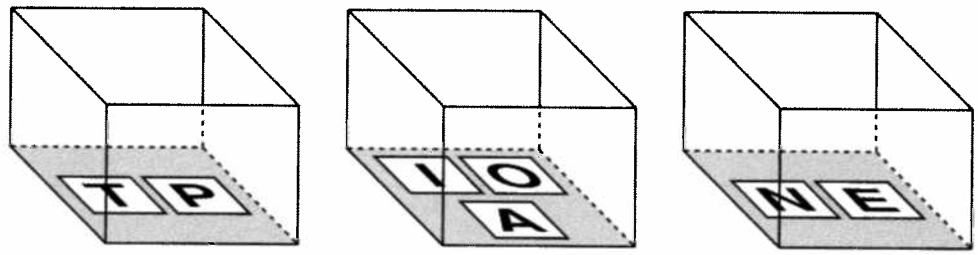
Name ______________________ Date ______________ Time ______________

STUDY LINK 7•5 A Random Draw and a Tree Diagram

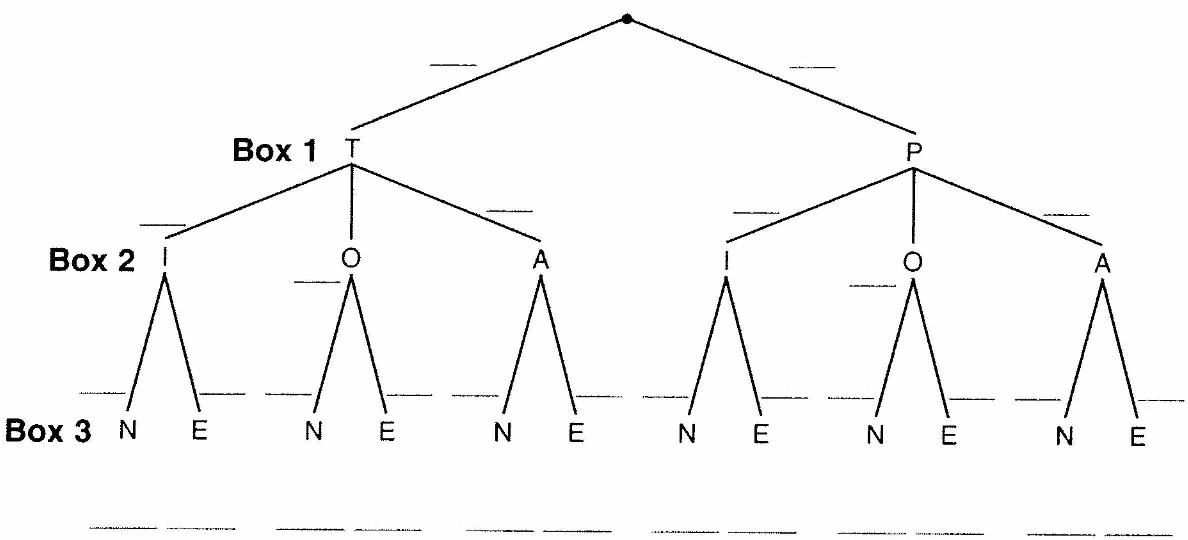
Boxes 1, 2, and 3 contain letter tiles.



Box 1 **Box 2** **Box 3**

Suppose you draw one letter from each box without looking. You lay the letters in a row—the Box 1 letter first, the Box 2 letter second, and the Box 3 letter third.

1. Complete the tree diagram. Fill in the blanks to show the probability for each branch.



2. How many possible combinations of letter tiles are there? ________

3. What is the probability of selecting:

a. the letters P and I? ________

b. the letter I, O, or A? ________

c. the letter combinations TO or PO? ________

d. two consonants in a row? ________

Practice

4. 657 ÷ 18 = ________

5. 858.8 ÷ 38 = ________

6. 1,575 ÷ 125 = ________

Name Date Time

LESSON 7•5

A Coin-Flipping Experiment

1. Suppose you flip a coin 3 times.

What is the probability that the coin will land

a. HEADS 3 times? ______

b. HEADS 2 times and TAILS 1 time? ______

c. HEADS 1 time and TAILS 2 times? ______

d. TAILS 3 times? ______

e. with the same side up all 3 times (that is, all HEADS or all TAILS)? ______

Make a tree diagram to help you solve the problems.

