbook. Blackline W2(b) has a sample letter.


Label the red arrows; try to label some arrows in two ways.
8
100×
+792
−48
÷7
$\frac{1}{2}$×
−32
800
40
56
$\frac{7}{100}$×
−786
+42
4×
5×
+224
−240
÷7
14
+256
20×
280
Other arrow labels are possible.
2

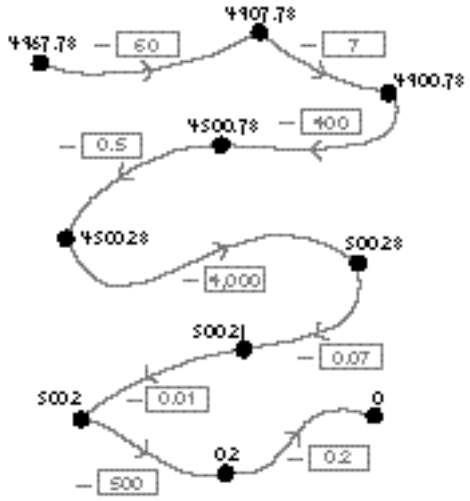

Build an arrow road from 9 to 119. Each arrow must be +, −, ×, or ÷ a one-digit whole number. Use as few arrows as you can.
9
+8
17
×5
45
×7
−5
40
×7
63
×3
120
×2
−1
126
−7
119
Other solutions are possible. A shortest solution has two arrows.
3


Yabu is a secret number.
Clue 1
Yabu is in this arrow picture.
−6
+5
3
1
8
7
13
Clue 2
−5 =
66 666
Yabu
Yabu could be 1, 4, or 9.
Clue 3
Less than 0
Less than 2
Yabu
Who is Yabu? 4
4


Draw a quadrilateral that has the blue segment as one side and that has three sides the length of the red segment. You will need a compass.
Other solutions are possible.
5

Wipe-out

Fill in the boxes for the arrows.



6

Put a one-digit number in each box to make the calculations correct.

1 3 9 5 3 3 4 + 4 4 8 8 6 2 1 7	7 9 8 6 − 3 2 2 7 4 7 5 9

Add.	Subtract.
340 + 97 + 16 823	76 092 − 1 459
340 97 +16 823 17 260 17 260	76 092 −1 459 74 633 74 633

7

At Olly School they need 1 teacher for every 25 students.
How many teachers do they need for 275 students? 11

$$25\overline{)275}\quad 11$$

10 teachers for 250 students
1 teacher for 25 students
11 teachers for 275 students

During lunch time at school, they need help from 2 mothers for every 10 kindergarten students. How many mothers do they need for 40 kindergarten students? 8

$$10\overline{)40}\quad 4 \text{ and } 2 \times 4 = 8$$

8

Complete.

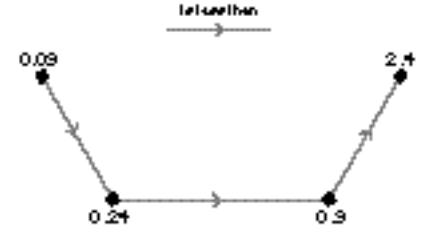

= 0.9


= 0.09


= 2.4


= 0.24

Label these dots with the four numbers above.

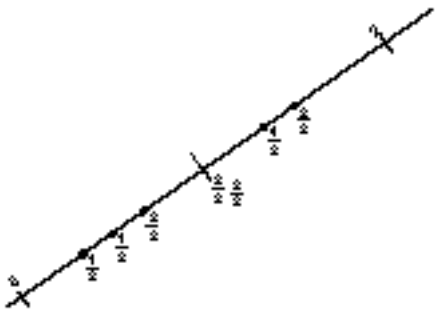


9

Using a ruler, draw a dot for each of these numbers on the number line.

$\frac{1}{3}$ $\frac{2}{3}$ $\frac{3}{3}$ $\frac{4}{3}$

$\frac{1}{2}$ $\frac{2}{2}$ $\frac{3}{2}$



10

Put a one-digit number in each box to make the calculations correct.

$$\begin{array}{r} 7\,6\,\square \\ \times\quad 3 \\ \hline 2\,3\,\square\,4 \end{array}$$

$$\begin{array}{r|l} \square\,\square & R=\square\,\square \\ \hline 43\overline{)1\,1\,3\,7} & \\ -\square\,\square\,0 & \square\,0 \\ \hline \square\,7\,\square & \\ -\square\,5\,\square & \square \\ \hline \square\,\square & \end{array}$$

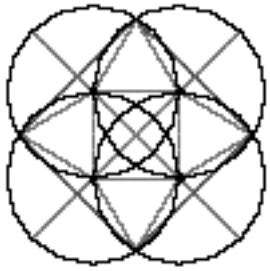
Multiply.

$$\begin{array}{r} 8\,4 \\ \times\ 4\,7 \\ \hline 5\,8\,8 \\ 3\,3\,6\,0 \\ \hline 3\,9\,4\,8 \end{array}$$

Divide.

$$\begin{array}{r|l} & 3\,5\,0\ \ R=27 \\ \hline 76\overline{)2\,6\,6\,2\,7} & \\ 2\,2\,8\,0\,0 & 3\,0\,0 \\ \hline 3\,8\,2\,7 & \\ 3\,8\,0\,0 & 5\,0 \\ \hline 2\,7 & \end{array}$$

11



Do not use a ruler to measure in doing these problems.

1) The blue segments all have the same length. Draw more blue segments in the picture so that all of the blue segments have the same length.

2) Use red to draw another set of line segments in the picture so that all of the red segments have the same length.

3) Use green to draw a third set of line segments in the picture so that all of the green segments have the same length.

There are other possibilities for the sets of red and green segments.

12

Complete.

$3 \times 18 = \boxed{54}$

$3 \times 1.8 = \boxed{5.4}$

$3 \times 0.18 = \boxed{0.54}$

$8 \times 910 = \boxed{7280}$

$8 \times 91.0 = \boxed{728.0}$

$8 \times 9.10 = \boxed{72.80}$

$8 \times 0.910 = \boxed{7.280}$

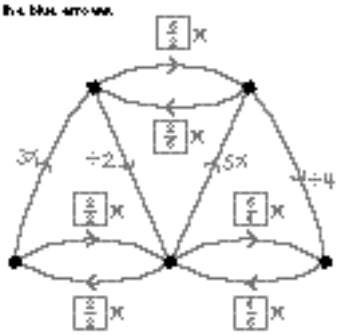
$7 \times 6 = \boxed{42}$

$0.7 \times 6 = \boxed{4.2}$

$0.7 \times 0.6 = \boxed{0.42}$

13

Label the blue arrows.



Complete these calculations.

$\frac{3}{2} \times 18 =$ 27 $\quad \frac{2}{5} \times 30 =$ 12

$\frac{2}{3} \times 18 =$ 12 $\quad \frac{5}{2} \times 30 =$ 75

$\frac{5}{4} \times 40 =$ 50 $\quad \frac{4}{5} \times 40 =$ 32

14

Timely Questions

Show your work for each problem in the space provided.

1. Mr. Gherchen works $7\frac{1}{2}$ hours each day and also has a 40-minute lunch break. If she begins work at 7:45 AM, what time does she finish? 3:55 PM
(Please remember to indicate AM or PM)

7 hr. 30 min. + 40 min. = 8 hr. 10 min.

7:45 AM $\xrightarrow{+8 \text{ hr. } 10 \text{ min.}}$ 3:55 PM

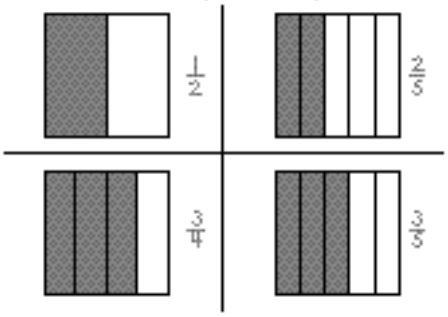
2. Eunice is 11 years and 11 months old and her mother is 36 years and 2 months old. How old would Eunice's mother have been when she was born? 24 years 3 months

$$\begin{array}{r} 36 \text{ years } 2 \text{ months} \\ -11 \text{ years } 11 \text{ months} \end{array} \rightarrow \begin{array}{r} 35 \text{ years } 14 \text{ months} \\ -11 \text{ years } 11 \text{ months} \\ \hline 24 \text{ years } 3 \text{ months} \end{array}$$

There are many good ways to solve these problems.

15

Color in one of the indicated fractional part of each square. Use a ruler to divide the squares accurately.

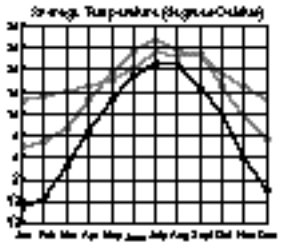


Draw all of the possible red arrows between these numbers.

Left is less than

Other divisions of the square and other colorings are possible.

16



Minneapolis Washington, D.C. Los Angeles

What is the average February temperature in Minneapolis? -8°C

How much colder is Minneapolis than Los Angeles in September? 7°C

In January? 24°C

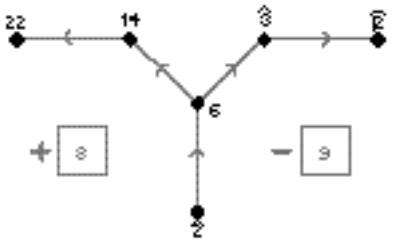
In which month is Minneapolis's average temperature closest to Los Angeles's? June How close? 1°C

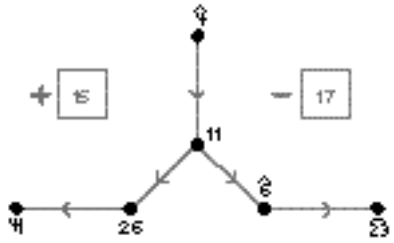
In which months is Washington's average temperature below 4°C?
January, February, March, November, December

In which months is Los Angeles's average temperature more than Washington, D.C.'s?
January, February, and December

17

Fill in the boxes to the arrows. Label the dots.





13

How Old?

Lillian is 8 years older than Gina. The sum of their ages is 30 years. How old is Lillian? 19 Gina? 11

19 − 11 = 8
19 + 11 = 30

How Rich?

Andre has exactly ten coins in his pocket. He has only dimes and quarters. If he has $2.05, how many quarters does he have? 7 dimes? 3

7 x $0.25 = $1.75
3 x $0.10 = $0.30

$1.75
$0.30
$2.05

The work here shows that the given solution is correct, not how to get it. Most students will use guess-and-check techniques.

19

Fill in the boxes.

$\frac{1}{2} = \frac{7}{14} = \frac{\boxed{4}}{8} = \frac{3}{\boxed{6}} = \frac{\boxed{5}}{10} = \frac{13}{\boxed{26}}$

$\frac{3}{5} = \frac{9}{15} = \frac{\boxed{6}}{10} = \frac{15}{\boxed{25}} = \frac{\boxed{30}}{50} = \frac{21}{\boxed{35}}$

Complete. You may use the different names for $\frac{1}{2}$ and $\frac{3}{5}$ at the top of this page.

$\frac{3}{5} + \frac{1}{2} = \underline{\frac{6}{10} + \frac{5}{10} = \frac{11}{10} = 1\frac{1}{10}}$

$\frac{3}{5} - \frac{1}{2} = \underline{\frac{6}{10} - \frac{5}{10} = \frac{1}{10}}$

20

Scale: 1 cm on the map = 100 kilometers

1. On the map, what is the length of the line segment between El Paso and Midland? 3 cm
What is the actual distance between El Paso and Midland? 300 km

2. On the map, what is the length of the line segment between Dallas and Houston? 3.5 cm
What is the actual distance between Dallas and Houston? 350 km

3. If an airplane flies 600 kilometers in 1 hour, about how long should the flying time be from El Paso to Midland? (Circle the closest answer.)
30 minutes 1 hour 20 minutes 1 hour 50 minutes

4. If an airplane flies 400 kilometers in 1 hour, about how long should the flying time be from Dallas to Houston? (Circle the closest answer.)
30 minutes 1 hour 10 minutes 1 hour 20 minutes

21

2780

2780 is divisible by which of these numbers? Circle your answers.

(1)	(9)	4
(3)	(6)	8

1010

1010 is divisible by which of these numbers? Circle your answers.

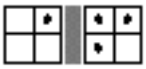
(2)	3	(5)
(10)	4	6

22

Dano is a secret number.

Clue 1

Dano can be put on the Minicomputer by adding just a ② checker.



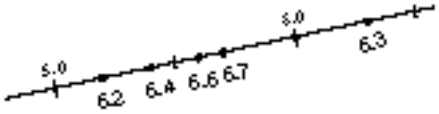
Dano could be 5.6, 5.8, 6.2, 7.0, 7.4, 9.4, 13.4, or 21.4.

Clue 2

Dano could be 5.6, 6.2, 7.4, or 13.4.

Clue 3

Dano is one of the dots on this number line.



Who is Dano? 5.6

23

A city council must choose a committee of three people from five eligible members: Arlene, Bret, Carla, Dinah, and Ed. The selection is not easy because some members refuse to serve if others are on the committee with whom they have close friendships.

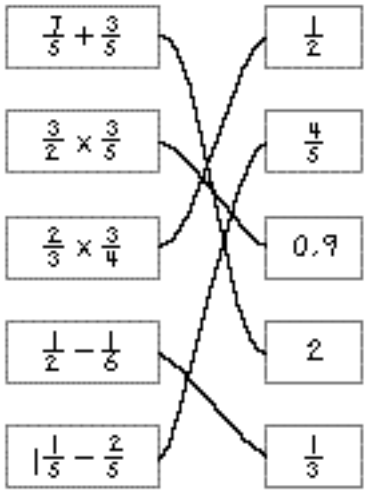
- Arlene will serve on the committee with anyone.
- Bret won't serve on the committee with Arlene.
- Carla will serve on the committee only if Bret and Dinah also serve.
- Dinah won't serve if Arlene or Carla also serve.
- Ed won't serve unless Dinah also serves.

Can you select a committee of three people so that everyone is satisfied?

Who is on your committee? Bret, Dinah, Ed

24

Match each ending with a blue leg.

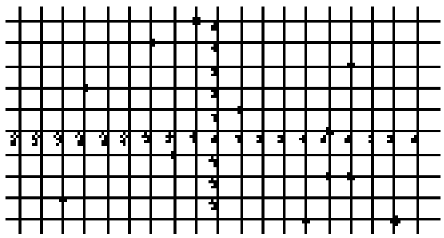


25

Tim and Tam are whole numbers.

Clue 1

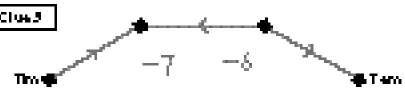
(Tim, Tam) is one of the dots on this grid.



Clue 2 Tim + Tam > 3

(Tim, Tam) could be (1, 5), (5, 0), (5, 3), (5, 2) or (3, 4)

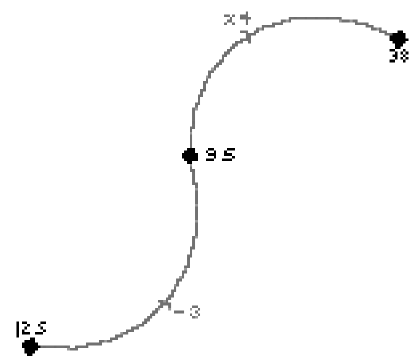
Clue 3



(Tim, Tam) is (5, 2)

26

Build a road from 12.5 to 38 with two arrows. Each arrow must be for +, −, ×, or ÷ a one-digit whole number.



27

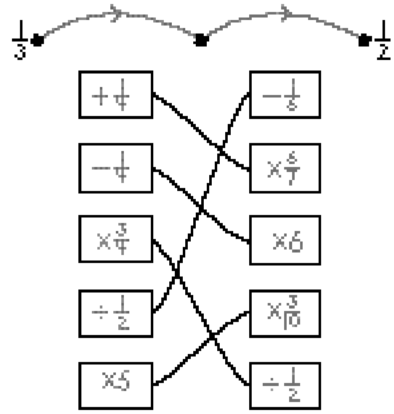
Amy shovels the sidewalk three times as fast as her little brother. If they clear a sidewalk 16 meters long, what length does Amy clear? 12 m
What length does her little brother clear? 4 m

3 × 4 = 12

4 + 12 = 16

The work here shows that the given solution is correct, not how to get it. Most students will use guess-and-check techniques.

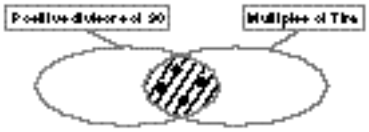
Pair the legs.



29

This is a secret whole number.

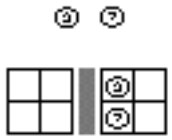
Clue 1



Tina could be 2, 3, or 5.

Clue 2

Tina can be put on this Mini-computer with exactly two two checkers.



Who is Tina? 3

Another way to put on 3 is with the ②-checker on the 0,1-square and the ⑦ ②-checker on the 0,1-square.

Complete.

$11^0 = 1$
$11^1 = 11$
$11^2 = 121$
$11^3 = 1331$
$11^4 = 14641$
$11^5 = 161051$
$11^6 = 1771561$
$11^7 = 19487171$

Describe patterns you notice.

The ones digit is always 1.
The tens digit goes up by 1 each time.

Digits look like a row of Pascal's triangle.

Complete.

	Sum of digits
$f = 1$	1
$1f = 121$	4
$11f = 12321$	9
$111f = 1234321$	16
$1111f = 123454321$	25

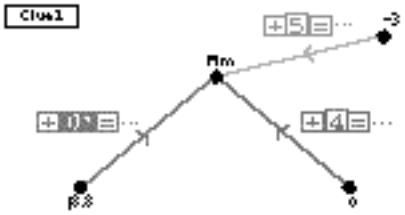
Predict. $1111111f =$ 1234567987654321 81

Describe patterns you notice.

The digits in the square increase by one up to the number of digits in the number being 81 squared and then decrease by one back to 1. The sum of the digits is a square number.

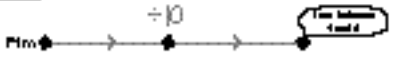
Pim is a secret number.

Clue 1



Pim could be 32, 92, 152, 212, 272, 332, 392, 452 and so on.

Clue 2



Who is Pim? 452

82

Capsule Lesson Summary

While reading the storybook *A Very Strange Neighborhood*, explore the ordering and density of decimal numbers. Through a detective story about a lost number sending radio signals, introduce a new kind of number, an *irrational* number.†

Materials

Teacher	• Colored chalk • Meter stick	**Student**	• *A Very Strange Neighborhood* Storybook

Description of Lesson

Begin with a discussion of different kinds of numbers, asking students to describe or give examples. Students should mention whole numbers, negative integers, and rational numbers. Write students' examples on the board; for example:

$$17 \qquad \widehat{82} \qquad \frac{5}{7} \qquad 8.2$$

If no suggestion uses a repeating decimal name such as $0.\overset{*}{3}$ or $5.1\overset{*}{\overline{462}}$, ask,

T: ***Do you remember a name for ⅓ that we said was a kind of decimal "nickname"?***

S: ***0.333 … or $0.\overset{*}{3}$.***

Write this expression on the board.

$$5.1\overset{*}{\overline{462}}$$

T: ***What does this notation mean?***

S: ***The digits 4, 6, and 2 repeat. We could write 5.1462462462 ….***

T: ***You already know many different kinds of numbers. Today we will read a story about a new kind of number.***

Distribute copies of the storybook *A Very Strange Neighborhood*. Read the story with your class. Questions based on the mathematical ideas are suggested below. Use the questions carefully to enhance, not diminish, the spirit of the story. By keeping the discussions brief, you should finish the storybook in one lesson. At a later time, you or your students may wish to discuss further some of the ideas.

Pages 1–4

Read pages 1 to 4 collectively.

T: ***Are there other numbers between 7 and 8?***

S: ***7.1, 7.2, 7.4, 7.6, and 7.9.***

Ask students to point to the unlabeled mark for each of these numbers on page 4.

† For your information only: rational numbers are numbers which have fractional names; for example, ½, 2 (2⁄1), and 5.02 (502⁄100) are rational numbers. Irrational numbers do not have fractional names, although they can be found on the (real) number line.

T: ***Any others?***

S: ***7.06, 7.29, and 7.84.***

S: ***7⅔.***

T: ***Are there numbers between 7.7 and 7.8?***

S: ***Yes, 7.74 and 7.79.***

S: ***7.715.***

S: ***7¾.***

Pages 5–6

Read pages 5 and 6 together.

T: ***On page 6 of your storybook, point to the mark on the number line for 7.73.***

Check that students are pointing to the correct mark.

Page 7

Read page 7 together.

T: ***Are there exactly nine numbers between 7.7 and 7.8?***

S: ***No; there are many more, for example, 7.727 and 7.70622.***

S: ***There are infinitely many numbers between 7.7 and 7.8.***

Page 8

Read page 8 together. Point out that the number line has been magnified again. Now only the numbers from 7.7 to 7.8 are shown.

Page 9

Read page 9 together.

T: ***Marks for many of the numbers between 7.7 and 7.8 are shown on this number line, but they are not labeled. What are some of the numbers at these marks?***

S: ***7.732.***

T: ***Where is 7.732 on the number line?***

S: ***Between 7.73 and 7.74; the second mark above 7.73.***

Let several students point out other numbers between 7.7 and 7.8.

Pages 10–11

Read pages 10 and 11 together.

T: ***Does the story ever end?***

S: ***No, you can always find more numbers between 7 and 8.***

Pages 12–14

Read pages 12 to 14 collectively.

T: ***Look at the spiral and try to figure out its rule. What would be the next number if we were to continue the spiral?***

S: ***7.888888.***

T: ***What numbers would come after 7.888888?***

S: ***Then 7.8888882, 7.8888884, 7.8888886, and so on.***

T: ***Can you explain the rule?***

There are several correct explanations, but "add 2 to the last digit" is not correct.

S: ***Start at 7. Add 0.2 four times; then add 0.02 four times; and so on.***

S: ***Add 2 to the last digit each time, except when the last digit is 8. Then add another decimal place by putting 2 at the end.***

Page 15

Read page 15 together.

T: ***What is the rule in the upper part of this snake dance?***

S: ***Put another 4 on the end of a number to get the next number.***

T: ***What is the rule in the lower part?***

S: ***Take off a 6 from the end of a number to get the next number.***

T: ***Is there a smallest number in this snake dance?***

S: ***Yes, 7.4.***

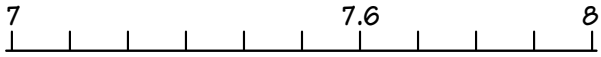
T: ***Is there a largest number?***

S: ***No. Although 7.666666666666 is the largest number shown on the page, the dance goes on.***

Draw this part of the number line on the board. Make the segment from 7 to 8 one meter long.

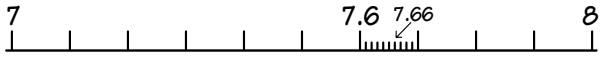
T: ***Who can point to where 7.6 is on this number line?***

Suggest that students use a meter stick to divide the segment from 7 to 8 into ten pieces of equal length.



T: ***Where is 7.66 on this number line?***

Again, suggest that students divide the segment from 7.6 to 7.7 into ten pieces of equal length.



T: ***Where is 7.666?***

S: ***Just to the right of 7.66.***

S: ***Between 7.66 and 7.67.***

T: ***Where is 7.6666?***

S: ***Between 7.666 and 7.667.***

T: ***These numbers in the snake dance, 7.6, 7.66, 7.666, and so on, are getting closer and closer to some number. That number has a fractional name. What number is it?***

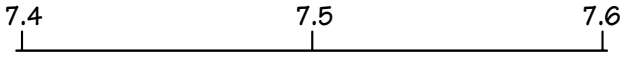
S: ***$7\frac{2}{3}$, because $0.666\ldots = 0.\overset{*}{6} = \frac{2}{3}$.***

If no one suggests $7\frac{2}{3}$, remind the class that $0.\overset{*}{3} = 0.333 = \frac{1}{3}$, and ask about a fraction for $0.\overset{*}{6}$. Lead the class to observe that $7.666\ldots = 7.\overset{*}{6} = 7\frac{2}{3}$.

T: ***If we start at 7.6 on the spiral and follow the arrows backwards, we get closer and closer to $7\frac{2}{3}$, but we never reach $7\frac{2}{3}$.***

Page 16

Read page 16 together, and draw this part of the number line on the board.



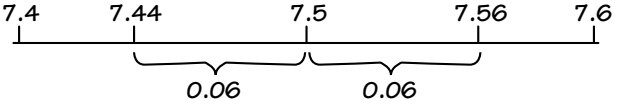
T: ***7.5 is exactly halfway between 7.4 and 7.6. Can you suggest two other numbers that 7.5 is exactly halfway between?***

S: ***7 and 8.***

S: ***7.3 and 7.7.***

S: ***7.44 and 7.56.***

Use the idea of distance from 7.5 to generate or confirm some answers; for example:



Depending on student interest, you may wish to challenge them to find pairs of numbers even closer to 7.5 which have 7.5 as their midpoint; for example, 7.49 and 7.51, 7.495 and 7.505, or 7.499 and 7.501.

Pages 17–20

Read pages 17 to 20 collectively.

T: ***So far in the story, you already know all of the numbers we have met. $7.\overset{*}{6}$ and 7.5000001 are somewhat unusual, but they are not new to you. Now we are going to meet a new kind of number.***

Pages 21–22

Read page 22.

T: ***This sad number is singing a strange song: "Bing, bang, bing, bing, bang; bing, bing, bing, bang; and so on." What number could be sending this message?***

Accept a few suggestions about what the sounds could mean.

Pages 23–26

Read pages 23 to 26 collectively. Refer to the last number, 7.5155155515555, on the red arrow road.

T: ***What would be the next number on the red arrow road?***

S: ***7.51551555155551.***

T: ***How can we get the next number?***

S: ***Put five 5s on the end of the new number.***

T: ***How can we get the next numbers?***

S: ***Put another 1 at the end.***

S: ***Then put six 5s.***

T: ***Who can explain the pattern?***

S: ***You alternate between putting on a 1 and putting on a group of 5s. Each time you put on 5s, you put on one more than the last time.***

T: ***And we could keep on going. Could we use the $*$-notation to write a shorthand name for the number we are heading towards?***

After a few attempts, students should conclude that it is impossible since no one part of the number is repeated; that is, one more 5 is used each time. Students might suggest some more elaborate abbreviations, such as $7.5\overset{+5}{\overline{155}}$. Accept these suggestions as possible notations, but mention that there is no standard notation for this type of number and that it would be impractical to invent a new notation for each non-repeating pattern we could imagine.

T: ***Now can anyone explain the "bing-bang" song?***

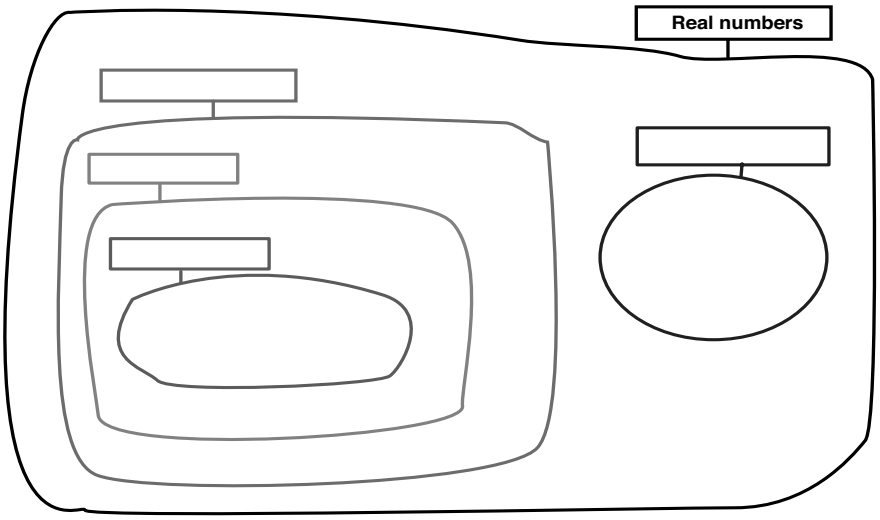
S: ***The number is trying to signal its name. Each bing is for a 5 and each bang is for a 1.***

Pages 27–30

Complete the story by reading pages 27 to 30 collectively. Let students comment on the story.

Optional Activity

Draw the following string picture on the board.



T (pointing to the black string): ***All of the numbers you know about are called*** **real numbers.** ***When you were very young, you first learned about numbers like 0, 1, 2, 10, and 100. These are called*** **whole numbers.**

Label the red string **Whole numbers**, and put a few examples of whole numbers inside the red string.

T: ***Then in first grade (in CSMP) you learned about negative numbers like $\widehat{1}$, $\widehat{42}$, and 30 418. When we combine these negative numbers and the whole numbers, we get a set of numbers called*** **integers.**

Label the blue string **Integers**, and put some examples of negative integers inside the blue string but outside the red string.

T: ***You next learned about fractions, decimal numbers like 6.02 and $\widehat{8.5}$, and a few unusual numbers like*** $7.\dot{6}$ ***and*** $5.1\dot{4}\dot{6}\dot{2}$ ***. These numbers, along with the integers, are called*** **rational numbers.**

Label the green string **Rational numbers**, and put some examples of non-integer rational numbers inside the green string but outside the blue string. (See the next illustration.)

T (pointing to the purple string)**:** ***The number we met today, 7.515515551…, is an example of another kind of real number which is not a rational number. When we try to use decimal writing for this kind of number there is no end and no pattern that repeats. Numbers of this kind are called*** **irrational numbers.**

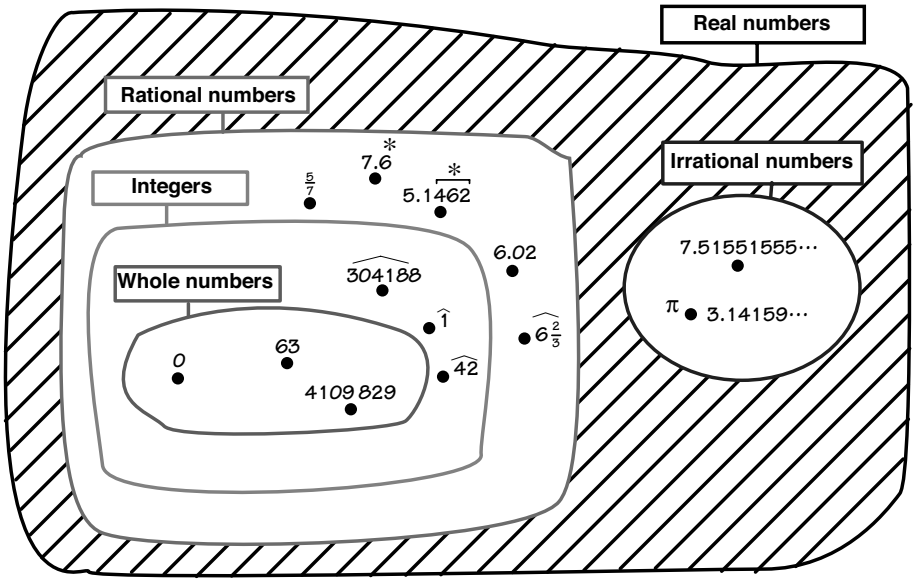
Label the purple string **Irrational numbers**, and put 7.515515551… inside the purple string.

T: ***There are infinitely many irrational numbers. You have already met one other irrational number this year. Does anyone remember another number we talked about in some geometry lessons that, when we try to use decimal writing, does not end and does not repeat?***

S: ***π (read as "pi").***

Put π inside the purple string. If time allows, invite students to suggest a few more examples of irrational numbers.

Hatch the indicated region of the string picture.



T (pointing to the hatching)**:** ***All real numbers are either rational numbers or irrational numbers. There are still numbers that are not real numbers,† however, you will not learn about these numbers for some time.***

†The *complex* numbers are one example of a set of numbers that contains numbers that are not real numbers.

Capsule Lesson Summary

Compare two numbers without doing any of the indicated calculations. Begin the workbook *Collage of Problems #2*. (This is the first of two lessons using this workbook.)

Materials

Teacher	• None	Student	• *Collage of Problems #2* Workbook • Colored pencils, pens, or crayons • Metric ruler • Compass • Square corner • Calculator

Description of Lesson

Write the following symbols on the board. Ask students to read these symbols.

$<$ $=$ $>$

Pose several comparison problems where you ask students to put one of these three symbols between two number expressions. (Answers are in boxes.) In each case, encourage students to make the comparisons without doing the calculations.

$1658 + 749$	$\bullet$	$926 + 1658$
$311 - 76$	$\bullet$	$311 - 47$
$\frac{1}{5}$	$\bullet$	$\frac{1}{20}$
0.5	$=$	$\frac{2}{4}$
46	$\bullet$	0.78×46

Invite students to explain their answers.

S: ***1 658 + 749 is less than 926 + 1658 because 749 is less than 926 and each number (749 and 926) is being added to 1658.***

S: ***311 – 76 is less than 311 – 47. Each number, 76 and 47, is being subtracted from 311. Since 76 is greater than 47, we take away more if we subtract 76. So 311 – 76 is less than 311 – 47.***

S: ***⅕ of something is more than 1/20 of the same thing, so ⅕ is greater than 1/20.***

S: ***0.5 and ²⁄₄ are both the same as ½, so 0.5 equals ²⁄₄.***

S: ***46 is greater than 0.78 x 46 because 0.78 is less than 1. When we multiply 46 by a number less than 1, the result is less than 46.***

Distribute copies of the workbook *Collage of Problems #2*, and let students work independently for the rest of the class period. If many students are having difficulty with a particular problem, you may wish to have a collective discussion about that problem. Students who reach page 11 may like to skip that page temporarily as it will be discussed in Lesson W5.

At the end of the class period, collect the workbooks for your review. They will be used again in Lesson W5.

Capsule Lesson Summary

Collectively solve a logic problem from *Collage of Problems #2*. Continue individual work in the workbook. (This is the second of two lessons using this workbook.)

Materials

Teacher	Student
• None	• *Collage of Problems #2* Workbook • Colored pencils, pens, or crayons • Compass • Metric ruler • Square corner • Calculator

Description of Lesson

Return students' copies of the workbook *Collage of Problems #2*. Instruct everyone to turn to page 11 and to read the problem. Allow a few minutes for students to think about the problem.

T: ***Which box contains the $100 bill? Why?***

If during class discussion students do not arrive at a clear explanation, proceed with the following dialogue.

T: ***Suppose that Maestro puts the $100 bill into the Gold Box. If he does this, how many of the three statements would be true?***

S: ***Two. The statements on the Gold Box and on the Silver Box would be true.***

S: ***The statement of the Lead Box would be false.***

T: ***Did Maestro put the $100 bill in the Gold Box?***

S: ***No, that would make two statements true, and we know that only one of the statements is true.***

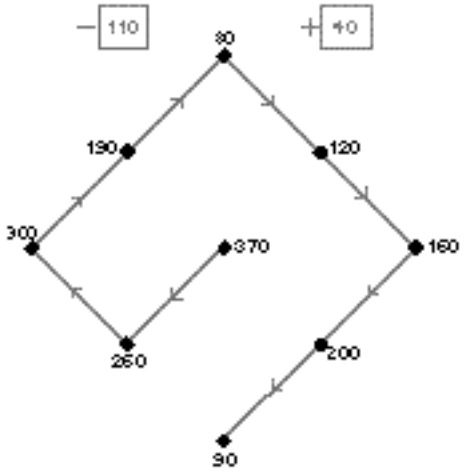
In a similar manner, consider the possibilities of Maestro putting the money in the Silver Box and in the Lead Box. Conclude that Maestro put the $100 in the Silver Box since then the only true statement is the statement on the Lead Box.

Ask students to correct or complete pages from the previous week's work, and then to continue working in their workbooks. You may wish to have a collective discussion about some problems that were difficult for many students the first week. At the end of the class period, collect the workbooks for your review. After checking the workbooks, you may wish to ask some students to work further in their workbooks during a study time or to take them home as an assignment.

Assessment Activity

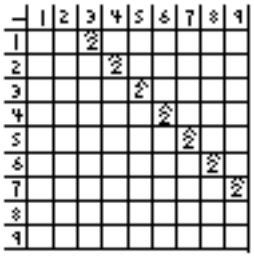
An individual student progress record for the workbook is available on Blackline W5. You may like to use this form to monitor student work.

Fill in the boxes for the arrows and label the dots.



2

Find all of the places in the table where the only is ☆.
One is to ask for you.

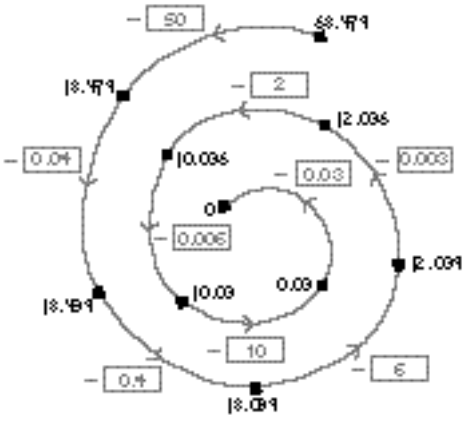


Did you find the other six places where the only is ☆? YES

3

Wipe-out

Fill in the boxes for the arrows.



4

Fill in each box with <, >, or =. Try to solve these problems without doing any calculation.

$782 + 149 \;\boxed{<}\; 782 + 188$

$621 - 17 \;\boxed{>}\; 621 - 84$

$567 + 138 + 495 \;\boxed{>}\; 316 + 567 + 138$

$71 - 25 \;\boxed{=}\; 73 - 27$

$0.82 \;\boxed{>}\; 0.135$

$0.94 \times 765 \;\boxed{<}\; 765$

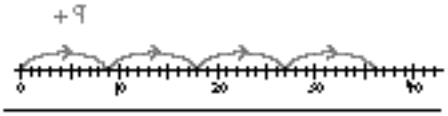
$\frac{1}{3} \;\boxed{>}\; \frac{1}{8}$

$\frac{5}{7} \;\boxed{>}\; \frac{2}{7}$

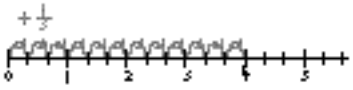
5

Draw arrows on each number line to show the solution to each problem.

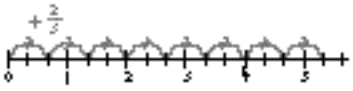
$36 \div 9 = 4$



$4 \div \frac{1}{3} = 12$

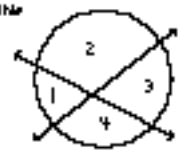


$5\frac{1}{3} \div \frac{2}{3} = 8$



6

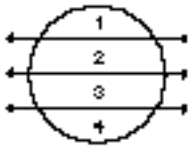
Using two lines, this circle is divided into four regions.



Use five straight lines to divide this circle into as many regions as you can.

How many regions? 7

Use four straight lines to divide this circle into as few regions as you can.



See page 20 for another style solution.

How many regions? 4

Note: To divide the circle, a line must intersect it in more than one point.

Show your work in the space provided.

Add.

$4.76 + 2.8$

$$\begin{array}{r} 4.76 \\ +2.80 \\ \hline 7.56 \end{array}$$

Subtract.

$4.76 - 2.8$

$$\begin{array}{r} 4.76 \\ -2.80 \\ \hline 1.96 \end{array}$$

Multiply.

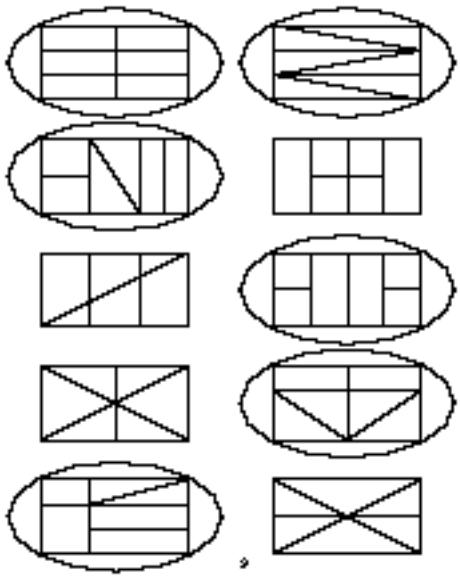
4.76×2.8

$$\begin{array}{r} 476 \\ \times\ 28 \\ \hline 13328 \end{array} \quad \begin{array}{c} \xrightarrow{\times 100} \\ \xrightarrow{\times 10} \\ \xrightarrow{\times 1000} \end{array} \quad \begin{array}{r} 4.76 \\ \times\ 2.8 \\ \hline 13.328 \end{array}$$

Students' work may vary. Accept any correct method.

8

Circle each picture that shows a rectangle divided into sixths.



9

Complete.

10% of 60 = 6 2% of 60 = 1.2

50% of 60 = 30 20% of 60 = 12

2.5% of 60 = 15 100% of 60 = 60

Use the facts above to solve these problems.

60% of 60 = 36 35% of 60 = 21

120% of 60 = 72 90% of 60 = 54

1% of 60 = 0.6 22% of 60 = 13.2

11% of 60 = 6.6 42% of 60 = 25.2

10

Mejatro the Magician put a $100 bill into one of these boxes. The other two boxes are empty.

Mejatro correctly tells you that exactly one of the statements on the boxes is true.

Which box contains the $100 bill? Silver

Which box has the true statement written on it? Lead

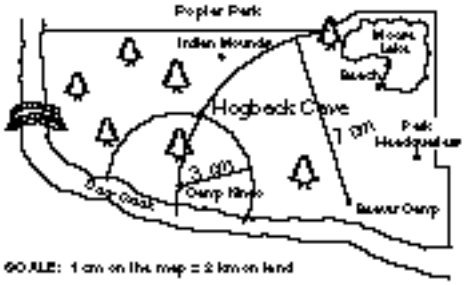
11

Complete these two division calculations.

	133 R=19	
48)	6403	
−	4800	100
	1603	
−	1440	30
	163	
−	144	3
	19	

	706 R=5	
21)	14831	
−	14700	700
	131	
−	126	6
	5	

12



SCALE: 1 cm on the map = 2 km on land

1. On the map, what is the length of a line segment between Camp Kinoo and Moose Lake Beach? 9 cm
What is the actual distance between Camp Kinoo and Moose Lake Beach? 18 km

2. If a hiker walks 4 km in one hour, how long should she take to walk from Camp Kinoo to Moose Lake Beach? 4½ hours
From Moose Lake Beach to the Indian Mounds? 3¼ hours

length on map = 6½ cm, so actual distance = 13 km

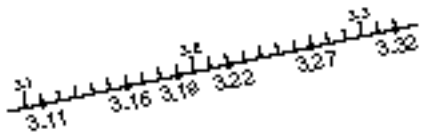
3. Hogback Cove in Poplar Park is 6 km from Camp Kinoo and 14 km from Beaver Camp. Find the location of Hogback Cove, draw a dot, and label it.

13

Line is a secret number.

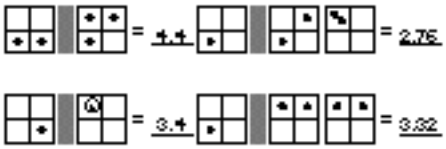
Clue 1

Line is one of the dots on this number line. Label the dots.



Clue 2

Line is one of these numbers.



Who is Line? 3.32

14

Timely Questions

Show your work in the space provided.

1. Lloyd takes a 5 hour and 40 minute bus ride from Chicago to St. Louis to see a football game. If he leaves Chicago at 8:30 AM, what time will he arrive in St. Louis? 2:10 PM
(Don't forget to indicate AM or PM)

8:30 AM —(+5 hrs. 40 mins.)→ 2:10 PM

2. Your heart beats about 80 times per minute.
About how many times does it beat in one day? 115,200
one year? 42,048,000

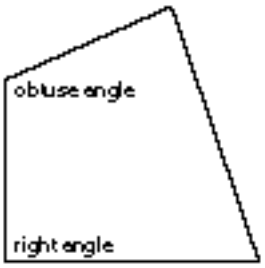
60 min. per hr. × 24 hr. per day = 1440 min. per day

1440 min. per day × 365 days per yr. = 525,600 min. per yr.

1440 × 80 = 115,200 525,600 × 80 = 42,048,000

15

Draw a quadrilateral (four-sided polygon) with at least one right angle and at least one obtuse angle.



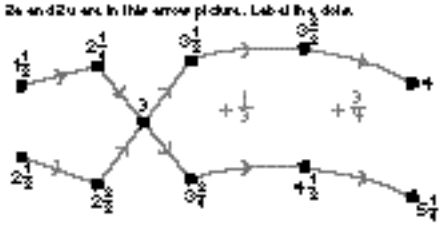
Other solutions are possible.

16

2a and 2u are secret numbers.

Clue 1

2a and 2u are in this arrow picture. Label the dots.



Clue 2

Who is 2a? 2 1/4 Who is 2u? 2 1/2

17

A Pair of Problems

1. There are 120 eighth graders in Jackson Middle School. If there are 12 more girls than boys in the eighth grade, how many girls are there? __66__ Boys? __54__

$66 + 54 = 120$

$66 - 54 = 12$

2. On a summer day in Tuscaloosa, there are 9 hours more of daylight than of darkness. On that day, how many hours of daylight are there? $16\frac{1}{2}$ Of darkness? $7\frac{1}{2}$

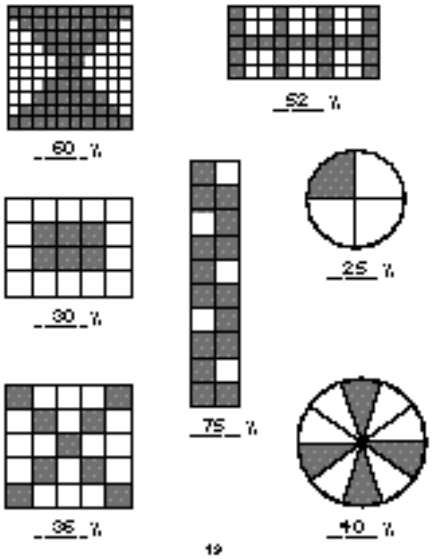
$16\frac{1}{2} - 7\frac{1}{2} = 9$

$16\frac{1}{2} + 7\frac{1}{2} = 24$

The work here shows that the given solution is correct, not how to get it. Most students will use guess-and-check techniques.

18

What percent of each shape is colored blue?



60 %

52 %

30 %

25 %

75 %

36 %

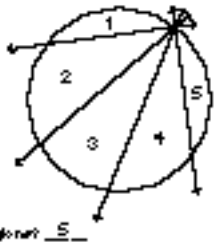
40 %

19

Use four lines to divide this circle into <u>seven</u> regions as you can.