2. One trial of an experiment consists of flipping a coin 3 times. Suppose you perform 100 trials. For about how many trials would you expect to get HHH or TTT? ______________

What percent of the trials is that? ______________

Name ____________ Date ____________ Time ____________

STUDY LINK 7•6

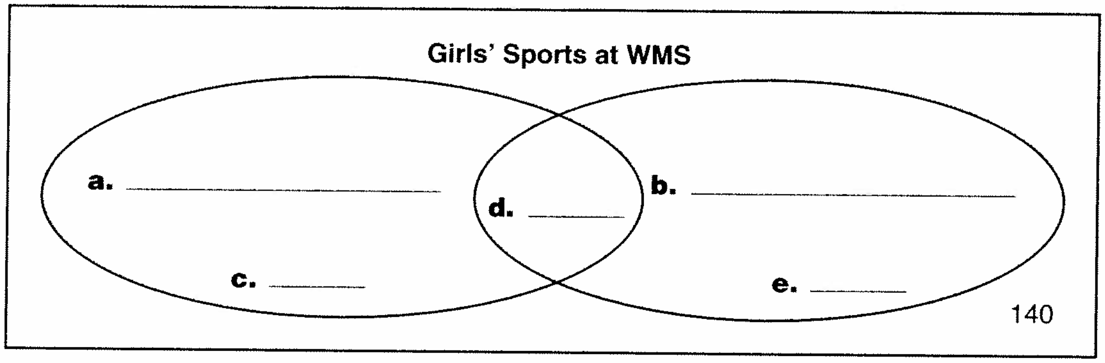
Venn Diagrams

SRB 263 264

There are 200 girls at Washington Middle School.

- 30 girls are on the track team.
- 38 girls are on the basketball team.
- 8 girls are on both teams.

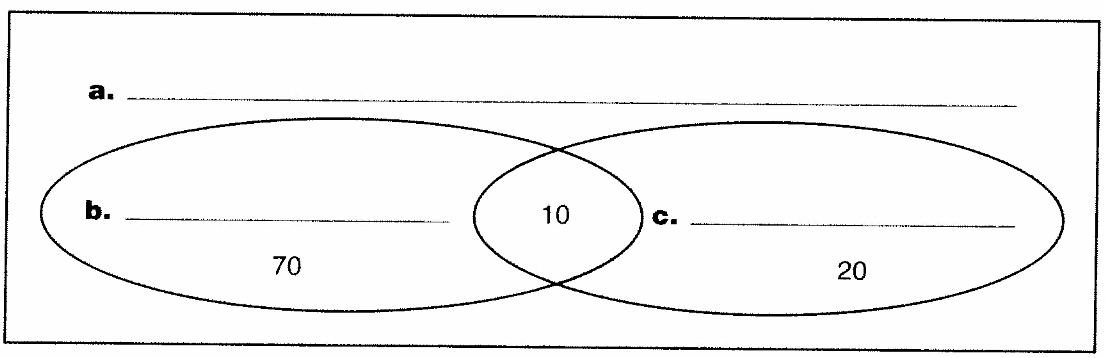
1. Complete the Venn diagram below to show the number of girls on each team.



f. How many girls are on one team but not both? ________ girls

g. How many girls are on the track team but not the basketball team? ________ girls

2. Write a situation (2d) for the Venn diagram below. Complete the diagram by adding a title (2a) and labeling each ring (2b and 2c).



d. ____

____

____

Practice

3. $\frac{7}{8} - \frac{9}{20} =$ ________

4. $7\frac{1}{3} - 4\frac{5}{12} =$ ________

5. $9\frac{2}{5} - 1\frac{1}{4} =$ ________

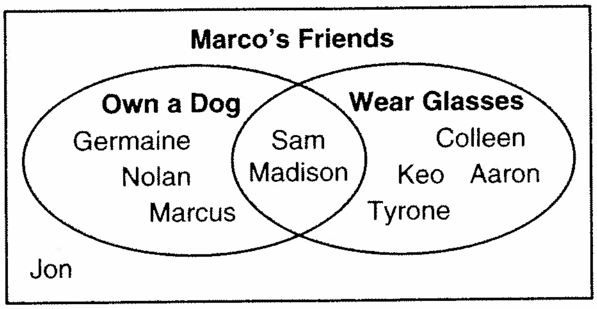
Name ____________ Date ____________ Time ____________

LESSON 7•6

Reviewing Venn Diagrams

A Venn diagram shows how data can belong in more than one group. The diagram is made up of rings that sometimes overlap.

Study the Venn diagram below.



1. Use a yellow highlighter or pencil to outline and lightly shade the Own a Dog ring.

2. List the names of Marco's friends who own a dog.

____

3. Use a blue highlighter or pencil to outline the Wear Glasses ring.

4. List the names of Marco's friends who wear glasses.

____

5. Using your blue highlighter, lightly shade the Wear Glasses ring.

a. Which names are in the area of the diagram that is shaded both yellow and blue (green)?

____

b. What can you tell about the friends whose names appear in the green area of the diagram?

____

6. Explain why Jon's name is outside the rings of the diagram.

____

Name ____________________ Date ____________ Time ____________

LESSON 7•6 Frequency Tables and Venn Diagrams

Suppose researchers chose 1,000 adults at random and tested them to find out whether they were right- or left-handed. People who showed no preference were classified according to the hand they used more often when writing.

Each person was also tested to determine which eye was dominant.*

Possible results are shown in the table at the right. For example, the table shows that 30 people were left-handed and right-eyed.

		Dominant Hand	
		Left	**Right**
Dominant Eye	**Left**	70	200
	Right	30	700

Refer to the table to answer the following questions.

1. The sum of the numbers in the table is ______________.

2. a. How many people in the sample were right-handed and right-eyed? ____________ people

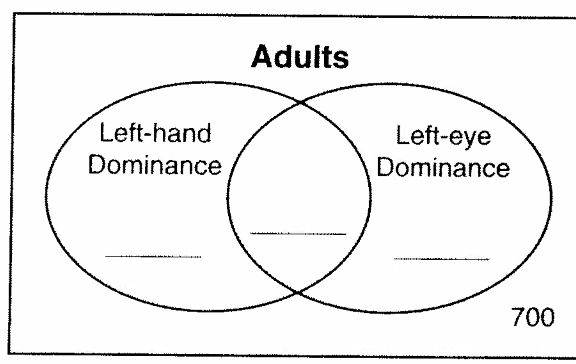
b. How many people were right-handed? ____________ people

3. a. How many people in the sample were left-handed and left-eyed? ____________ people

b. How many people were left-handed? ____________ people

c. How many people were left-eyed? ____________ people

4. Use your answers from Problem 3 to complete the Venn diagram. Fill in the missing numbers.



5. What percent of the people in the sample have their dominant hand and dominant eye on the same side?

____

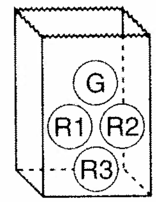
*Eye dominance refers to the tendency to use one eye more than the other in certain tasks involving precise hand-eye coordination and a reasonably distant target. Your dominant eye is the eye you use to aim when you throw darts, for example.

Name Date Time

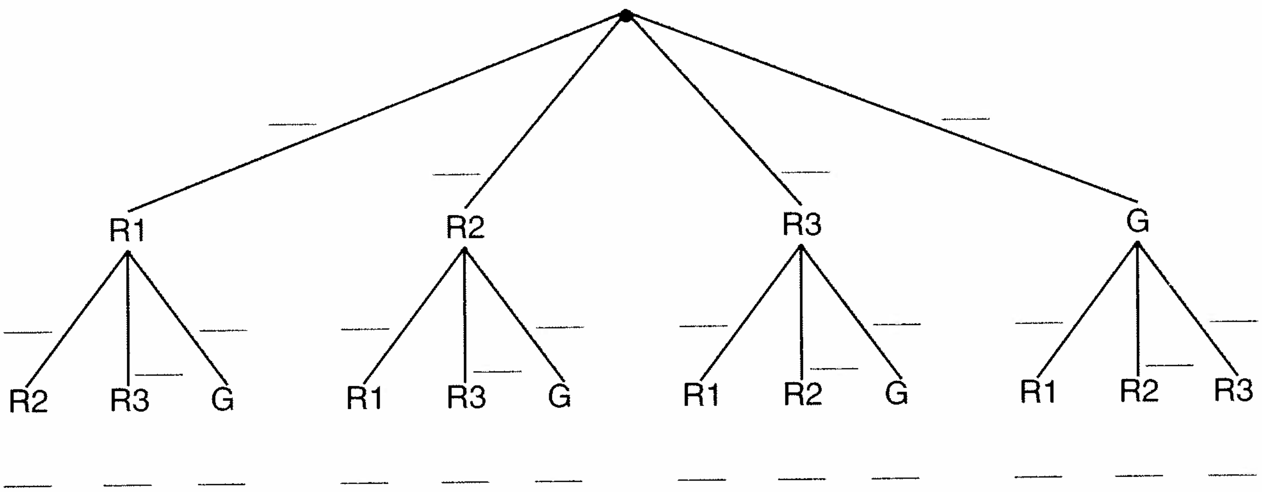
STUDY LINK 7·7

More Tree Diagrams

Denise has 3 red marbles and 1 green marble in a bag. She draws 1 marble at random. Then she draws a second marble without putting the first marble back in the bag.