How many regions? 11

Use four lines to divide this circle into <u>eight</u> regions as you can.

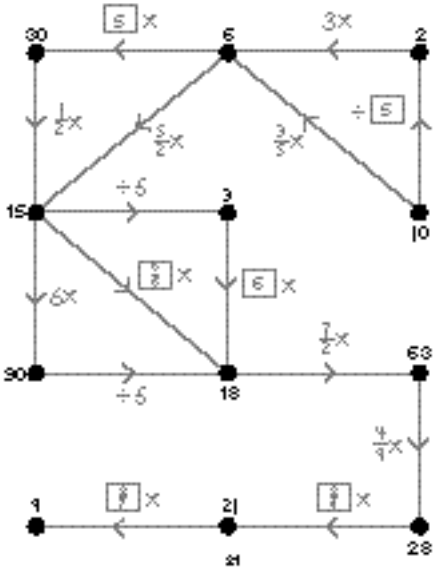


See page 7 for another style solution.

How many regions? 5

Note: To divide the circle <u>at all</u> a line must intersect it in more than one point.

Label the dots and fill in the boxes for the arrows.



Rim is a secret number.

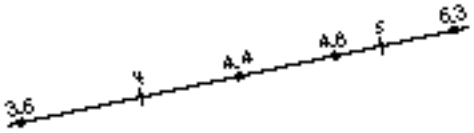
Clue 1

Rim can be put on the MiniComputer by adding one register checker.

Rim could be 3.7, 3.8, 4, 4.4, 4.6, 5.6, 7.6, or 11.6

Clue 2

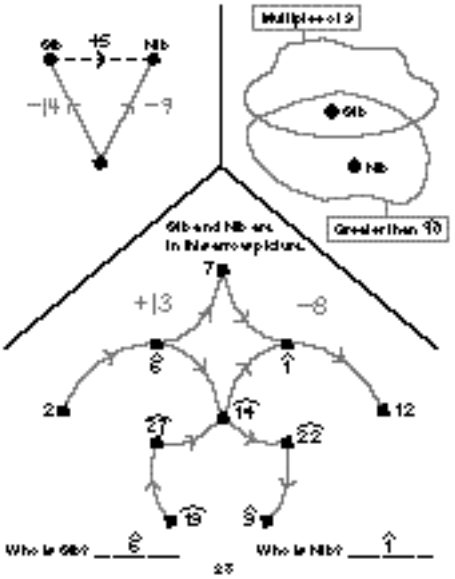
Rim is one of the dots on this number line. Label the dots. (Use a ruler.)



Who is Rim? 4.4

22

Gib and Nib are secret numbers.



Who is Gib? 6 Who is Nib? 1

23

Ask your teacher to check your answers on pages 17 and 20. Use correct answers to fill in the boxes in this table.

Number of line segments	1	2	3	4	5	6
Maximum number of regions	2	4	7	11		

Do you see a pattern? YES Predict the largest number of regions into which you can divide a circle using five line segments. 16

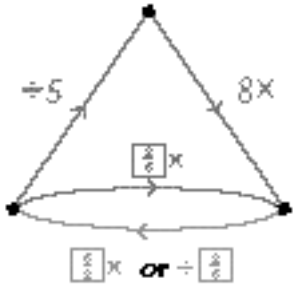
Check your prediction by using five line segments to divide this circle into as many regions as you can.

How many regions? 16 Was your prediction correct? YES

Using the same pattern, predict the largest number of regions into which you could divide a circle using six line segments. 22

24

Fill in the boxes or the arrows.



Complete.

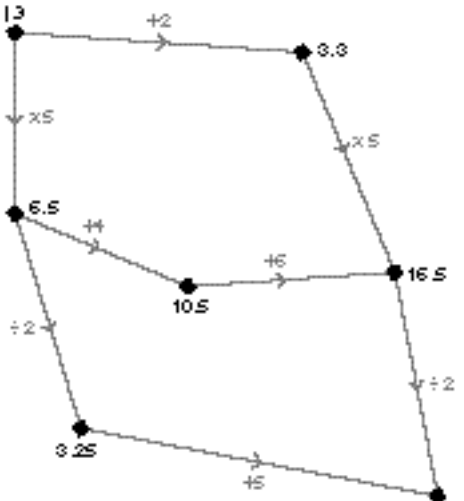
$40 \div \frac{8}{5} = 25$ $40 \div \frac{5}{8} = 64$

$56 \div \frac{8}{5} = 35$ $100 \div \frac{5}{8} = 160$

$\frac{5}{6} \div \frac{8}{5} = \frac{25}{48}$ $\frac{5}{6} \div \frac{5}{8} = \frac{40}{30} = 1\frac{1}{3}$

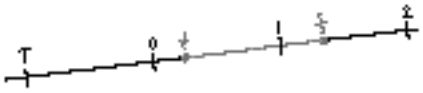
25

Build an arrow road from 1.3 to 8.25. Each arrow must be for +, −, ×, or ÷ a one-digit whole number. Use at most four arrows.



Many solutions are possible. A shortest road has three arrows.

26



Complete the tables and circle the entries that belong to the blue segment.

+	$\frac{1}{2}$	$\frac{5}{4}$
$\frac{5}{4}$	$\frac{5}{4}$	$\frac{5}{2}$
$\frac{3}{5}$	$\frac{11}{10}$	$\frac{31}{20}$
$\frac{2}{5}$	$\frac{9}{10}$	$\frac{33}{20}$

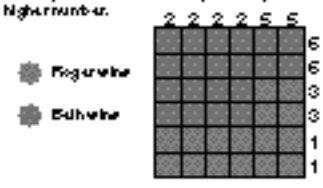
−	$\frac{1}{2}$	$\frac{5}{4}$
$\frac{5}{4}$	$\frac{1}{4}$	0
$\frac{3}{5}$	$\frac{1}{10}$	$\frac{1}{20}$
$\frac{2}{5}$	$\frac{1}{10}$	$\frac{1}{20}$

27

These are the maps of two number cubes.

Roger and Beth play a game with these two cubes; higher number wins. Roger rolls the red cube and Beth rolls the blue cube.

Use this sequence to calculate the probability that Roger rolls the higher number.



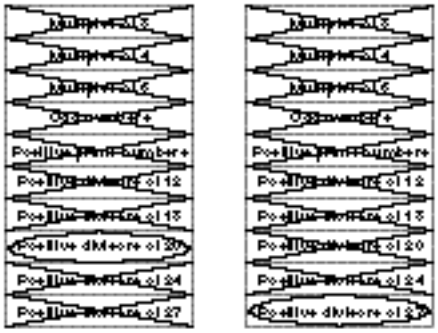
What is Roger's probability of winning? $\frac{16}{36}$, or $\frac{4}{9}$

Who is favored in this game, Roger or Beth? Beth

28

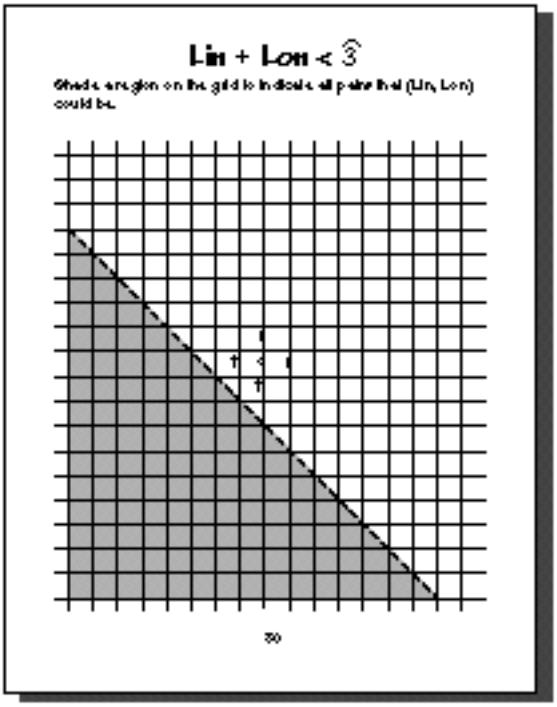
The red label is one of these:

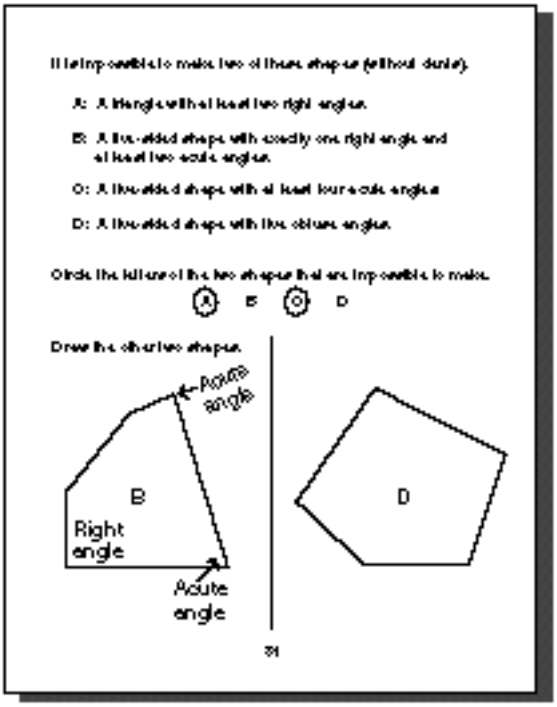
The blue label is one of these:

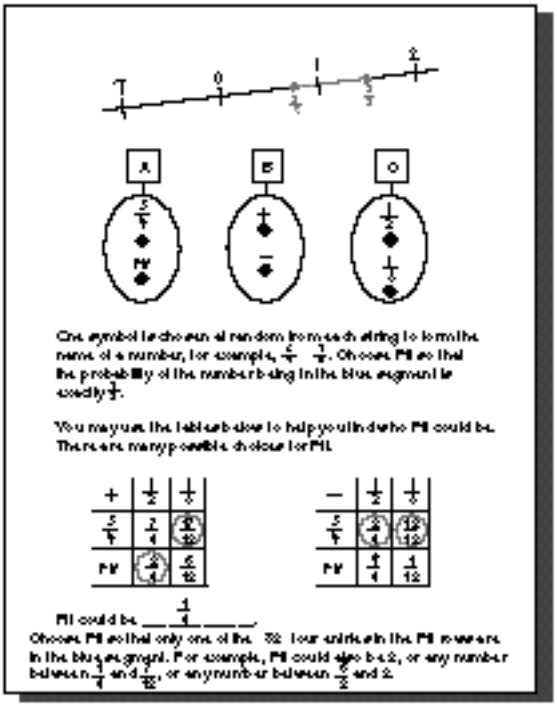


Label the strings.

29


Lin + Lon < 3
Shade one region on the grid to indicate all pairs that (Lin, Lon) could be.
30


It is impossible to make two of these shapes (without duplicating).
A: A triangle with at least two right angles.
B: A five-sided shape with exactly one right angle and at least two acute angles.
C: A five-sided shape with at least four acute angles.
D: A five-sided shape with five obtuse angles.
Circle the letters of the two shapes that are impossible to make.
A B C D
Draw the other two shapes.
Acute angle
B
Right angle
Acute angle
D
31


A
B
C
One symbol is chosen at random from each string to form the name of a number, for example, 5/4 + 1/4. Choose Pill so that the probability of the number being in the blue segment is exactly 1/4.
You may use the table below to help you find what Pill could be. There are many possible choices for Pill.
+ 1/2 1/3
5/4 2 4/3
Pill 3/4 5/12
− 1/2 1/3
5/4 3/4 13/12
Pill 1/4 1/12
Pill could be 1/4.
Choose Pill so that only one of the 32 four-strings in the Pill row ends in the blue segment. For example, Pill could also be 0, 2, or any number between 1/4 and 1/12, or any number between 5/4 and 2.

Capsule Lesson Summary

Count by sixths. Observe the results of successively adding ⅙; then use the results to add fractions with unlike denominators. Begin the workbook *Collage of Problems #3*. (This is the first of two lessons using this workbook.)

Materials

Teacher	Student
• None	• *Collage of Problems #3* Workbook • Colored pencils, pens, or crayons • Compass • Metric ruler • Square corner • Calculator

Description of Lesson

Begin the lesson counting by sixths. Start the count at ⅙ and ask each student, in turn, to name the next fraction. Each time a student says a fraction that has a simpler name (for example, ⅗ or ⅞), pause, and ask for an equivalent (simpler) name (for example, ½ or 1⅙). Complete the counting after each student has participated.

Write these expressions on the board as you ask,

$$\frac{1}{6} + \frac{1}{6} =$$

T: ***What number is ⅙ + ⅙?***

S: ***⅖.***

T: ***What is a simpler name for ⅖?*** (⅓)

Complete the equation, and continue by adding another ⅙.

$$\frac{1}{6} + \frac{1}{6} = \frac{2}{6} = \frac{1}{3}$$

T: ***How many sixths is ⅓ + ⅙? Why?***

S: ***Three, because ⅓ = ⅖ and ⅖ + ⅙ = ⅗.***

$$\frac{1}{3} + \frac{1}{6} = \frac{\quad}{6}$$

T: ***What is a simpler name for ⅗?*** (½)

Continue in the same manner, following this pattern.

$$\frac{1}{6} + \frac{1}{6} = \frac{2}{6} = \frac{1}{3}$$

$$\frac{1}{3} + \frac{1}{6} = \frac{3}{6} = \frac{1}{2}$$

$$\frac{1}{2} + \frac{1}{6} = \frac{4}{6} = \frac{2}{3}$$

$$\frac{2}{3} + \frac{1}{6} = \frac{5}{6}$$

$$\frac{5}{6} + \frac{1}{6} = \frac{6}{6} = 1$$

Then pose this question.

$$\frac{1}{2} + \frac{1}{3} = \frac{\quad}{6}$$

T: ***How many sixths is ½ + ⅓? Why?***

S: ***Five, because ½ = ⅗ and ⅓ = ⅖, so ½ + ⅓ = ⅗ + ⅖ = ⅕.***

Continue with the following problems. (Answers are in boxes.)

$$\frac{5}{6} + \frac{1}{2} = \boxed{\frac{8}{6} = 1\frac{2}{6} = 1\frac{1}{3}}$$

$$\frac{2}{3} + \frac{1}{2} = \boxed{\frac{\quad}{6} = 1\frac{1}{6}}$$

Distribute copies of the workbook *Collage of Problems #3*, and let students work independently for the rest of the class period. If many students are having difficulty with a particular problem, you may wish to have a collective discussion about that problem.

At the end of the class period, collect the workbooks for your review. They will be used again in Lesson W7.

Capsule Lesson Summary

Solve a counting problem to find the number of shortest paths from one corner to the opposite corner of a four-by-four grid square. Continue individual work in the workbook *Collage of Problems #3*. (This is the second of two lessons using this workbook.)

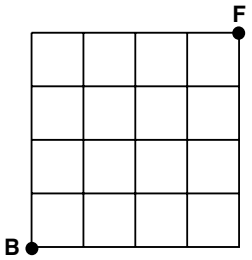
Materials

Teacher
- Grid board (optional)

Student
- *Collage of Problems #3* Workbook
- Colored pencils, pens, or crayons
- Compass
- Metric ruler
- Square corner
- Calculator

Description of Lesson

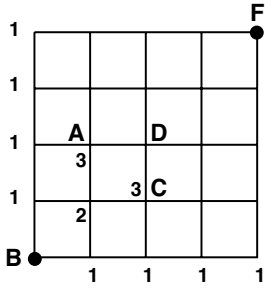
Draw a four-by-four square grid on the board, and present a counting problem to find the number of shortest paths from one corner to the opposite corner. You may put the problem in a context similar to the following.

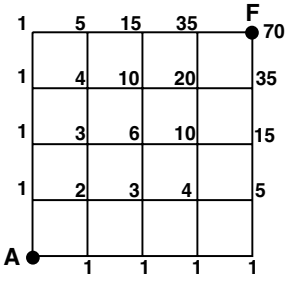


T: ***A bug is at* B *and its food is at* F*. How many shortest paths can it take to get the food.***

Let the class discuss how to solve this counting problem. They should recall a method used in *The Hidden Treasure* from *IG-IV* or in the "Codes" lessons in the L-strand.

- There is one way to get to any intersection directly right or up from **B**.
- There are two ways to get to the corner opposite **B** on the grid square.
- There are three ways to get to **A** (or **C**)—one through the intersection two up (or two right) from **B**, and two through the corner opposite **B** on the grid square.
- Continuing in this way, there are six ways to get to **D** and so on, as indicated in this labeled grid. There are 70 shortest paths from **B** to **F**.





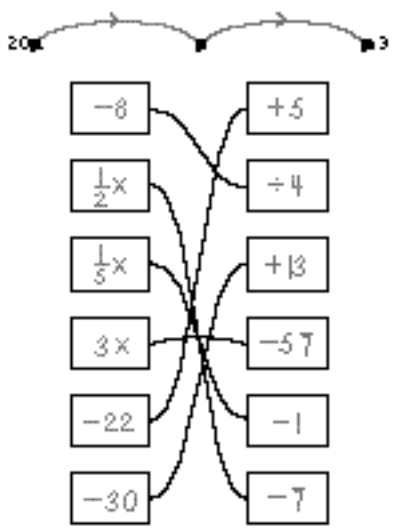
Distribute students' copies of the workbook *Collage of Problems #3*. Ask students first to correct or complete pages from the previous week's work, and then to continue working in their workbooks. You may wish to have a collective discussion about some problems that were difficult for many students the first week.

At the end of the class period, collect the workbooks for your review. After checking the workbooks, you may wish to ask some students to work further in their workbooks during a study time or to take them home as an assignment.

Assessment Activity

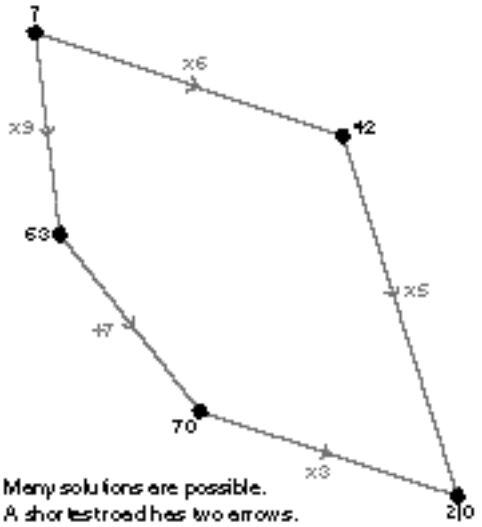
An individual student progress record for the workbook is available on Blackline W7. You may like to use this form to monitor student work.

Pair the logs.



2

Build an arrow road from 7 to 210. Each arrow must be for +, −, ×, or ÷ a one-digit whole number. Use as few arrows as you can.



Many solutions are possible.
A shortest road has two arrows.

3

All of these calculations are correct, except that a decimal point is missing in each answer. Place a decimal point in each answer to make a true sentence.

$787.6 + 35.87 = 823.47$

$613.82 + 492.48 = 1106.3$

$86.15 - 12.483 = 73.667$

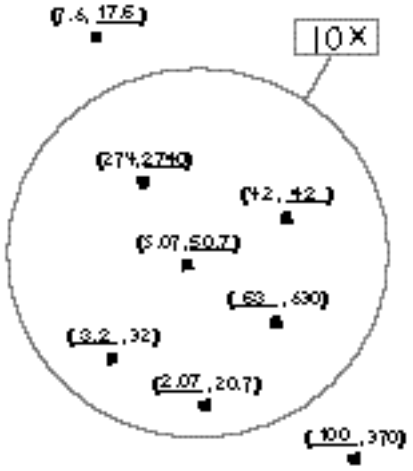
$420.36 - 381.76 = 38.6$

$6.2 \times 4.5 = 27.9$

$31.53 \times 4.97 = 156.7041$

4

Fill in the blanks.



Many solutions are possible for the dots outside the string.

5

Fill in each box with <, >, or =. Try to solve these problems without doing any calculation.

$736 + 587$ [>] $587 + 426$

$1018 - 650$ [<] $1018 - 200$

$500 + 700$ [=] $520 + 680$

$82 \div 7$ [<] $82 \div 3$

70×36 [=] 7×360

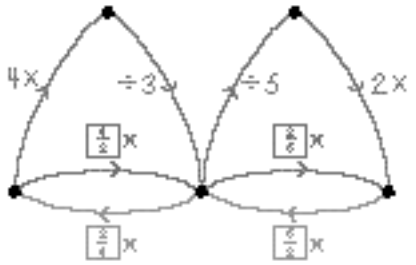
68×67 [<] 71×68

$\frac{2}{3}$ [>] $\frac{2}{5}$

$\frac{3}{2}$ [<] $\frac{5}{2}$

6

Fill in the boxes for the arrows.



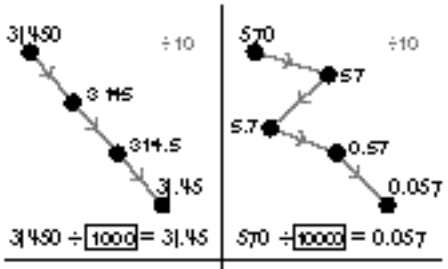
Complete these calculations.

$\frac{4}{3} \times 12 =$ 16 $\frac{2}{5} \times 20 =$ 8

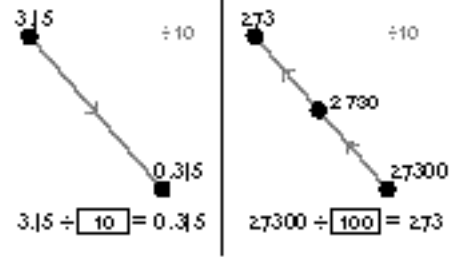
$\frac{3}{4} \times 12 =$ 9 $\frac{5}{2} \times 20 =$ 50

7

Use ×10 arrows to build an arrow road diagram for the two numbers in each problem. Then complete the division fact.



$3450 \div$ [1000] $= 3.45$ $570 \div$ [10000] $= 0.057$



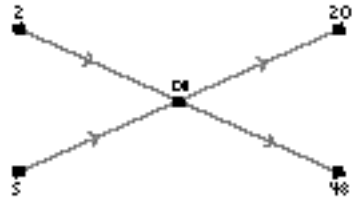
$3.15 \div$ [10] $= 0.315$ $27300 \div$ [100] $= 273$

8

Dll is a secret whole number.

Clue 1

Is a positive divisor of | Is less than



Dll could be 5, 8, 12, or 16.

Clue 2

The one-digit distance between 3 and Dll is not equal to 1.

$d(3, \text{Dll}) \neq 1$

Who is Dll? 16

9

Fill in the boxes with one-digit numbers.

$\frac{1}{8} + \frac{1}{8} = \frac{\boxed{2}}{8} = \frac{1}{\boxed{4}}$

$\frac{1}{4} + \frac{1}{8} = \frac{\boxed{3}}{\boxed{8}}$

$\frac{3}{8} + \frac{1}{8} = \frac{\boxed{4}}{8} = \frac{2}{\boxed{4}} = \frac{\boxed{1}}{2}$

$\frac{1}{2} + \frac{1}{8} = \frac{\boxed{5}}{\boxed{8}}$

$\frac{5}{8} + \frac{1}{8} = \frac{\boxed{6}}{\boxed{8}} = \frac{3}{\boxed{4}}$

$\frac{3}{4} + \frac{1}{8} = \frac{\boxed{7}}{\boxed{8}}$

$\frac{7}{8} + \frac{1}{8} = \frac{\boxed{8}}{\boxed{8}} = \boxed{1}$

Complete.

$\frac{1}{2} + \frac{3}{8} = \frac{7}{8}$

$\frac{1}{4} + \frac{7}{8} = \frac{9}{8} = 1\frac{1}{8}$

$\frac{5}{8} + \frac{1}{2} = \frac{9}{8} = 1\frac{1}{8}$

10

The Scouts are planning a 3-day camping trip for 18 people. The manual suggests they take 2 gallons of water for 4 people for 1 day. How much water should the Scouts plan to take?

27 gals.

1 day	3 days
2 gals/4 people	6 gals/4 people
8 gals/16 people	24 gals/16 people
1 gal/2 people	3 gals/2 people
9 gals/18 people	27 gals/18 people

The 18 people taking the camping trip include adults. The Scouts agreed there should be 1 adult for every 5 youths. How many adults and how many youths are taking the trip? 3 adults 15 youths

1 adult for 5 youths
2 adults for 10 youths
3 adults for 15 youths

3 + 15 = 18

Suppose the Scout leaders decide they need 1 adult for every 3 youths. How many more adults would need to go? 2 adults
How much more water would they need? 3 gals.

1 adult for 3 youths
5 adults for 15 youths

11

SCALE: 1 cm = 250 km

1. Find the length of each line segment and the actual distance between each pair of cities.

	Line Segment	Actual Distance
Los Angeles – Chicago	11 cm	2,750 km
Chicago – New York	4.5 cm	1,125 km

2. If an airplane flies 400 km in one hour, what is the flying time from Los Angeles to Chicago? (Circle the closest answer.)

3 hours 5 hours (7 hours) 9 hours

... from Chicago to New York? (Circle the closest answer.)

1¾ hours (2¾ hours) 3½ hours 4½ hours

3. The city Truth or Consequences, is 1000 km from Los Angeles and is in the United States. Using a compass, show in red the places where Truth or Consequences could be.

12

Fill in the boxes.

$\hat{5} \times 3 = \boxed{3} \times \hat{5} = \boxed{\hat{15}}$

$\boxed{3} \times \hat{5} = \hat{3} \times 5 = \boxed{\hat{15}}$

$\hat{3} \times 9 = \hat{9} \times \boxed{3} = \boxed{\hat{27}}$

$\hat{6} \times \boxed{5} = \hat{5} \times \boxed{6} = \widehat{30}$

$\hat{6} \times \boxed{\hat{5}} = \hat{5} \times \boxed{\hat{6}} = 30$

$4 \times \boxed{7} = \boxed{\hat{4}} \times \hat{7} = 28$

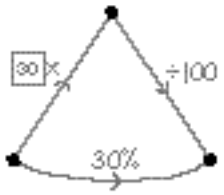
13

Complete these two division calculations.

$$\begin{array}{r} 307\ R=14 \\ 42\overline{)12\,908} \\ -12\,600 \quad 300 \\ \hline 308 \\ -294 \quad 7 \\ \hline 14 \end{array} \qquad \begin{array}{r} 23\ R=12 \\ 67\overline{)1553} \\ -1340 \quad 20 \\ \hline 213 \\ -201 \quad 3 \\ \hline 12 \end{array}$$

14

Fill in the box for the arrow.



Complete.

30% of 60 = 18

30% of 40 = 12

30% of 30 = 9

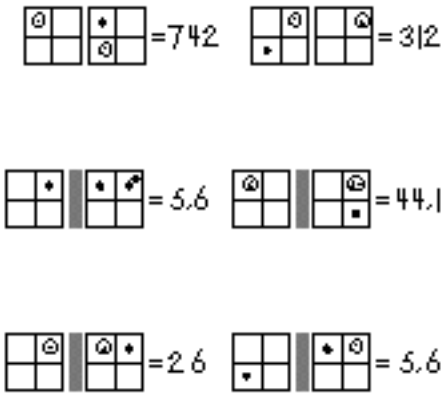
30% of 70 = 21

30% of 50 = 15

30% of 100 = 30

15

Put each number on the Minicomputer by adding exactly one regular checker.



16

1. When a printer prints the page numbers of a 100-page book, how many '9's are printed? 20

10 ones digits
+10 tens digits
20

When a printer prints the page numbers of a 1000-page book, how many '9's are printed? 300

10 x 20 = 200 ones and tens digits
+100 hundreds digits
300

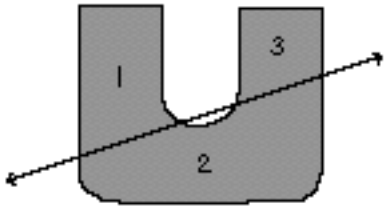
2. Shawn and Yidd Figure ran in the Tri-City Marathon. Shawn took 2 hours and 40 minutes to finish the race and Yidd took 2 hours and 57 minutes.

If Shawn finished at 1:10 PM, at what time did he start? 10:30 AM

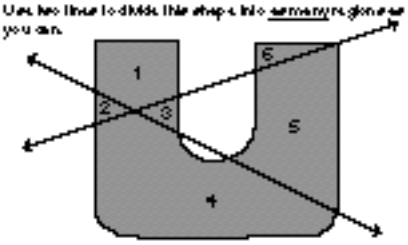
If Yidd started at the same time as Shawn, at what time did she finish? 1:27 PM

17

Using one line, this shape is divided into three regions.



Use two lines to divide this shape into as many regions as you can.



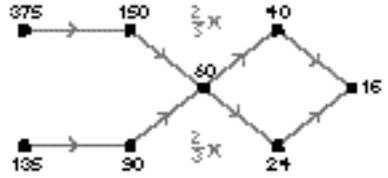
How many regions? __6__

13

Write a word number.

Clue 1

Write in the arrow picture.



Clue 2

In binary writing Write is a seven-digit number.

What is Write's binary name? __1011010__

Who is Write? __90__

19

School Days

There are 180 school days in a year. If you attend a 50-minute math class every school day, how many hours do you spend in math class?

__150__ hours

Show your work here.

50 x 180 = 9 000 9 000 minutes in math class

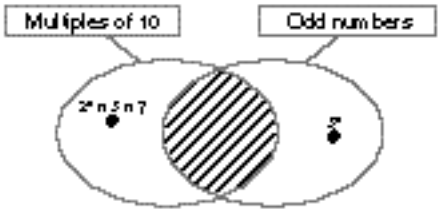
9 000 ÷ 60 = 150 150 hours in math class

20

The red label is one of these:

The blue label is one of these:

Label the strings.



21

After a burglary the police question three men: Archie, Gus, and Paul. The police know that exactly one of these men is guilty. The suspects make the following statements:

Archie: Gus did it.
Gus: Paul did it.
Paul: Archie lied when he said Gus did it.

If exactly one of these statements is false, who is the guilty man? ___Paul___

Whose statement is false? ___Archie's___

22

Complete the calculations. Draw all the missing red arrows between the dots.

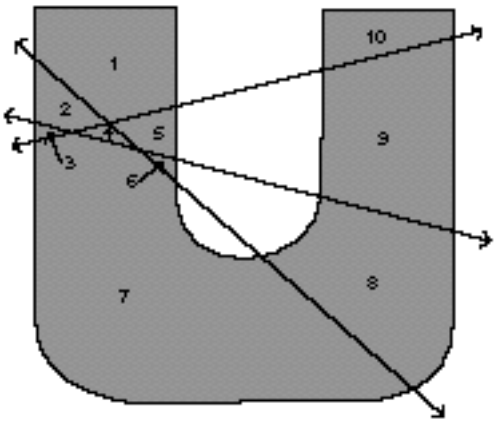
Is less than

$\frac{3}{4} + \frac{2}{5} = \frac{23}{20} = 1\frac{3}{20}$ $\frac{3}{4} - \frac{2}{5} = \frac{7}{20}$

$\frac{3}{4} \times \frac{2}{5} = \frac{6}{20} = \frac{3}{10}$ $\frac{3}{4} \div \frac{2}{5} = \frac{15}{8} = 1\frac{7}{8}$

23

Use the lines to divide the shape into as many regions as you can.



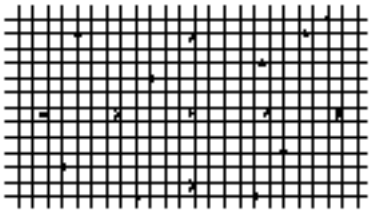
How many regions? ___10___

24

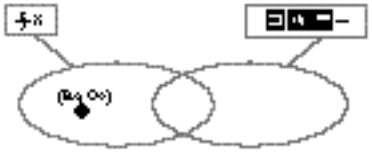
Bo and Oo are secret numbers.

Clue 1

(Bo, Oo) is one of the dots on this grid.



Clue 2



(Bo, Oo) is (___7.5___, ___5___)

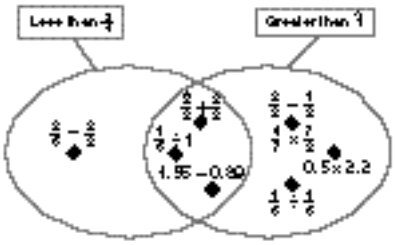
25

Label the dots. One of the numbers has two names listed. Write both names for that number beside its dot.

$\frac{2}{3} \div \frac{1}{2}$ $\frac{3}{2} + \frac{2}{3}$ 0.5×2.2

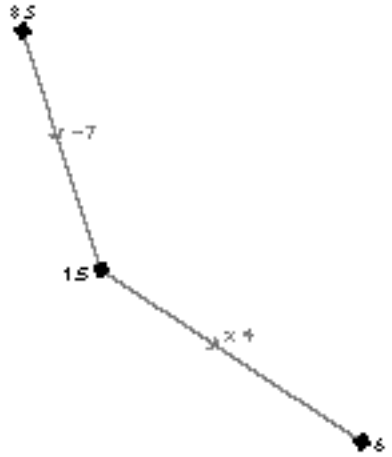
$1.56 - 0.89$ $\frac{1}{6} \div \frac{1}{5}$

$\frac{1}{6} \div 1$ $\frac{2}{3} - \frac{3}{2}$ $\frac{4}{7} \times \frac{7}{3}$



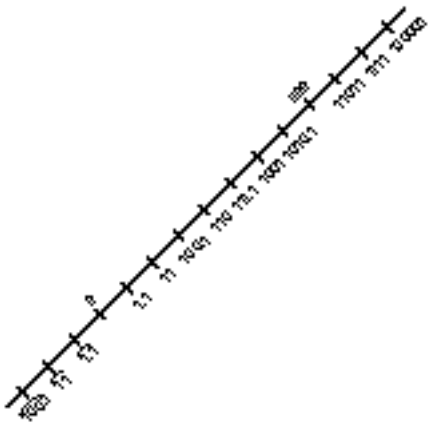
26

Build a road from 3.5 to 6 with exactly two arrows. Each arrow must be $+$, $-$, $\times$, or $\div$ a one-digit whole number.



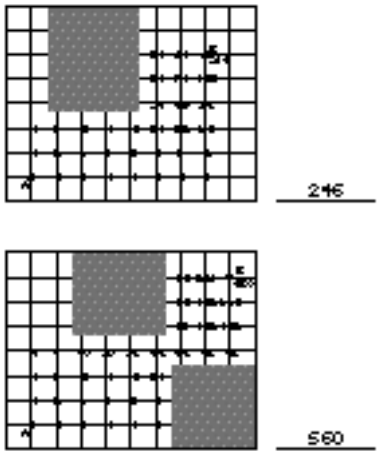
27

Label the number line in the binary code.

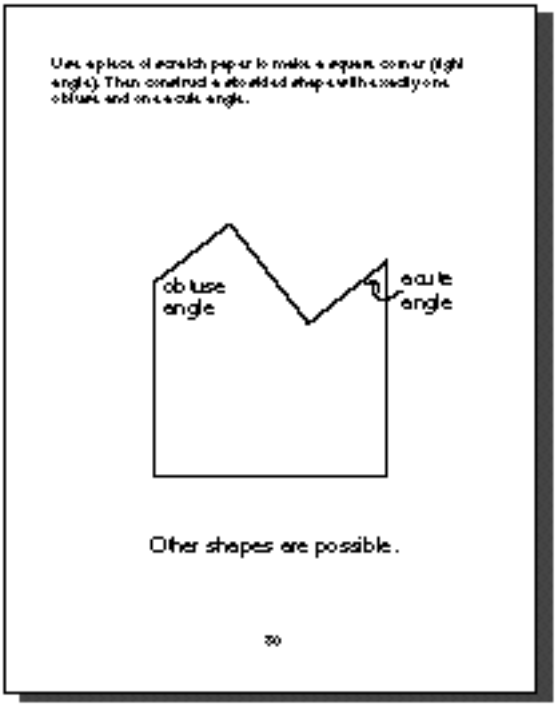


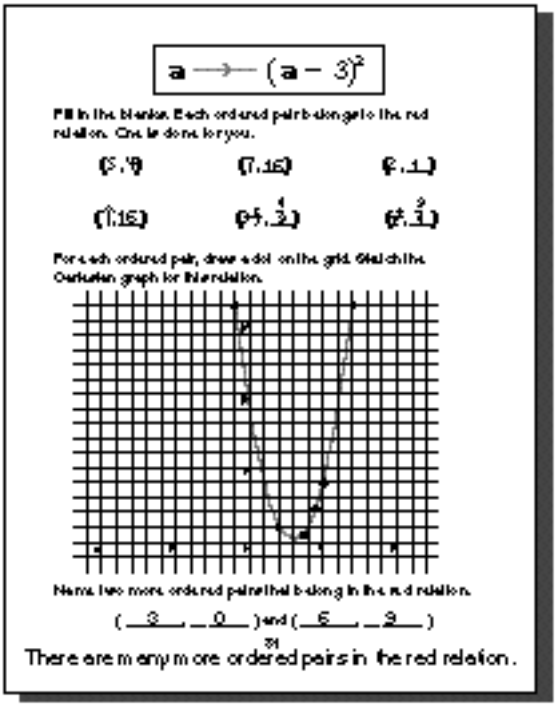
28

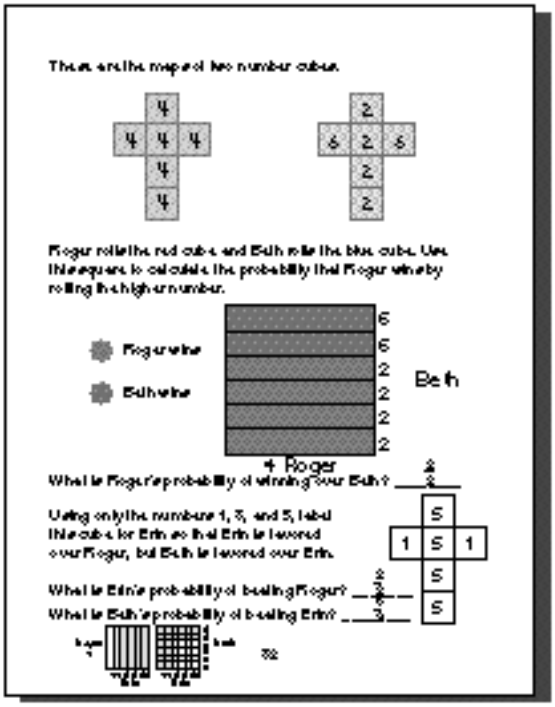
How many shortest routes from A to B.
Note: Routes must follow grid lines and may not go through the shaded areas.



29


Use a piece of scratch paper to make a square corner (right angle). Then construct a shape with exactly one obtuse and one acute angle.
obtuse angle
acute angle
Other shapes are possible.
30


a → (a − 3)²
Fill in the blanks. Each ordered pair belongs to the red relation. One is done for you.
(5, 4)
(7, 16)
(9, 1)
(1, 16)
(4½, 2½)
(4, 2)
For each ordered pair, draw a dot on the grid. Sketch the Cartesian graph for this relation.
Name two more ordered pairs that belong in the red relation.
(3 , 0) and (6 , 9)
31
There are many more ordered pairs in the red relation.


These are the maps of two number cubes.
4 4 4 4 4 4
2 2 2 6 2 2
Roger rolls the red cube and Beth rolls the blue cube. Use this square to calculate the probability that Roger wins by rolling the higher number.
Roger wins
Beth wins
6 6 2 2 2 2
Beth
Roger
What is Roger's probability of winning over Beth? 2/3
Using only the numbers 1, 3, and 5, label this cube for Erin so that Erin is favored over Roger, but Beth is favored over Erin.
5 1 5 1 5 5
What is Erin's probability of beating Roger? 2/3
What is Beth's probability of beating Erin? 5/9
32

Capsule Lesson Summary

Review the rounding operation. Begin the workbook *Collage of Problems #4*. (This is the first of two lessons using this workbook.)

Materials

Teacher	• None	Student	• *Collage of Problems #4* Workbook • Colored pencils, pens, or crayons • Compass • Metric ruler • Calculator

Description of Lesson

Begin the lesson by asking the class (or one student) to count by nines from $\widehat{27}$ to 81.

S: ***$\widehat{27}$, $\widehat{18}$, $\widehat{9}$, 0, 9, 18, 27, 36, 45, 54, 63, 72, 81.***

Write this problem on the board. 57 ® 9 =

T: ***Do you remember the rounding operation? What is the nearest multiple of 9 to 57?*** (54)

Record the answer and read the equation: 57 rounded to the nearest (multiple of) 9 is 54. 57 ® 9 = 54

Continue with these problems. (Answers are in boxes.) With the class, recall the convention that if the first number in a problem is halfway between two multiples of the second number, the result is the greater multiple.

30 ® 8 = 32	18 ® 4 = 20	1 .1 ® 2 = 18
63 ® = 63	100 ® = 98	100.25 ® = 98
28 ® 3 = 2	50 ® 6 = 48	0.041 ® 1 = 0

Ask the class (or one student) to count by tenths from 0 to 2.

S: ***0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 2.***

1.28 ® 0.1 =

Write this problem on the board.

T: ***When we count by tenths starting at 0, which of the numbers is closest to 1.28?***

S: ***1.3.***

1.28 ® 0.1 = 1.3

Record the answer and read the equation: 1.28 rounded to the nearest (one) tenth is 1.3.

Continue with these problems. (Answers are in boxes.)

1.15 ® 0.1 = 1.2
2.08 ® 0.1 = 2.1
2.02 ® 0.1 = 2

1 .51 ® 0.1 = 1 .5
1 .512 ® 0.1 = 1 .5
1 .512 ® 0.01 = 1 .51

Distribute copies of the workbook *Collage of Problems #4*, and let students work independently for the rest of the class period. If many students are having difficulty with a particular problem, you may wish to have a collective discussion about that problem.

At the end of the class period, collect the workbooks for your review. They will be used again in Lesson W9.

Capsule Lesson Summary

Review multiplication and division with decimal numbers. Continue individual work in the workbook *Collage of Problems #4*. (This is the second of two lessons using this workbook.)

Materials

Teacher
- None

Student
- *Collage of Problems #4* Workbook
- Colored pencils, pens, or crayons
- Compass
- Metric ruler
- Calculator

Description of Lesson

Review multiplication and division of decimals. Suggested exercises with answers are given below.

$$\begin{array}{r} 384 \\ \times\ 67 \\ \hline 2\,688 \\ 23\,040 \\ \hline 25\,728 \end{array}$$

$67 \times 384 = 25\,728$

$67 \times 38.4 = 2\,572.8$

$67 \times 3.84 = 257.28$

$67 \times 0.384 = 25.728$

$6.7 \times 3.84 = 25.728$

$0.67 \times 3.84 = 2.5728$

$$\begin{array}{r|l} 386 & \\ 8\overline{)\,3\,088} & \\ -\,2\,400 & 300 \\ \hline 688 & \\ -\,640 & 80 \\ \hline 48 & \\ -\,48 & 6 \\ \hline 0 & \end{array}$$

$3\,088 \div 8 = 386$

$308.8 \div 8 = 38.6$

$30.88 \div 8 = 3.86$

$3.088 \div 8 = 0.386$

$0.3088 \div 8 = 0.0386$

Distribute copies of the workbook *Collage of Problems #4*. Ask students first to correct or complete pages from the previous week's work, and then to continue working in their workbooks. You may wish to have a collective discussion about some problems that were difficult for many students the first week.

At the end of the class period, collect the workbooks for your review. After checking the workbooks, you may wish to ask some students to work further in their workbooks during a study time or to take them home as an assignment.

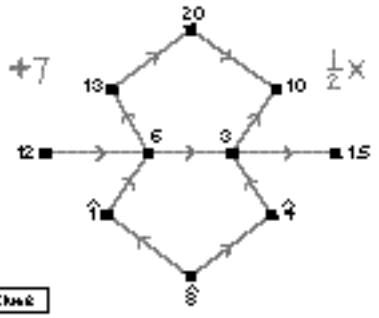
Assessment Activity

An individual student progress record for the workbook is available on Blackline W9. You may like to use this form to monitor student work.

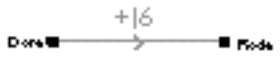
Dora and Frodo are secret numbers.

Clue 1

Dora and Frodo are in this arrow picture.



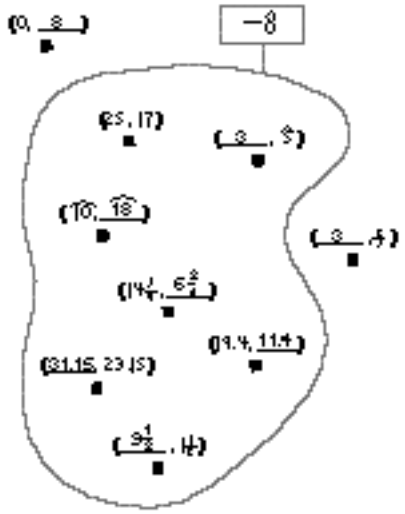
Clue 2



Who is Dora? 4 Who is Frodo? 12

2

Fill in the blanks.

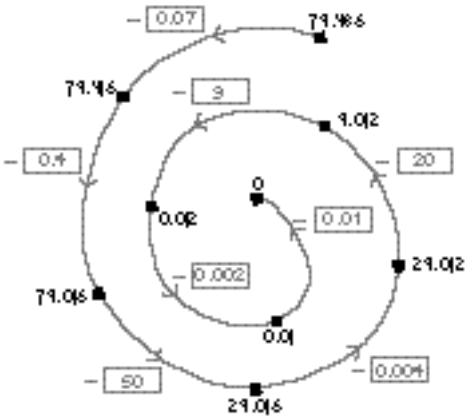


Many solutions are possible for the dots outside the string.

3

Wipe-out

Fill in the boxes for the arrows.



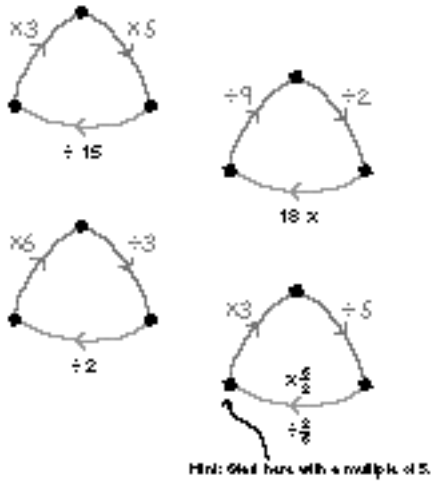
4

Fill in each box with <, >, or =. Try to solve these problems without doing any calculation.