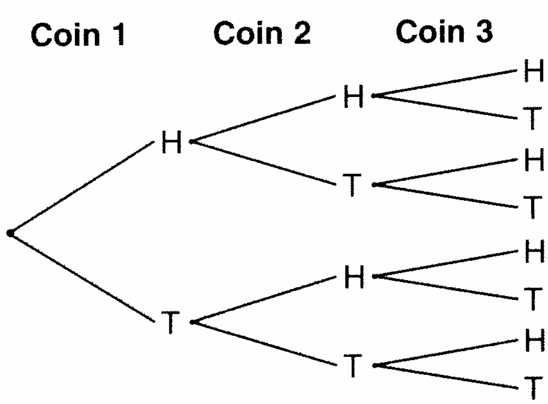
1. Find the probabilities for each branch of the tree diagram below.



a. What is the probability that Denise will select 2 red marbles? ________%

b. What is the probability that Denise will first draw a green marble and then a red marble? ________%

2. Three coins are tossed.



Outcomes
HHH
TTT

a. Complete the table of possible outcomes at the right.

b. What is the probability of tossing *exactly* 2 HEADS? ________%

c. What is the probability of tossing *at least* 1 TAIL? ________%

Name Date Time

LESSON 7•7

A Coin-Flipping Experiment

1. Draw a tree diagram to show all possible outcomes when you flip a coin 4 times.

2. How many possible outcomes are there? ____________

3. What is the probability that the coin will land TAILS once and HEADS 3 times? ____________

4. What is the probability that the coin will land TAILS the same number of times it lands HEADS? ____________

5. What is the probability that the coin will land on the same side all 4 times? ____________

6. What is the probability that the coin will land TAILS more often than HEADS? ____________

7. What is the probability that the coin will land TAILS 75 percent of the time? ____________

8. What is the probability that the coin will land HEADS *at least* once? ____________

Optional Experiment

9. Do the coin-flipping experiment several times and record the actual results. Combine your results with those of your classmates. Do the actual results come close to the predicted results?

Actual Results ____________

Conclusions ____________

____

Name Date Time

LESSON 7·7

Making a Fair Game

Work with your group to figure out how to make the following game fair.

Sum Game

Materials ☐ one each of number cards 1, 3, 6, and 10 (from the Everything Math Deck, if available)

Players 1

Directions

1. Mix the cards and place them facedown on the playing surface.
2. Turn over two of the cards.
3. Add the numbers on the two cards. The 1-card (or ace) is worth 1, the 3-card is worth 3, and so on. The sum is your score for the game.
4. You win if you score at least a *certain number* of points. Otherwise, you lose.

Your group's job is to figure out the *certain number* so the game is fair. In other words, you must find the answer to the following question:

What is the least number of points you must score to win half of the time?

Answer: You win if you score at least ________ points.

Explain how you found the answer.

____

____

____

____

____

____

Name ____________________ Date ____________ Time ____________

STUDY LINK 7·8

Reviewing Probability

SRB 148–155, 263, 264

1. Each fraction in the left column below shows the probability of a chance event. Write the letter of the description next to the fraction that represents it.

____ $\frac{1}{3}$ **A.** Probability of getting HEADS if you flip a coin

____ $\frac{1}{4}$ **B.** Probability of rolling 3 on a 6-sided die

____ $\frac{1}{2}$ **C.** Probability of choosing a red ball from a bag containing 2 red balls, 3 white balls, and 1 green ball

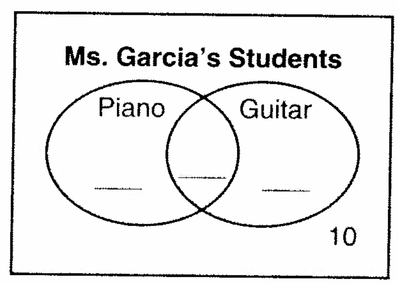
____ $\frac{1}{6}$ **D.** Probability of drawing a heart card from a deck of playing cards