55 ÷ 9	<	55 ÷ 7
73 ÷ 6	<	87 ÷ 6
23 ÷ 3	=	230 ÷ 30
80% of 40	>	20
23% of 18	<	18
100% of 37	=	37
$\frac{3}{2}\times 175$	>	175
$\frac{2}{3}\times 175$	<	175

5

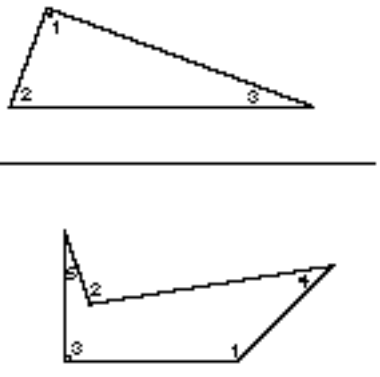
Label the grey arrows. Try labelling the dots are check.



Hint: Start here with a multiple of 5.

6

In each picture, write 1 by the vertex of the largest angle determined by the polygon; 2 by the vertex of the next largest; and so on until all of the angles are labeled. Right angles are indicated.



7

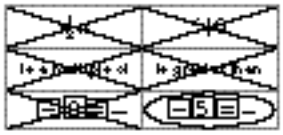
Put a one-digit number in each box to make the calculations correct.

$$\begin{array}{r} \boxed{5}.7 \\ 30.\boxed{3}8 \\ 7.09 \\ +26.5\boxed{6} \\ \hline \boxed{6}9.73 \end{array} \qquad \begin{array}{r} \boxed{8}9.60 \\ -25.\boxed{8}3 \\ \hline 63.7\boxed{7} \end{array}$$

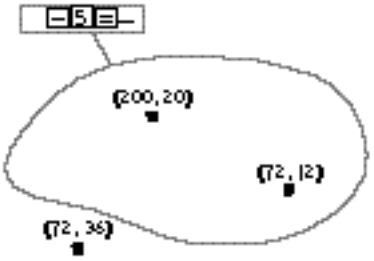
Add.	Subtract.
$163.7 + 38 + 84.53$	$803.42 - 539.6$
163.7 38.0 +84.53 286.23	803.42 −539.6 263.82
286.23	263.82

8

The red string is for one of these relations.



Label the string.



10

Use the rounding operation @ to complete these problems.
The first two are done for you.

11 @ 3 = 12
The nearest multiple of 3 to 11 is 12.

4.3 @ 0.5 = 4.5
When rounding to 0.5s from 0, the closest we get to 4.3 is 4.5.

17 @ 4 = 16

60 @ 7 = 63

38 @ 5 = 40

172 @ 20 = 180

283 @ 10 = 280

4527 @ 10 = 4530

283 @ 100 = 300

4527 @ 100 = 4500

13.58 @ 1 = 14

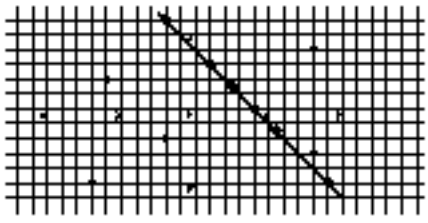
7.66 @ 0.1 = 7.7

11

Fee and Gee are secret numbers.

Clue 1

(Fee, Gee) is one of the dots on this grid.

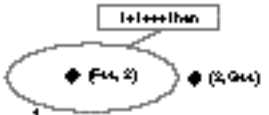


Clue 2

Fee + Gee = 4

On the grid, circle the other dot that (Fee, Gee) could be.

Clue 3



(Fee, Gee) is $(\frac{2}{2}, \frac{1}{2})$

12

One number in each calculation is missing a decimal point.
Place a decimal point in the number to make the equation true.

376 + 14.29 + 265.8 = 656.09

408.27 + 255.68 + 3862.75 = 4526.7

3461.3 − 512.76 = 2948.54

7.4 × 53.27 = 394.198

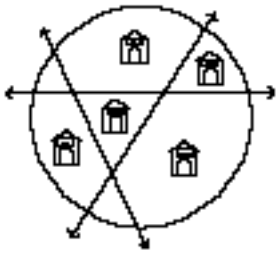
31.35 × 8.06 = 252.681

648.69 ÷ 2.1 = 308.9

83.3 ÷ 19.6 = 4.25

13

Using three straight lines (lines), this circle is divided so that each dog house is in a different region.



Use three straight lines (lines) to divide this circle so that each dog house is in a different region.

14

There are other ways to draw the three lines.

Complete the calculations. Show your work.

7.36×1.3

$$\begin{array}{r} 7.36 \\ \times\ 1.3 \\ \hline 2208 \\ 736 \\ \hline 9.568 \end{array}$$

97.2×6.7

$$\begin{array}{r} 97.2 \\ \times\ 6.7 \\ \hline 680.4 \\ 5832 \\ \hline 651.24 \end{array}$$

$596.4 \div 7$

$$\begin{array}{r|l} 560 & 80 \\ \hline 36.4 & \\ -35 & 5 \\ \hline 1.4 & \\ -1.4 & 0.2 \\ \hline \end{array}$$

$2356.2 \div 63$

$$\begin{array}{r|l} 1890 & 30 \\ \hline 466.2 & \\ -441 & 7 \\ \hline 25.2 & \\ -25.2 & 0.4 \\ \hline \end{array}$$

15

Pair each red tag with a blue tag.

$\frac{5}{8} + \frac{3}{8}$	$\frac{3}{10}$
$\frac{5}{8} - \frac{3}{8}$	$1\frac{1}{10}$
$\frac{3}{5} + \frac{1}{2}$	$\frac{1}{4}$
$\frac{3}{5} - \frac{1}{2}$	$\frac{6}{5}$
$\frac{3}{5} \times \frac{1}{2}$	1
$\frac{3}{5} \div \frac{1}{2}$	$\frac{1}{10}$

16

Alice, Brenda, and Carl are all different ages. They make the following statements:

Alice: I am older than Carl.

Brenda: Carl is not the oldest.

Carl: I am older than Brenda.

Problem 1: If all three statements are true, list the three people from youngest to oldest.

Brenda (youngest) Carl Alice (oldest)

Problem 2: If exactly one of the statements is false, who is the youngest? Carl

Whose statement is false? Carl's

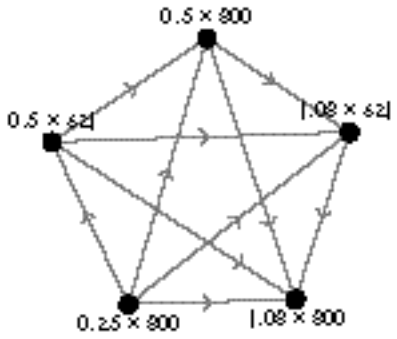
Problem 3: If the only true statement is Brenda's, list the three people from youngest to oldest.

Alice (youngest) Carl Brenda (oldest)

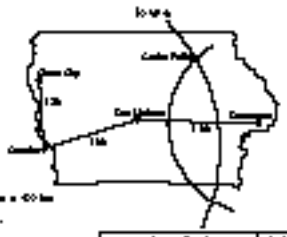
17

Draw as many red arrows as possible in this picture.

is less than



13



Complete.

	Length of Line Segment on Map		Actual Distance by Road	
Davenport to Dunkelnaw	5	cm	250	km
Dunkelnaw to Omaha	4	cm	200	km
Omaha to Sioux City	2.8	cm	140	km

Mr. Pullin drives from Omaha to Davenport on I-80. If she averages 90 km per hour, about how long is her drive?
___5___ hours

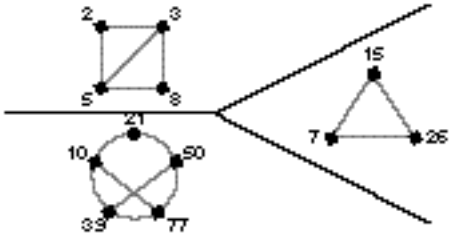
Mr. Pullin's car uses one liter of gasoline every 10 km. The gasoline costs $0.50 for one liter. How much gasoline does she use on her trip from Omaha to Davenport? ___45___ liters
How much does that much gasoline cost? $13.50

By air, Ocker Falls is 360 km from Omaha and 135 km from Davenport. Draw and label a dot for Ocker Falls in Iowa. You may use a compass.

19

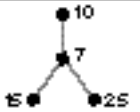
Label the dots following this rule.

Two numbers can be joined by a red cord
if and only if
they are relatively prime.



With your way of labeling the dots, are there more red cords that can be drawn in a picture? ___yes___ If so, draw them.
Other solutions give different possibilities for additional red cords.

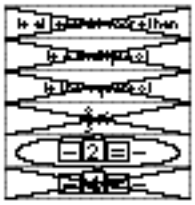
Label the dots in this picture so that no more red cords can be drawn.



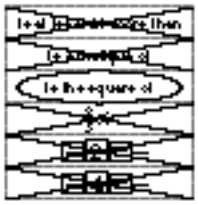
20

Many solutions are possible.

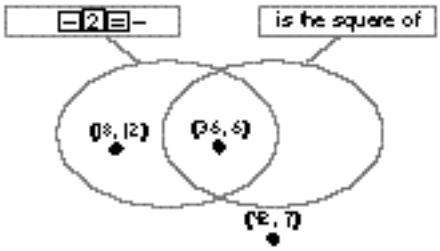
The red string letter one of these relations.



The blue string letter one of these relations.



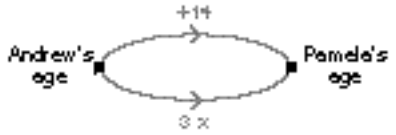
Label the strings.



21

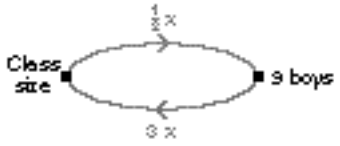
Two at a Time

1. Pamela is 14 years older than her brother Andrew. She is also 3 times as old as Andrew. How old is Pamela? 21
Andrew? 7



Pamela's age must be a multiple of 3 greater than 14.

2. Only one-third of the students in Mr. Cunliffe's class are boys. If there are nine boys in his class, how many students are in his class? 27

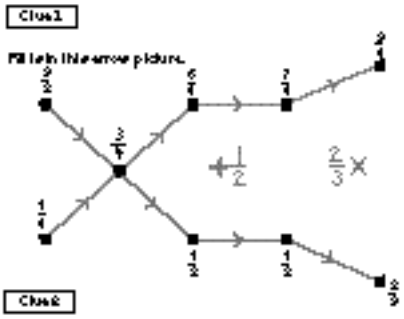


22

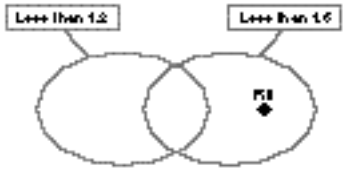
Fill in a secret number.

Clue 1

Fill in the arrow picture.



Clue 2



What is Fill? 1.25 (or 5/4)

23

Mr. and Mrs. Harris and their two children, Audrey and Glen, must cross a river. The only boat available is a small canoe which can hold at most one adult or the two children. All of the Harris' love who is to paddle the canoe. Describe how the family can use the canoe to cross the river. The alligators in the river prevent anyone from swimming. Try to use as few trips as possible.

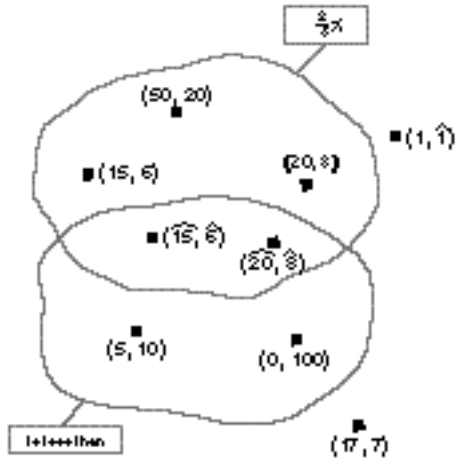
Above each arrow, indicate who is in the boat. You may not need to use all of the arrows.

First trip across	Audrey, Glen	Fourth trip across	Mrs. Harris
First return trip	Audrey	Fourth return trip	Glen
Second trip across	Mr. Harris	Fifth trip across	Audrey, Glen
Second return trip	Glen	Fifth return trip	
Third trip across	Audrey, Glen	Sixth trip across	
Third return trip	Audrey	Sixth return trip	
		Fourth trip across	

24

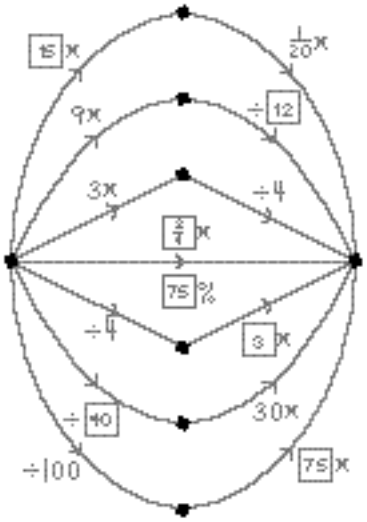
There are other minimal solutions.

The clue are for ordered pairs of numbers.
Label the dots. Challenge for you. How many solutions are possible.
Hint: Some ordered pairs are negative numbers.



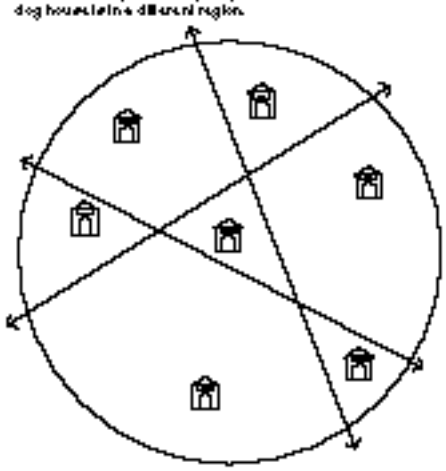
25

Fill in the boxes for the answer.



26

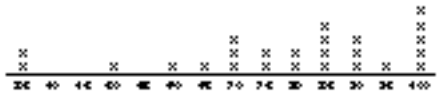
Use three straight fences (lines) to divide the circle so that each dog house is in a different region.



There are other ways to draw the three lines.

27

Test scores for Mr. Dexter's class are pictured below. Find the mean, median, and mode for the class. Which type of average (mean, median, or mode) best describes the class's performance on the test? Explain your answer.



Mean 78.8

Median 85

Mode 100

Answers may vary.

In this case the median may best describe the class's performance, because the scores appear to be mostly from 70 to 100, and 85 is the middle. The low scores appear to bring the mean average down too much compared to the rest of the class.

28

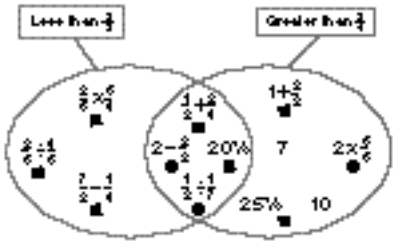
Put the given numbers in the sorting picture.

$\frac{1}{2} + \frac{3}{4}$ $\frac{3}{5} \times \frac{5}{4}$ $2 \times \frac{5}{6}$

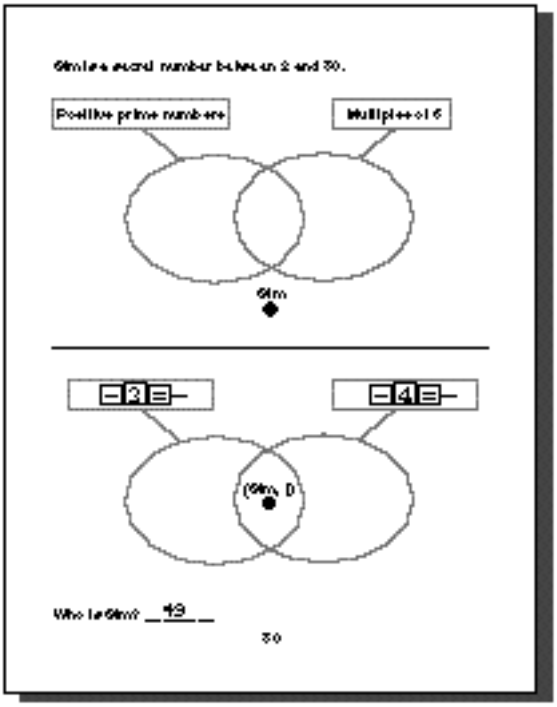
25% of 10 20% of 7

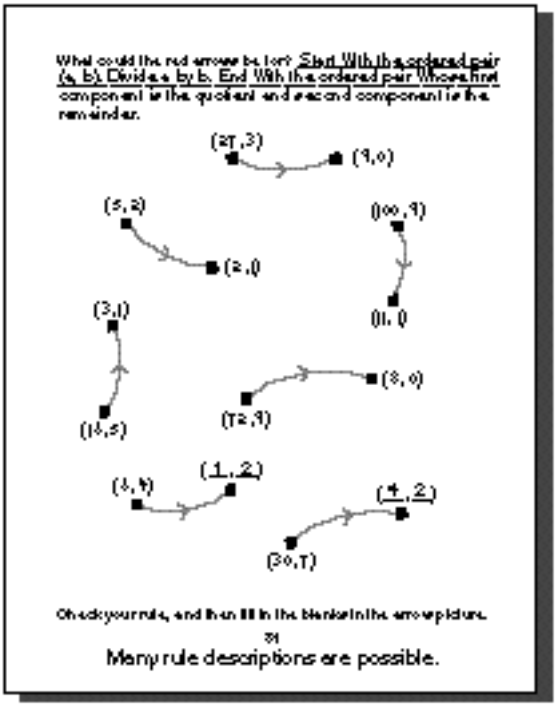
$\frac{7}{8} - \frac{1}{4}$ $\frac{1}{2} \div \frac{1}{7}$ $\frac{2}{5} \div \frac{4}{5}$

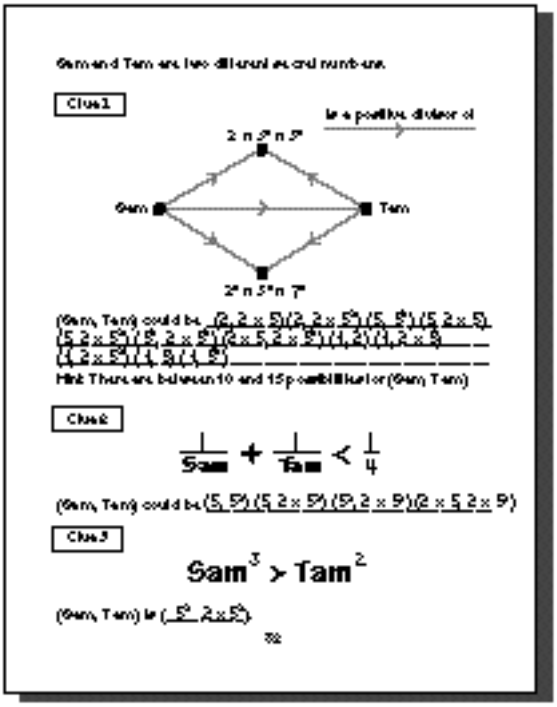
$1 + \frac{2}{3}$ $2 - \frac{2}{3}$



29


Positive prime numbers
Multiples of 6
6m
-2=-
-4=-
(6m, 0)
Who is 6m? 49
30


What could the red arrows be for? Start With the ordered pair (a, b) Divide a by b. End With the ordered pair Whose first component is the quotient and second component is the remainder.
(27,3)
(9,0)
(5,2)
(2,1)
(100,9)
(11,0)
(3,1)
(14,5)
(8,0)
(12,9)
(1,2)
(4,1)
(4,2)
(30,7)
Check your rule, and then fill in the blanks in the arrow picture.
31
Many rule descriptions are possible.


Sam and Tam are two different secret numbers.
Clue 1
is a positive divisor of
2 n 3^2 n 5^3
Sam
Tam
2^2 n 3^5 n 7^3
(Sam, Tam) could be (2, 2 x 5)(2, 2 x 5^2)(5, 5^2)(5, 2 x 5)
(5, 2 x 5^2)(5^2, 2 x 5^2)(2 x 5, 2 x 5^2)(1, 2)(1, 2 x 5)
(1, 2 x 5^2)(1, 5^2)(1, 5^3)
Hint There are between 10 and 15 possibilities for (Sam, Tam)
Clue 2
1/Sam + 1/Tam < 1/4
(Sam, Tam) could be (5, 5^2)(5, 2 x 5^2)(5^2, 2 x 5^2)(2 x 5, 2 x 5^2)
Clue 3
Sam^3 > Tam^2
(Sam, Tam) is (5^2, 2x5^2)
32

Capsule Lesson Summary

Given a set of fractions, identify each as being between two whole numbers, and locate the fractions on a number line. Begin the workbook *Collage of Problems #5*. (This is the first of two lessons using this workbook.)

Materials

Teacher	• Meter stick	Student	• *Collage of Problems #5* Workbook • Colored pencils, pens, or crayons • Protractor • Metric ruler • Calculator

Description of Lesson

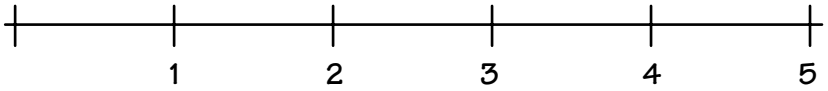
Write these five fractions on the board.

$$\frac{5}{6} \qquad \frac{7}{2} \qquad \frac{13}{3} \qquad \frac{23}{8} \qquad \frac{23}{18}$$

T: ***Of these five numbers, which is least? Greatest?***

Let students express their opinions, but do not acknowledge which answers or explanations are correct at this time.

Write this information on the board.



$$< \square < 1 < \square < 2 < \square < 3 < \square < 4 < \square < 5$$

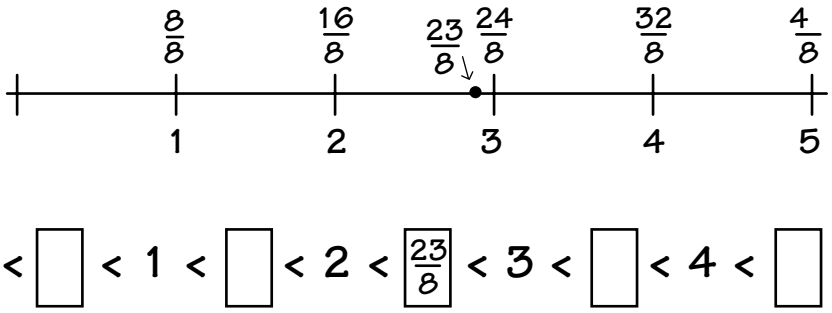
T: ***There are five fractions listed on the board and there are five boxes. Exactly one of the fractions is between 0 and 1, another is between 1 and 2, and so on. Select a fraction and tell us which box it belongs in.***

Let students consider the fractions in any order. For example:

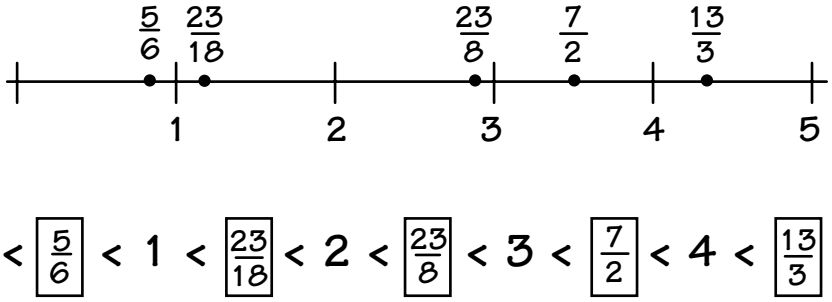
S: ***$2\frac{3}{8}$ is between 2 and 3, since $\frac{16}{8} = 2$ and $\frac{24}{8} = 3$.***

S: ***$2\frac{3}{8} = 2\frac{7}{8}$.***

On the number line, give eighths labels to the whole numbers, as shown below. Invite a student to find the approximate location of $\frac{23}{8}$ on the number line and to fill in the appropriate box.



Erase the eighths labels, except $\frac{23}{8}$, from the number line. Let students locate the other four fractions in a similar manner.



Focus attention on the least, $\frac{5}{6}$, and the greatest, $\frac{13}{3}$, of the fractional numbers to note which of the students earlier answers and explanations were correct.

Distribute copies of the workbook *Collage of Problems #5*, and let students work independently for the rest of the class period. If many students are having difficulty with a particular problem, you may wish to have a collective discussion about that problem.

At the end of the class period, collect the workbooks for your review. They will be used again in Lesson W11.

Capsule Lesson Summary

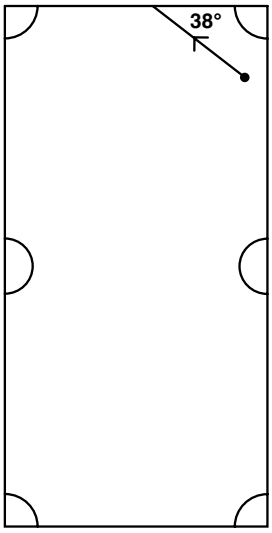
Measure angles to determine the path of a billiard ball on a pool table. Continue individual work in the workbook *Collage of Problems #5*. (This is the second of two lessons using this workbook.)

Materials

Teacher	• Demonstration protractor • Straightedge	Student	• *Collage of Problems #5* Workbook • Colored pencils, pens, or crayons • Protractor • Metric ruler • Calculator

Description of Lesson

Draw this picture on the board. A 50 cm by 100 cm rectangle is a good size. Draw the indicated ball path at an angle of 38° to the edge. The exact starting location for the ball is not crucial.



T: ***This is a picture of a pool table. If I hit the pool ball (without a sideways spin) in this direction, which direction will it go after it hits the edge?***

On the board, let students trace the path they think the ball will travel.

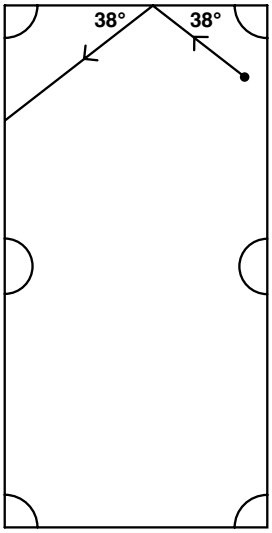
Point to the 38° angle you have drawn.

T: ***To know more exactly how the ball will travel, we need to measure this angle.***

S: ***It is a 38° angle.***

T: ***If this is a 38° angle, the ball will also leave the edge at a 38° angle.***

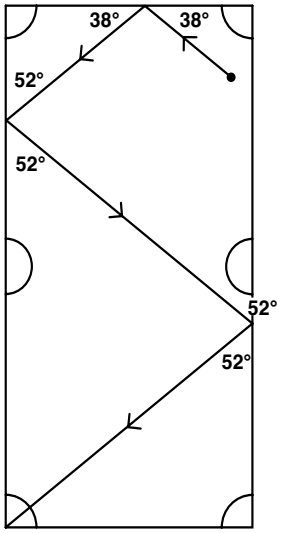
Carefully measure a 38° angle, and draw the deflecting path in the picture.



T: ***Where will the ball travel after it hits the second edge?***

Lead students to measure the appropriate angles, and add this information to the picture.

Continue in a similar manner until the ball hits a pocket, or declare that the ball stops after two or three more rebounds. For example:



Distribute students' copies of the workbook *Collage of Problems #5*. Ask students first to correct or complete pages from the previous week's work, and then to continue working in their workbooks. You may wish to have a collective discussion about some problems that were difficult for many students the first week.

At the end of the class period, collect the workbooks for your review. After checking the workbooks, you may wish to ask some students to work further in their workbooks during a study time or to take them home as an assignment.

Assessment Activity

An individual student progress record for the workbook is available on Blackline W11. You may like to use this form to monitor student work.

For each problem, list at least four whole numbers that could be in the box.

10 , 2 , 5 , 8

also 1, 4, 20, 40

4 , 7 , 28 , 1

also 2, 14

5 , 9 , 3 , 45

also 1, 15

2

Complete the calculations. Show your work.

$$\begin{array}{r} 8.70 \\ 0.96 \\ +\,0.40 \\ \hline 10.06 \end{array}$$

$0.08 + 7.153 + 64$

$$\begin{array}{r} 0.080 \\ 7.153 \\ 64.000 \\ \hline 71.233 \end{array}$$

$$\begin{array}{r} 65.70 \\ -\ 8.46 \\ \hline 57.24 \end{array}$$

$326 - 89.7$

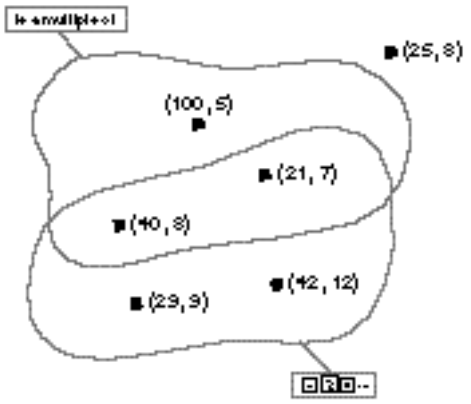
$$\begin{array}{r} 326.0 \\ -\ 89.7 \\ \hline 236.3 \end{array}$$

3

Place these ordered pairs in the string picture.

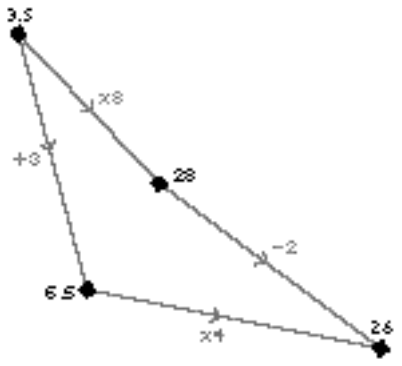
(21, 7) (42, 12) (40, 8)

(25, 8) (100, 5) (29, 9)



4

Build an arrow road from 3.5 to 26. Each arrow must be for +, −, ×, or ÷ a one-digit whole number. Use as few arrows as you can.



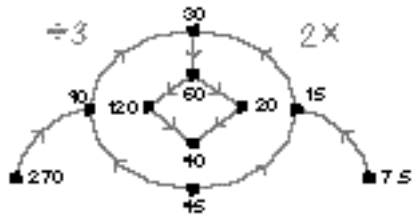
Other solutions are possible.

5

Probe is a mystery number.

Clue 1

Probe is in this arrow picture. Label the dots.



Clue 2

Who is Probe? 60

6

Fill in the boxes with these numbers.

$\frac{8}{3}$ $\frac{9}{2}$ $\frac{5}{8}$

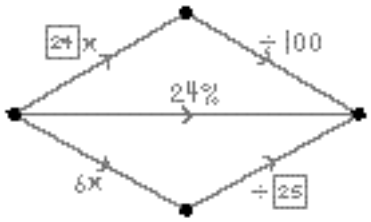
$\frac{5}{11}$ $\frac{13}{11}$ $\frac{37}{10}$

$0 < \boxed{\frac{5}{11}} < \frac{1}{2} < \boxed{\frac{5}{8}} < 1 < \boxed{\frac{13}{11}} < 2$

$2 < \boxed{\frac{8}{3}} < 3 < \boxed{\frac{37}{10}} < 4 < \boxed{\frac{9}{2}} < 5$

7

Fill in the boxes for the arrows.



Complete.

24% of 60 = 14.4 24% of 250 = 60

124% of 60 = 74.4 24% of 150 = 36

48% of 60 = 28.8 24% of 36 = 8.64

8

A farmer must carry a fox, a goose, and a basket of cabbage across a river. The farmer's rowboat is large enough for the farmer and only one item. The farmer cannot leave the goose and cabbage together because the goose will eat the cabbage. Also, the fox and goose cannot be left together (for obvious reasons). Describe how the farmer can get all three items across the river safely. Try to use as few trips as possible.

Above each arrow, write what the farmer carries. You may not need all the arrows.

First trip across — goose
First return trip
Second trip across — fox
Second return trip — goose
Third trip across — cabbage
Third return trip
Fourth trip across — goose
Fourth return trip
Fifth trip across

Another minimal solution is possible: interchange the fox and cabbage trips.

9

Complete.

$60 \times \underline{7} = 420$ $60 \times \underline{0.7} = 42$

$60 \times \underline{700} = 42\,000$ $60 \times \underline{0.007} = 0.42$

Complete the calculations. Show your work.

Multiply.

37.6×0.06

37.6 $\xrightarrow{\times 10}$ 376 $\xrightarrow{\times 100}$ 2256 $\xleftarrow{\div 10\,000}$ 2256

Multiply.

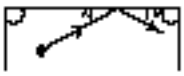
63.8×1.49

63.8 $\xrightarrow{\times 10}$ 638 $\xrightarrow{\times 100}$ 95 062 $\xleftarrow{\div 10\,000}$ 95 062

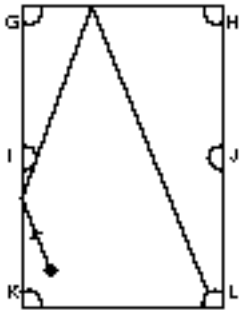
10

Students' work may vary. Accept any correct method.

Again on Billiard Hall



If a ball is hit with no spin, angle B will always equal angle A. Use this fact to draw the path of the ball in the following picture of a pool table.



Which pocket does the ball enter? L

11

Write each number as a product of positive prime numbers. One is done for you.

$280 = \underline{2 \times 2 \times 2 \times 5 \times 7 = 2^3 \times 5 \times 7}$

(42) $= \underline{2 \times 3 \times 7}$

(90) $= \underline{2 \times 3^2 \times 5}$

$275 = \underline{5^2 \times 11}$

$392 = \underline{2^3 \times 7^2}$

Circle the two numbers above that are divisors of $2 \times 3^2 \times 5^3 \times 7^2$.

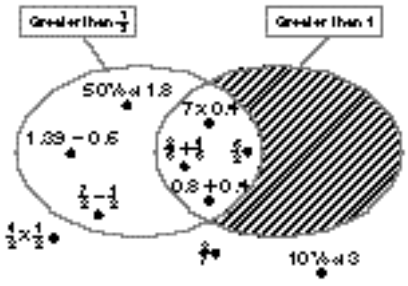
12

Put each of these numbers in the string picture.

$\frac{5}{5}$ $\frac{3}{7}$ $\frac{3}{5} + \frac{4}{5}$ $\frac{7}{8} - \frac{1}{8}$

$\frac{4}{3} \times \frac{1}{3}$ 50% of 1.8 10% of 3

0.8 + 0.4 1.39 − 0.6 7 × 0.4

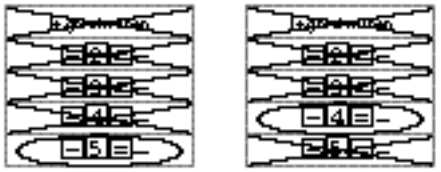


One region of the picture can be hatched. Hatch it.

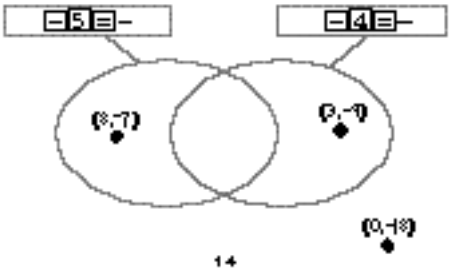
13

The red string is for one of these relations.

The blue string is for one of these relations.



Label the strings.



14

Write three division problems with the same answer as this division problem.

18 ÷ 2.5

1.8 ÷ 0.25

180 ÷ 25

72 ÷ 10

Complete these calculations. You may change each problem into a problem with the same answer. Show your work.

Divide.

18 ÷ 2.5

36 ÷ 5 = 7.2

or

72 ÷ 10 = 7.2

Answer: 7 , 2

Divide.

43.586 ÷ 0.62

4358.6 ÷ 62

70.3

62 | 4358.6

4340 | 70

18.6

−18.6 | 0.3

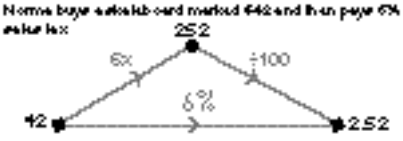
Answer: 7 0 , 3

15

In each case, there are many division problems with the same answer.

Use the arrow picture to help solve each problem. Label the data and arrows, then answer the questions.

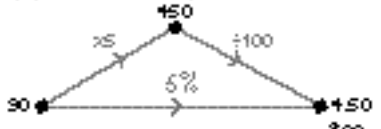
1. Norma buys a skateboard marked $42 and then pays 6% sales tax.



How much tax does Norma pay? $2.52

What is her total bill? $44.52

2. Mr. Hummel buys a bicycle for his son. With a 5% tax rate, he pays $4.50 tax on the bicycle.



How much does the bicycle cost (without tax)? $90

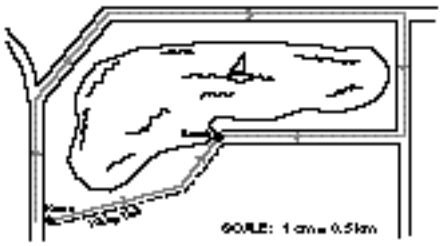
What is her total bill? $94.50

16

Put each number on the base 2 abacus. Write the base 2 name for each number. One is done for you.

Decimal Name		Base 2 Name
1 =		= 1
2 =		= 10
3 =		= 11
4 =		= 100
5 =		= 101
6 =		= 110
7 =		= 111
8 =		= 1000

17



Lalida enjoys running on the hiking trail (blue) from her home to the beach. Her brother, Tony, prefers riding his bicycle around the lake along the route marked in red.

Complete.

	Length of route on map	Actual distance traveled
Lalida (blue)	8 cm	4 km
Tony (red)	34 cm	17 km

Lalida runs an average of 10 km in one hour and Tony rides 20 km in one hour. About how long does it take Lalida to run on the hiking trail from her home to the beach? 24 minutes

About how long does Tony take to ride his bicycle on the route from his home to the beach? 51 minutes

18

(LI, MI) is a secret ordered pair of numbers.

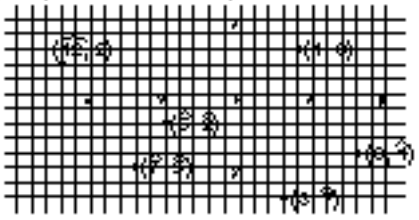
Clue 1

LI could be 8, 3, 2, 7, 12, 17, 22 and so on.

MI could be 10, 7, 4, 1, 2, 5, 8 and so on.

Clue 2

(LI, MI) is one of the dots on this grid.



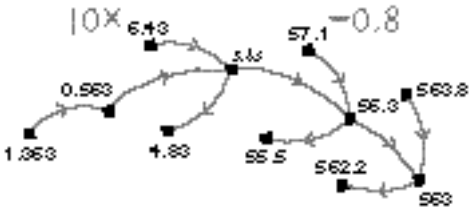
(LI, MI) = (7, 5)

19

Run is a secret number.

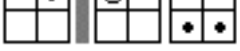
Clue 1

Run is in this error picture.



Clue 2

Run can be put on this Mimicomputer by adding just a ② anywhere.



What is Run? 6.43

20

EARL's Parking Lot

$0.30 for each $\frac{1}{4}$ hour

How much does it cost to park a car for 1 hour? $1.20
10 hours? $12

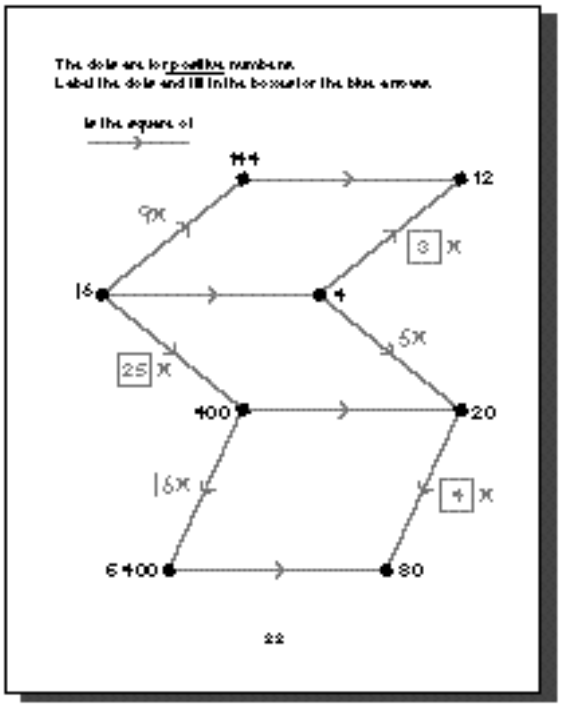
About how long were a car parked if the charge is $0.30? $\frac{1}{4}$ hour
$5.00? 21 hours

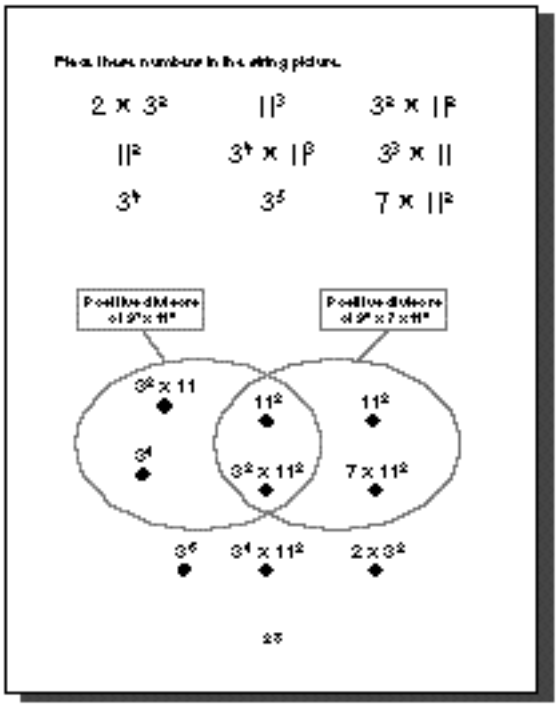
Sharon parked her car from 11:20 AM to 1:20 PM. How much must she pay? $2.40

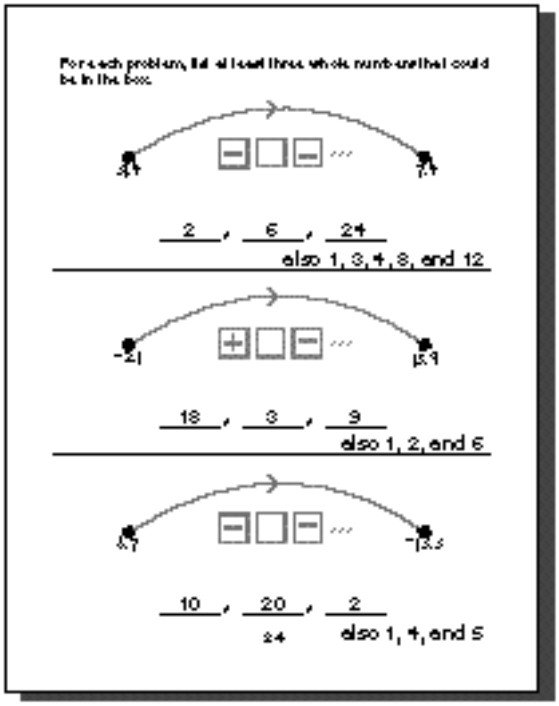
Douglas parked his car from 5:45 PM to 7:00 PM. How much must he pay? $1.50

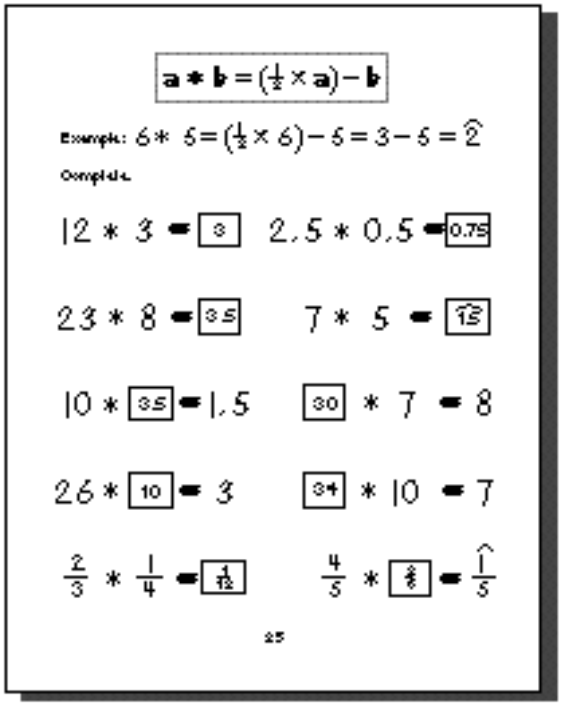
Carlos parked his car at 7:50 PM. When he left the lot, he had to pay $0.60. About what time did he leave the lot? 8:20 PM

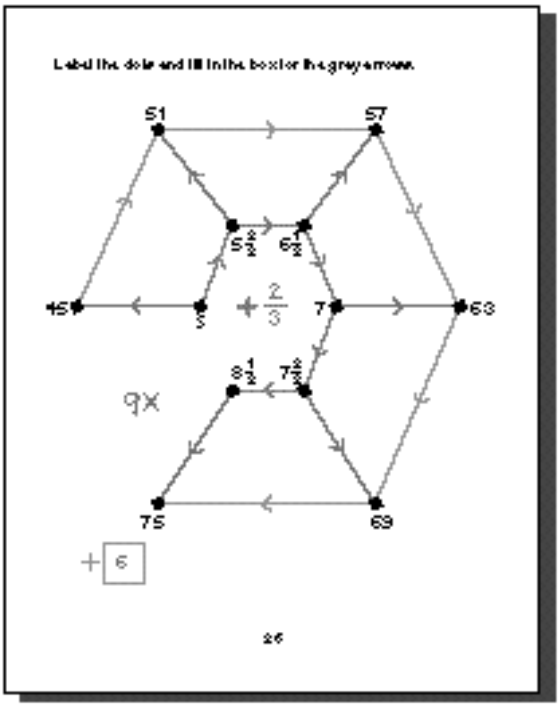
21

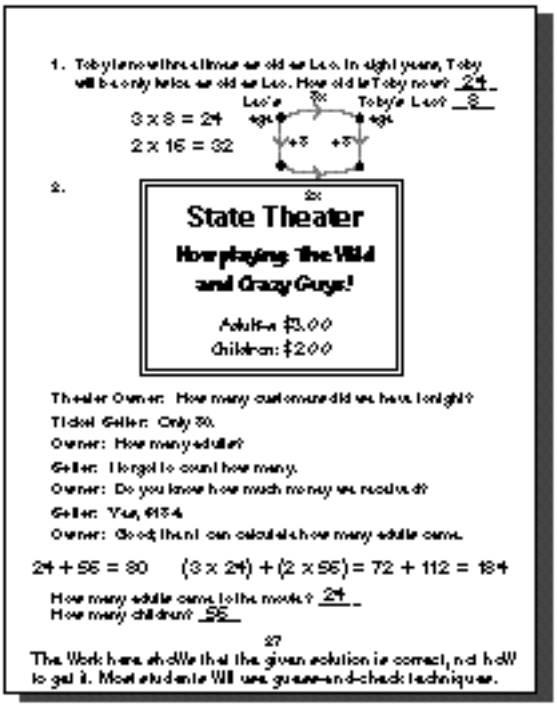

The dots are for positive numbers.
Label the dots and fill in the boxes for the blue arrows.
In the square of
144
12
16
4
400
20
6400
80
9x
3x
25x
5x
16x
4x

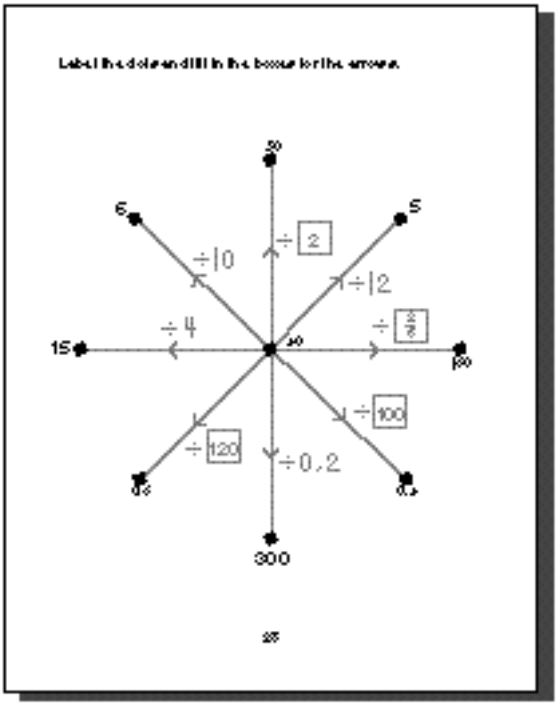

Place these numbers in the sorting picture.
2 x 3²
11³
3² x 11²
11²
3⁴ x 11²
3⁵
7 x 11²
Positive divisors of 3² x 11²
Positive divisors of 3² x 7 x 11²
3² x 11
11²
11²
3⁴
3² x 11²
7 x 11²
3⁶
3⁴ x 11²
2 x 3²

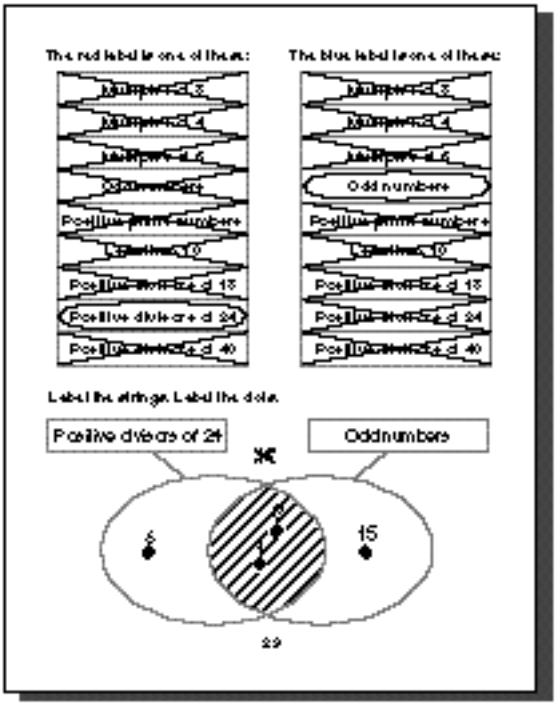

For each problem, list at least three whole numbers that could be in the box.
2 , 6 , 24
also 1, 3, 4, 8, and 12
18 , 3 , 9
also 1, 2, and 6
10 , 20 , 2
24
also 1, 4, and 5

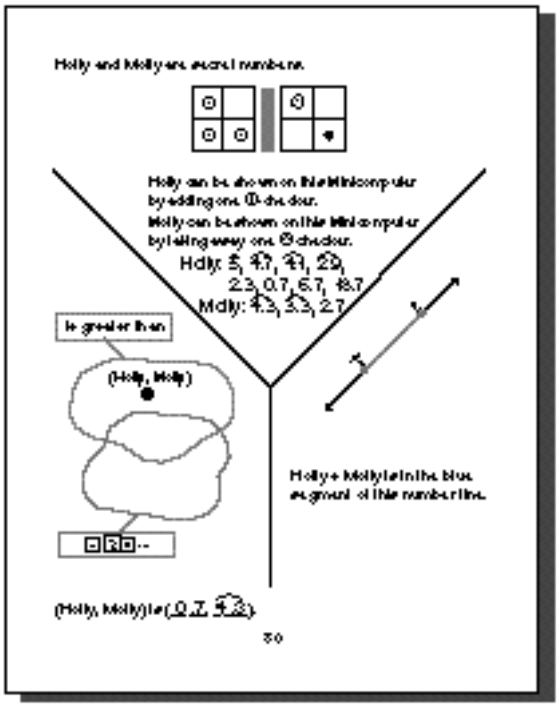

a * b = (½ × a) − b
Example: 6 * 5 = (½ × 6) − 5 = 3 − 5 = −2
Complete.
12 * 3 = 3
2.5 * 0.5 = 0.75
23 * 8 = 35
7 * 5 = −13
10 * 35 = 1.5
30 * 7 = 8
26 * 10 = 3
34 * 10 = 7
2/3 * 1/4 = 1/12
4/5 * 3/5 = −1/5

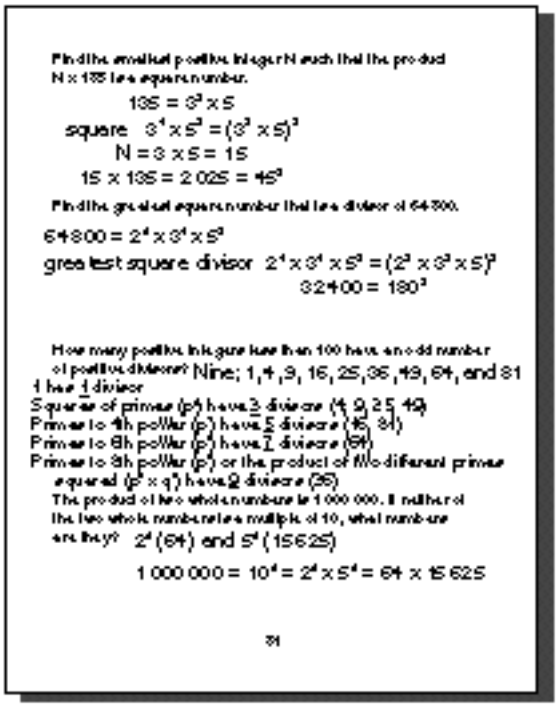

Label the dots and fill in the boxes for the gray arrows.
51
57
15
63
75
69
9x
+ 6
26

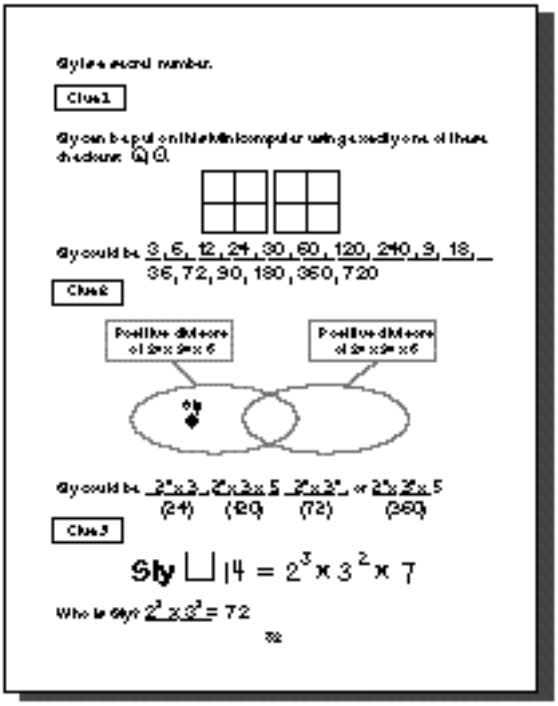

1. Toby is now three times as old as Leo. In eight years, Toby will be only twice as old as Leo. How old is Toby now? 24
Leo's age
Toby's age
3 x 8 = 24
2 x 16 = 32
+8
+8
Leo
2.
State Theater
Now playing: The Wild and Crazy Guys!
Adults: $3.00
Children: $2.00
Theater Owner: How many customers did we have tonight?
Ticket Seller: Only 80.
Owner: How many adults?
Seller: I forgot to count how many.
Owner: Do you know how much money we received?
Seller: Yes, $184.
Owner: Good, then I can calculate how many adults came.
24 + 56 = 80 (3 x 24) + (2 x 56) = 72 + 112 = 184
How many adults came to the movie? 24
How many children? 56
27
The Work here should be that the given solution is correct, not how to get it. Most students will use guess-and-check techniques.


Label the dots and fill in the boxes for the arrows.
30
6
5
15
60
300
÷ 10
÷ 2
÷ 12
÷ 4
÷ 100
÷ 120
÷ 0.2
28


The red label is one of these:
The blue label is one of these:
Odd numbers
Positive divisors of 24
Odd numbers
5
15
29


Holly and Molly are secret numbers.
Holly can be shown on this Mini-computer by adding one ⊙ checker.
Molly can be shown on this Mini-computer by taking away one ⊙ checker.
Holly: 5, 4.7, 21, 29, 2.3, 0.7, 6.7, 18.7
Molly: 4.3, 3.3, 2.7
is greater than
(Holly, Molly)
Holly+Molly is in the blue segment of the number line.
(Holly, Molly) is (0.7, 5.3).
30


Find the smallest positive integer N such that the product N x 135 is a square number.
135 = 3³ x 5
square 3⁴ x 5² = (3² x 5)²
N = 3 x 5 = 15
15 x 135 = 2 025 = 45²
Find the greatest square number that is a divisor of 64 800.
64 800 = 2⁵ x 3⁴ x 5²
greatest square divisor 2⁴ x 3⁴ x 5² = (2² x 3² x 5)²
32 400 = 180²
How many positive integers less than 100 have an odd number of positive divisors? Nine; 1, 4, 9, 16, 25, 36, 49, 64, and 81
1 has 1 divisor
Squares of primes (p²) have 3 divisors (4, 9, 25, 49)
Primes to 4th power (p⁴) have 5 divisors (16, 81)
Primes to 6th power (p⁶) have 7 divisors (64)
Primes to 8th power (p⁸) or the product of two different primes squared (p² x q²) have 9 divisors (36)
The product of two whole numbers is 1 000 000. If neither of the two whole numbers is a multiple of 10, what numbers are they? 2⁶ (64) and 5⁶ (15625)
1 000 000 = 10⁶ = 2⁶ x 5⁶ = 64 x 15 625
31


Sly is a secret number.
Clue 1
Sly can be put on this Mini-computer using exactly one of these checkers: ⊙ ⊙
Sly could be 3, 6, 12, 24, 30, 60, 120, 240, 9, 18, 36, 72, 90, 180, 360, 720
Clue 2
Positive divisors of 2² x 3² x 5
Positive divisors of 2³ x 3² x 5
Sly could be 2²x3, 2²x3x5, 2³x3², or 2³x3x5 (24) (60) (72) (360)
Clue 3
Sly = 2³ x 3² x 7
Who is Sly? 2³ x 3² = 72
32

Capsule Lesson Summary

Use an arrow picture to first determine how much a person earns on commission when the sales are given. Then use the picture to determine the sales when the amount earned is given. Begin the workbook *Collage of Problems #6*. (This is the first of two lessons using this workbook.)

Materials

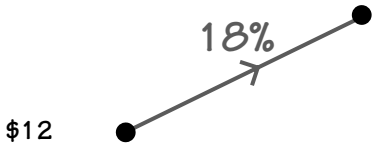
Teacher	• Colored chalk	Student	• *Collage of Problems #6* Workbook • Colored pencils, pens, or crayons • Compass • Metric ruler • Protractor • Calculator

Description of Lesson

Draw a red arrow on the board, and label it "18%."

T: ***Mr. Carfinkle works on commission. He earns 18% of the sales he makes. One month his sales are $12 000. Where should we put $12 000 in this arrow picture?***

S: ***At the starting dot of the arrow.***

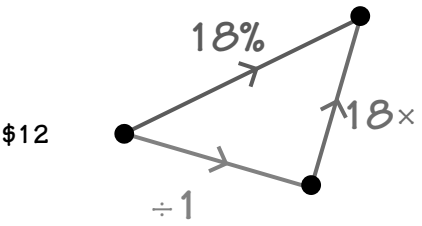


Label the appropriate dot.

T: ***Can you suggest a detour for this arrow that will help us determine how much Mr. Carfinkle will earn this month?***

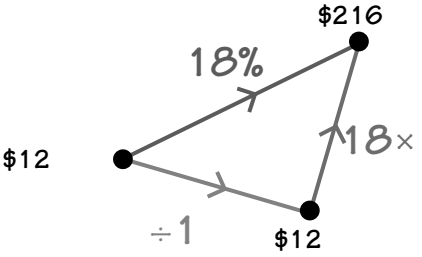
S: ***18% is the same as ÷100 followed by 18× (or 18× followed by ÷100).***

Add arrows to the picture according to a student's suggestion, as illustrated here.

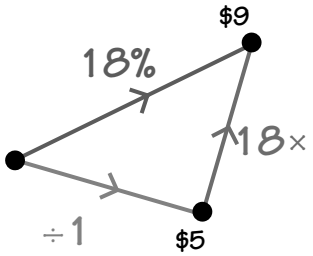


Let students tell you how to label the dots in the arrow picture. Find that Mr. Carfinkle earns $2 160 this month.

Erase all the dot labels.



T: ***Mr. Carfinkle was on vacation for part of a month, but still he earned $900. How much were his sales during this month? Where should we put $900 in this arrow picture?***

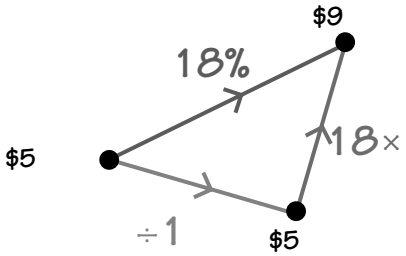


S: ***At the ending dot of the 18% arrow.***

T: ***Try to determine Mr. Carfinkle's sales.***

Allow a few minutes for individual work; then collectively discuss the problem.

Let students tell you how to label the dots in the arrow picture. Point out the use of return arrows to follow the detour in reverse. Find that Mr. Carfinkle's sales were $5 000.



Distribute copies of the workbook *Collage of Problems #6*, and let the students work independently for the rest of the class period. If many students are having difficulty with a particular problem, you may wish to have a collective discussion about that problem.

At the end of the class period, collect the workbooks for your review. They will be used again in Lesson W13.

Capsule Lesson Summary

Continue individual work in the workbook *Collage of Problems #6*. (This is the second of two lessons using this workbook.)

Materials

Teacher
- None

Student
- *Collage of Problems #6* Workbook
- Colored pencils, pens, or crayons
- Protractor
- Metric ruler
- Compass
- Calculator

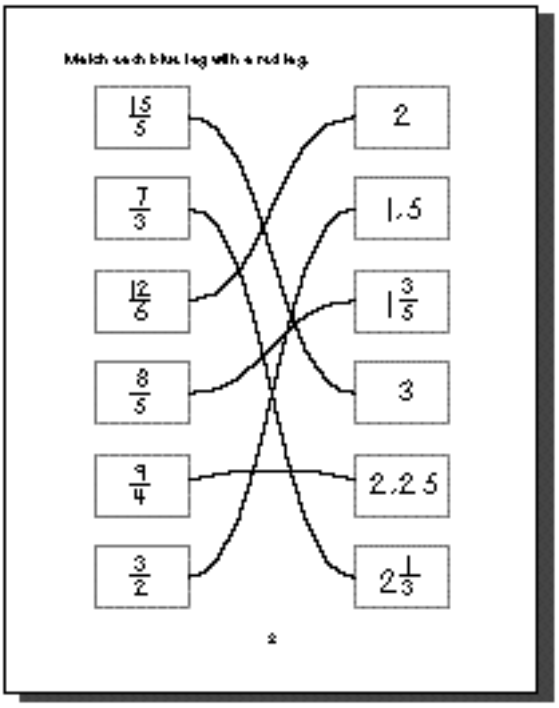
Description of Lesson

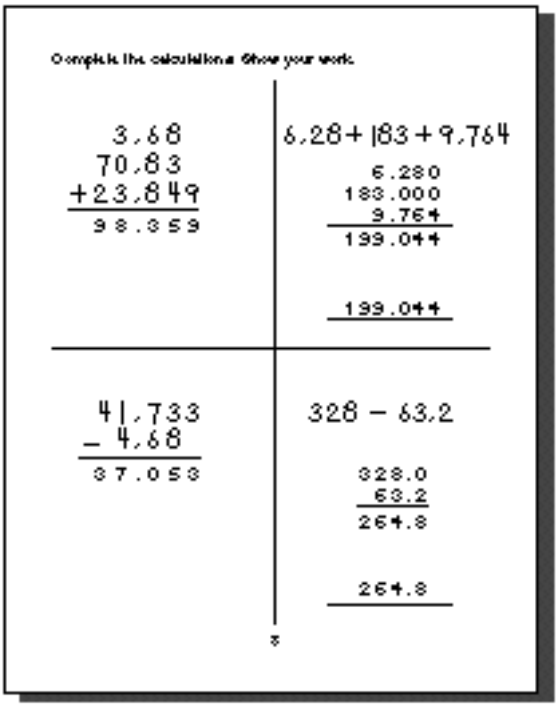
Distribute students' copies of the workbook *Collage of Problems #6*. Ask students first to correct or complete pages from the previous week's work, and then to continue working in their workbooks. You may wish to have a collective discussion about some problems that were difficult for many students the first week.

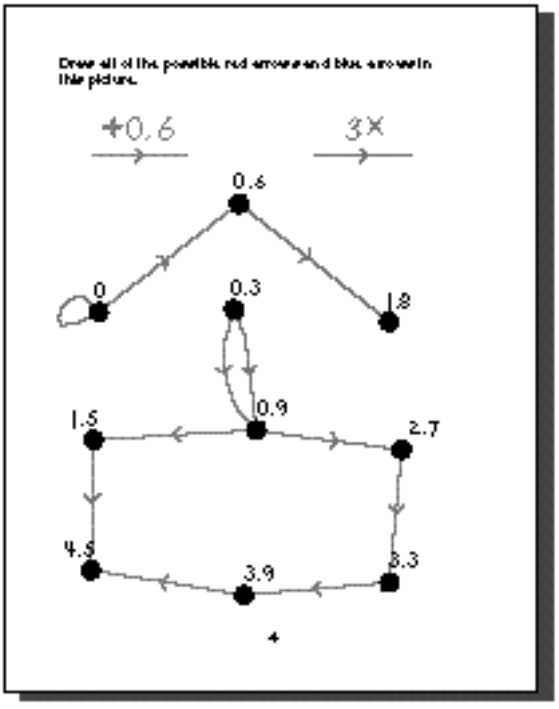
At the end of the class period, collect the workbooks for your review. After checking the workbooks, you may wish to ask some students to work further in their workbooks during a study time or to take them home as an assignment.

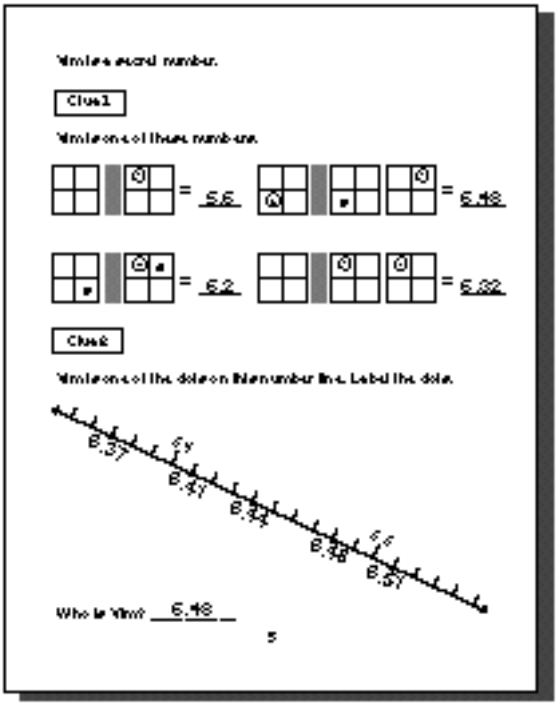
Assessment Activity

An individual student progress record for the workbook is available on Blackline W13. You may like to use this form to monitor student work.


Match each blue tag with a red tag.
$\frac{15}{5}$
$\frac{7}{3}$
$\frac{12}{6}$
$\frac{8}{5}$
$\frac{9}{4}$
$\frac{3}{2}$
2
1.5
$1\frac{3}{5}$
3
2.25
$2\frac{1}{3}$
2


Complete the calculations. Show your work.
3.68
70.83
+23.849
98.359
6.28+183+9.764
6.280
183.000
9.764
199.044
199.044
41.733
− 4.68
37.053
328 − 63.2
328.0
63.2
264.8
264.8
3


Draw all of the possible red arrows and blue arrows in this picture.
+0.6
3×
0.6
0
0.3
1.8
0.9
1.5
2.7
4.5
3.9
3.3
4


Vim's secret number.
Clue 1
Vim's one of these numbers.
= 5.6
= 6.48
= 6.2
= 6.82
Clue 2
Vim's one of the dots on this number line. Label the dots.
6.37
6.41
6.44
6.48
6.51
Who is Vim? 6.48
5

Math-magic

(The Great Mathumalidan knows all...)

1. Write a three-digit number whose first and last digits differ by more than 1. 725

2. Write this number with the digits reversed. 527

3. Find the difference between your number in steps 1 and 2. (Subtract the smaller number from the larger number.) 198

4. Write the number in step 3 with the digits reversed. 891

5. Add the numbers in steps 3 and 4. 1089

The Great Mathumalidan has written your number in step 5 on page 30.

Many choices are possible for step 1. The choice determines steps 2, 3, and 4. At step 5 the number will always be 1089.

6

Match each blue tag with a red tag.

$\frac{9}{10}+\frac{3}{10}$ $\frac{9}{10}-\frac{3}{10}$ $\frac{2}{3}+\frac{1}{2}$ $\frac{2}{3}-\frac{1}{2}$ $\frac{3}{4}\div\frac{2}{3}$ $\frac{3}{4}\times\frac{2}{3}$

0.6 $\frac{1}{6}$ $\frac{9}{8}$ $1\frac{2}{10}$ $\frac{1}{2}$ $1\frac{1}{6}$

7

Alonzo wants to make a ramp (like the one pictured above) for his go-cart. He has the pieces of wood of lengths 2, 3, 4, 5, and 7 inches. What combinations of the three pieces of wood could he use to build the ramp?

2	3	4
2	4	5
3	4	5
3	5	7
4	5	7

8

Complete the chart.

→	→
÷6	÷4
÷12	÷2
÷8	÷3
x2	÷48
÷96	$\div\frac{2}{3}$

Many solutions are possible for the last two entries in the chart.

9

Use the given information to help solve these problems.

20% of $350 = $70
6% of $350 = $21

26% of $350 = $91 14% of $350 = $49

60% of $350 = $210 18% of $350 = $63

100% of $350 = $350 106% of $350 = $371

40 % of $350 = $140 10 % of $350 = $35

120 % of $350 = $420 200 % of $350 = $700

10

The red label is one of these:

Multiple of 5

Multiple of 5

Greatest number is 40

Less than 40

Positive divisor of 15

Positive divisor of 30

The blue label is one of these:

Multiple of 2

Multiple of 5

Greatest number is 40

Less than 40

Positive divisor of 15

Positive divisor of 20

Label the strings.

Positive divisors of 20

Multiples of 2

5

5

*

11

Leah is trying to figure out the money in Gidnia. This is what she knows so far.

- There are three kinds of coins:

Amon Emon Omon

- One Amon is due for three Emons

A = 3E

- One Emon is due for two Omons

E = 2O

Complete this information for Leah.

A = 6 O

1E = 4 A

1E = 24 O

3E + A = 12 O

3A = 9 E

4O = 2 E

A + E = 8 O

2E + 2O = 1 A

Leah has three Amons. Give as many different answers as you could make for Emons and Omons.

3A = 9E 3A = 6E + 2O 3A = 6E + 6O

Other solutions are: 3A = 7E + 4O 3A = 5E + 12O 3A = 2E + 14O 3A = E + 16O 3A = 18O

12

Complete the calculations. Show your work.

4.79 × 0.603

4.79 × 100 = 479

0.603 × 1 000 = 603

479 × 603 = 288 837

479 × 1 = 479

479 × 600 = 287 400

479 × 3 = 1 437

288 837 ÷ 100 000 = 2.88837

Students' work may vary. Accept any correct method.

377.4 ÷ 1.2

314.5	
12) 3774	
−3600	300
174	
−120	10
54	
−48	4
6	
−6	0.5

Answer: 314.5

204.36 ÷ 1.5

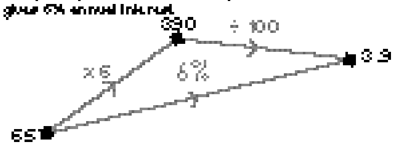
136.24	
15) 2043.6	
−1500	100
543.6	
−450	30
93.6	
−90	6
3.6	
−3.0	0.2
0.6	
−0.6	0.04

Answer: 136.24

13

Use the arrow picture to help solve each problem. Label the dots and then solve the problem.

1. Josephine places $65 in a savings account at a bank which gives 6% annual interest.



How much interest does Josephine earn at the end of one year? $3.90

2. Lester places his money in a savings account at the same bank. At the end of one year, he collects $2.64 interest.

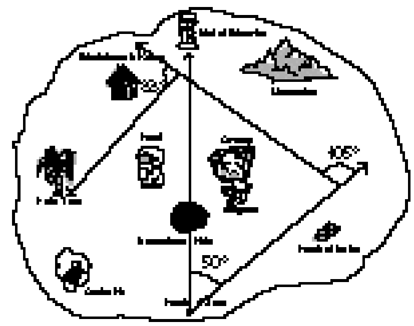
How much money does Lester put in his savings account at the start? $44

14

Treasure Map

Start at the magical Rock of Zum and face the Idol of Whoosh. Turn 50° to your right (draw a ray to show where you are facing). Walk 16 kilometers straight ahead and mark your location with a dot. Turn 105° to your left and walk 16 kilometers straight ahead. Draw a ray and then a dot to mark your new location. Turn 33° to your left. You are now facing the location of a hidden treasure. It is 17 kilometers straight ahead. Draw an X to mark the spot.

SCALE: 1 cm = 2 km



15

Tug-of-War

Barb, Alice, Jerry, and Ted enjoy playing tug-of-war. Alice by herself can beat Barb and Jerry together. Alice and Barb together are exactly as strong as Jerry and Ted; neither team can win. But Ted and Barb together easily beat Alice and Jerry.

List the children in order of strength.

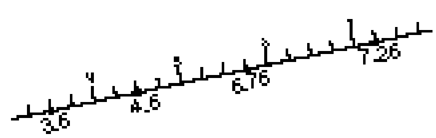
Ted, Alice, Barb, Jerry
(strongest) (weakest)

16

Tina is a secret number.

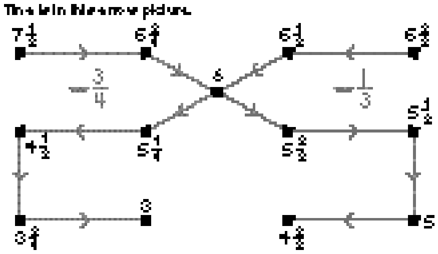
Clue 1

One of these dots is for Tina. Label the dot.



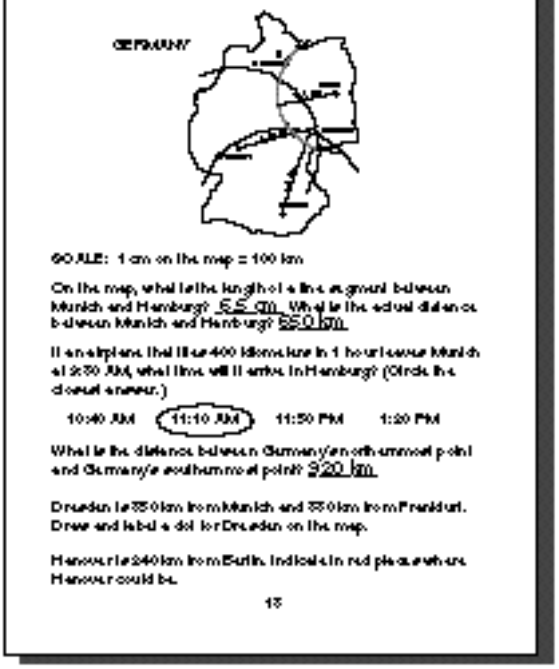
Clue 2

Tina is in this arrow picture.



Who is Tina? 4.5

17



SCALE: 1 cm on the map = 100 km

On the map, what is the length of a line segment between Munich and Hamburg? 6.5 cm What is the actual distance between Munich and Hamburg? 650 km

If an airplane that flies 400 kilometers in 1 hour leaves Munich at 9:30 AM, what time will it arrive in Hamburg? (Circle the closest answer.)

10:40 AM (11:10 AM) 11:50 PM 1:20 PM

What is the distance between Germany's northernmost point and Germany's southernmost point? 920 km

Dresden is 350 km from Munich and 330 km from Frankfurt. Draw and label a dot for Dresden on the map.

Hanover is 240 km from Berlin. Indicate in red pencil where Hanover could be.

18

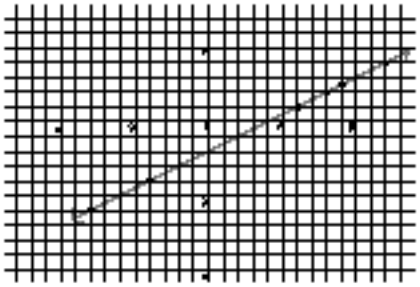
$a \rightarrow (\frac{1}{2} \times a) - 2$

Fill in the blanks. Each ordered pair belongs to the rule above. One is done for you.

(8, 2) (12, 4) (6, 1)

(8, 2) (4, 0) (9, 2.5)

For each ordered pair, draw a dot on the grid. Sketch the Cartesian graph of the relation.



19

Young Wilbur visits the zoo one day and later told his sister, Julie, about one area where he saw both ostriches and zebras. Julie asked, "How many ostriches and zebras did you see?" Wilbur answered, "I won't tell you that, but there were 24 eyes and 30 feet."

Julie quickly calculated the number of ostriches and zebras. Can you?

Eyes: $2 \times 12 = 24$ (12 animals)

Feet: $(2 \times 9) + (4 \times 3) = 18 + 12 = 30$

$9 + 3 = 12$

There were 9 ostriches and 3 zebras.

Extra problem: Wilbur saw some other common jungle animals in another part of the zoo. Altogether, these animals had 5 heads and 8 feet. Which animals and how many of each kind could Wilbur have seen? (Hint: The answer is a little tricky.)

2 lions and 3 snakes, or 4 parrots and 1 snake, or 1 lion and 2 parrots and 2 snakes

20

Answers will vary.

Put each number on the Minicomputer by adding exactly one of these checkers:

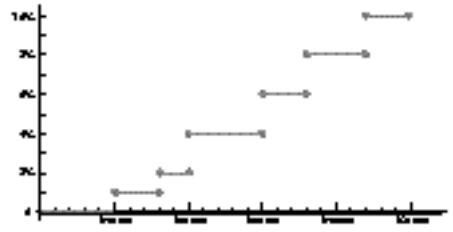
= 10.8 = 0.52

= 11.2 = 1.74

= 7.2 = 5.04

21

State Income Tax Rate



Annual Income

1. What is the percent state income tax rate for a person who earns $25,500 in one year? 4% $17,300? 2%

2. Mr. Gish's state income tax rate is 6%. What is the largest his annual income could be? $35,000 Smallest? $30001

3. Mr. Dowler earns $40,000 per year. How much state income tax does he pay? $38640 After paying his state income tax, Mr. Dowler puts 5% of his earnings into a savings account this year. How much does he put in the account? $1932
($40,000 – $2,360 = $38640 and 5% of $38,640 = $1932)

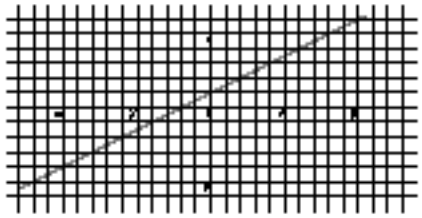
4. Mr. Lapkin's state income tax rate is 10%. This year she paid $4,570 in state income tax. What is her annual income?
$45700

22

(Kim, Tim) is a second ordered pair of numbers.

Clue 1

(Kim, Tim) is a dot on the graph.



(Kim, Tim) could be (6, 4), (6, 2), (8, 5), (10, 4) (9, 5.5), (9, 3.5), and so on.

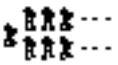
Clue 2 | is equal to

(Kim, Tim) is (2, 2)

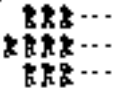
23

Palen High School's marching band is preparing to march in a city parade. Their director is trying to find which formation they should use.

When the band marches in rows of two, poor Waldo is alone in the last row.



When the band marches in rows of three, again poor Waldo is alone in the last row.



When the band marches in rows of four, alas, poor Waldo is alone in the last row.

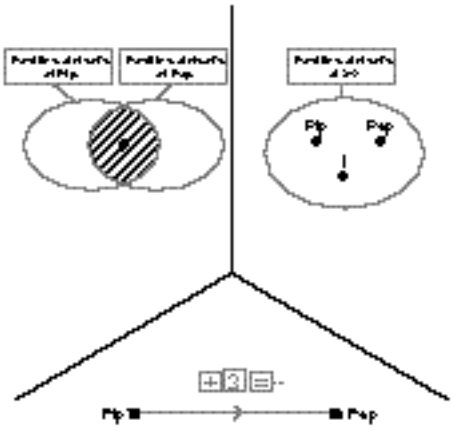
But when the band marches in rows of five, every row has exactly five people.

What is the least number of members the band could have? 25

If the band has between 50 and 140 members, how many students are in the band? 85

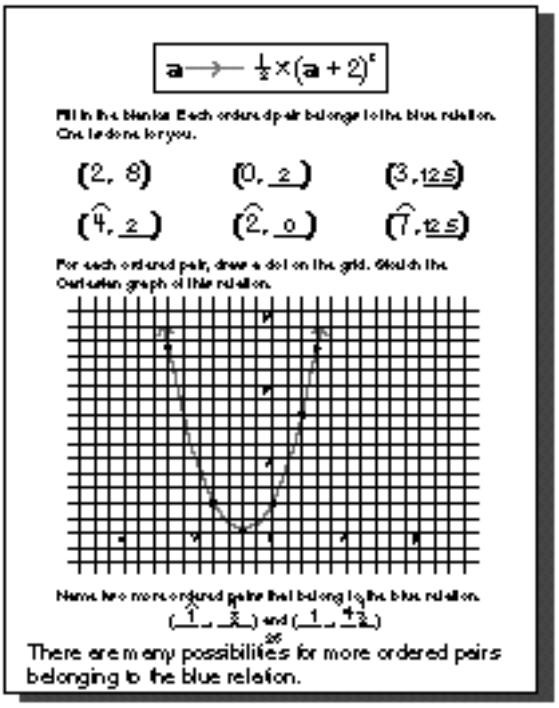
24

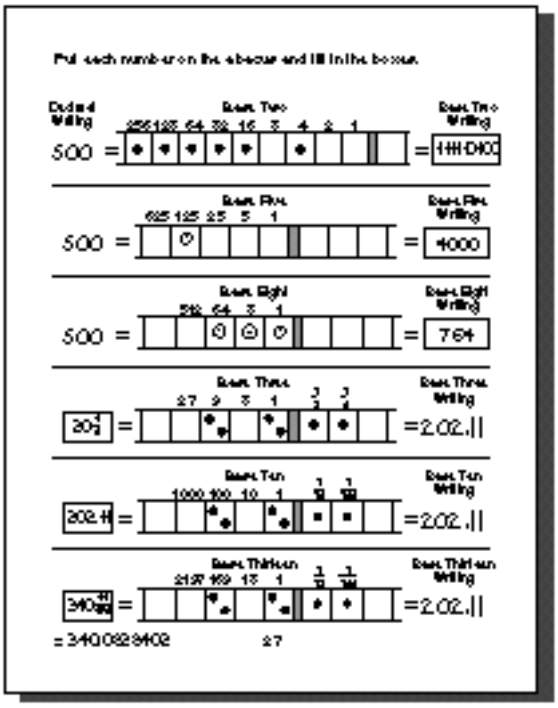
Pip and Pep are second numbers.

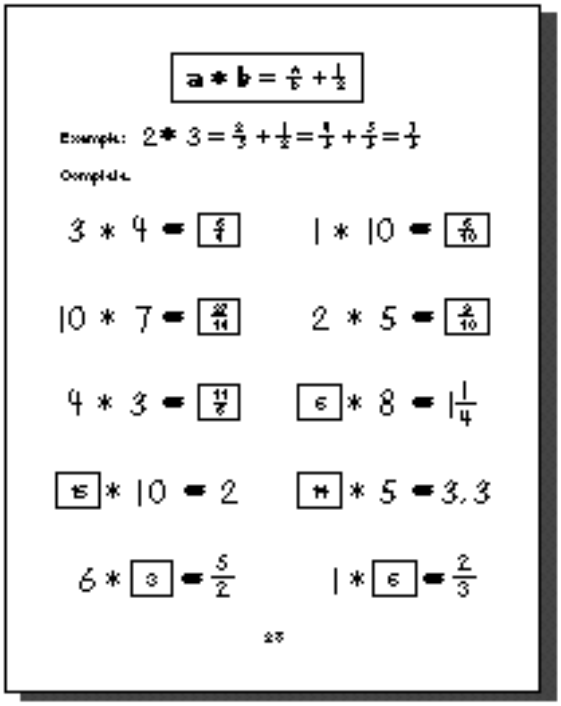


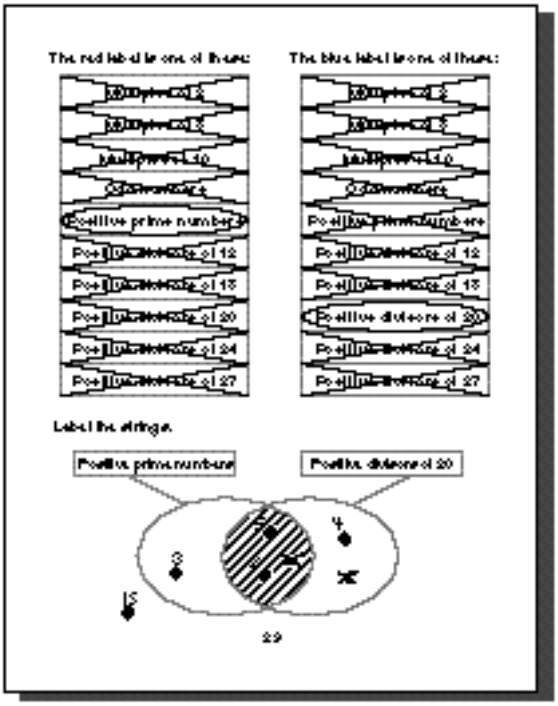
Who is Pip? 2 Who is Pep? 5

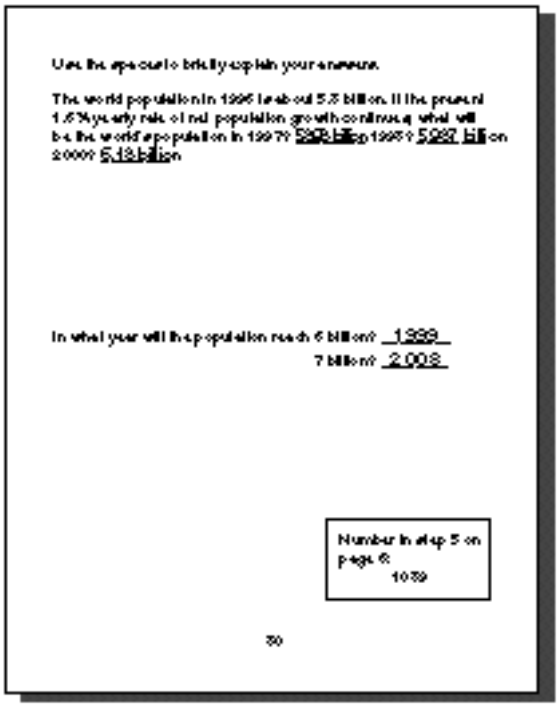
25


a → ½×(a+2)²
Fill in the blanks. Each ordered pair belongs to the blue relation. One is done for you.
(2, 8)
(0, 2)
(3, 12.5)
(4, 2)
(2, 0)
(7, 12.5)
For each ordered pair, draw a dot on the grid. Sketch the Cartesian graph of this relation.
Name two more ordered pairs that belong to the blue relation.
(1, 4½) and (1, 4½)
There are many possibilities for more ordered pairs belonging to the blue relation.
26


Put each number on the abacus and fill in the boxes.
Decimal Writing
Base Two
Base Two Writing
500 =
Base Five
Base Five Writing
500 =
4000
Base Eight
Base Eight Writing
500 =
764
Base Three
Base Three Writing
Base Ten
Base Ten Writing
202.4 =
2.02.||
Base Thirteen
Base Thirteen Writing
=2.02.||
= 340282402
27


a * b = a/5 + b/2
Example: 2 * 3 = 2/5 + 1/2 = 4/10 + 5/10 = 9/10
Complete.
3 * 4 = 7/5
1 * 10 = 6/10
10 * 7 = 87/14
2 * 5 = 9/10
4 * 3 = 11/5
6 * 8 = 1 1/4
15 * 10 = 2
11 * 5 = 3.3
6 * 3 = 5/2
1 * 6 = 2/3
28


The red label is one of these:
The blue label is one of these:
Positive prime number
Positive divisors of 20
Label the strings.
Positive prime numbers
Positive divisors of 20
4
3
5
29



Use the space below to briefly explain your answers.

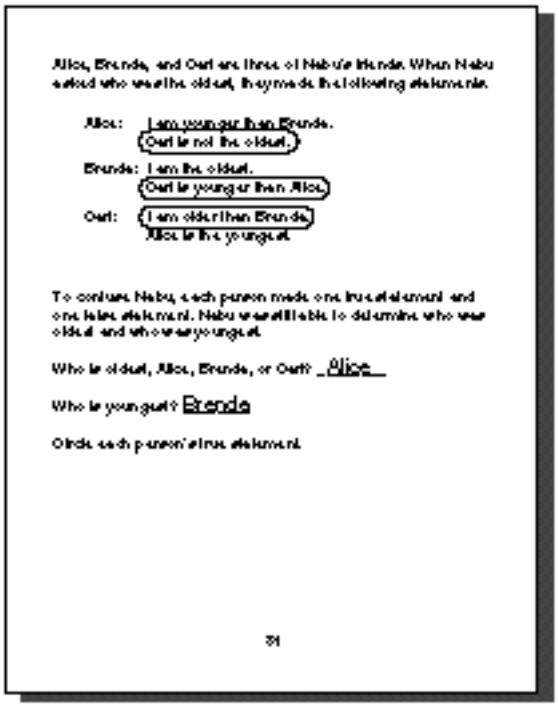
The world population in 1995 is about 5.7 billion. If the present 1.6% yearly rate of net population growth continues, what will be the world population in 1997? 5.83 billion 1998? 5.927 billion 2000? 6.13 billion

In what year will the population reach 6 billion? 1999

7 billion? 2008

Number in step 5 on page 6:
1039

30



Alice, Brenda, and Carl are three of Nabu's friends. When Nabu asked who was the oldest, they made the following statements.

Alice: I am younger than Brenda.
(Carl is not the oldest.)

Brenda: I am the oldest.
(Carl is younger than Alice.)

Carl: (I am older than Brenda.)
Alice is the youngest.

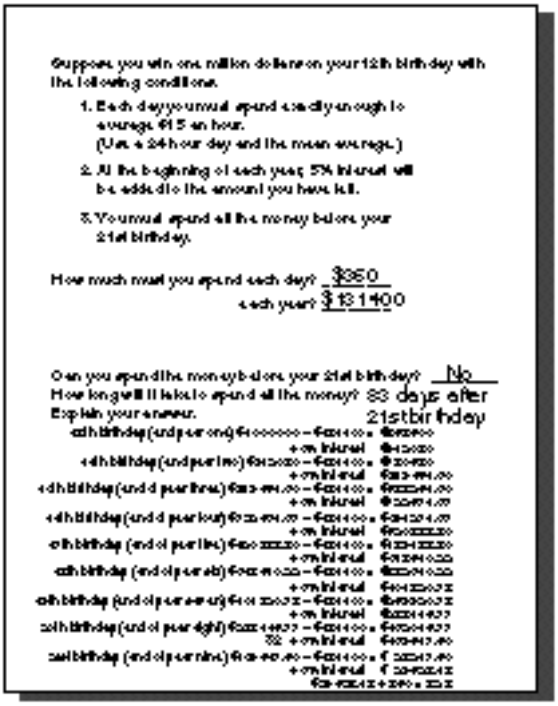
To confuse Nabu, each person made one true statement and one false statement. Nabu was still able to determine who was oldest and who was youngest.

Who is oldest, Alice, Brenda, or Carl? Alice

Who is youngest? Brenda

Circle each person's true statement.

31



Suppose you win one million dollars on your 12th birthday with the following conditions.

1. Each day you must spend exactly enough to average $15 an hour.
(Use a 24-hour day and the mean average.)
2. At the beginning of each year, 5% interest will be added to the amount you have left.
3. You must spend all the money before your 21st birthday.

How much must you spend each day? $360

each year? $131400

Can you spend the money before your 21st birthday? No

How long will it take to spend all the money? 83 days after 21st birthday

Explain your answer.