2. Sidone bought 3 new swimsuits—1 red suit, 1 blue suit, and 1 white suit. She also bought 2 pairs of beach sandals—1 red pair and 1 white pair. Make a tree diagram in the space at the right to show all possible combinations of swimsuits and sandals.

a. How many different combinations of suits and sandals are there? ____

b. If Sidone chooses a swimsuit and a pair of sandals at random, what is the probability that they will be the same color? ____

3. a. Ten students in Ms. Garcia's class play the piano. Seven students play the guitar. Two students play both the piano and the guitar. Complete the Venn diagram at the right.



b. How many students are in Ms. Garcia's class? ____ students

Explain how you know.

____

____

____

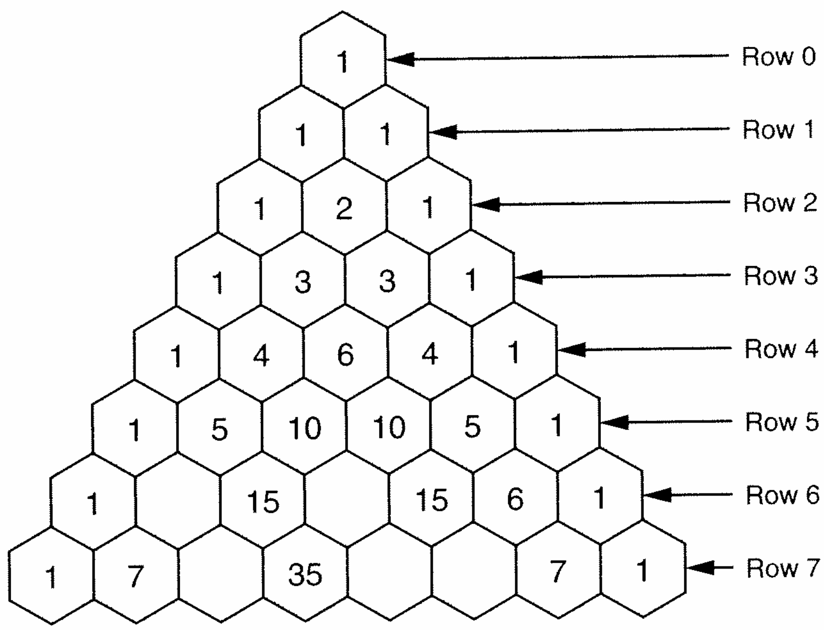
Name ____________ Date ____________ Time ____________

LESSON 7·8

Pascal's Triangle

The triangular array of natural numbers shown below is called Pascal's triangle. This triangle is named after the French mathematician Blaise Pascal. A pattern is used to generate the numbers of the triangle. This pattern can be extended indefinitely.

Compare the numbers in each row of the triangle to the numbers in the row above and below it. Then complete Rows 6 and 7.



Study your completed triangle, looking along rows and diagonals for additional patterns. Describe any pattern(s) you find on the lines below. Then share your pattern(s) with a partner.

____

____

____

____

____

Name ________________ Date ________ Time ________

LESSON 7•8

Probability and Pascal's Triangle

1. Suppose you toss 2 coins.

   a. Complete the table of possible outcomes at the right.

   b. How many outcomes are possible? ________

   c. Find the probability of tossing

   both HEADS. ________ only one HEAD. ________ both TAILS. ________

Coin 1	Coin 2
H	H

2. Look at Row 2 of Pascal's triangle on *Math Masters,* page 240.

   a. What is the sum of the numbers in Row 2? ________

   b. Copy the numbers from Row 2 of the triangle in the spaces below.

   ________ ________ ________

   c. Compare your answers for Problems 1b and 1c (above) with your answers for Problems 2a and 2b.

   What do you notice? ____

   ____

3. Suppose you toss 3 coins. Use Row 3 of Pascal's triangle to complete the following.

   a. How many outcomes are possible? ________

   b. Find the probability of getting

   3 HEADS. ________ 2 HEADS and 1 TAIL. ________ 1 HEAD and 2 TAILS. ________ 3 TAILS. ________

4. Which row of Pascal's triangle would you use to find the possible outcomes and probabilities when 6 coins are tossed? Row ________

5. How many different ways could you answer 5 true/false questions? ________ ways

Name Date Time

STUDY LINK 7•9

Unit 8: Family Letter

Rates and Ratios

The next unit is devoted to the study of rates and ratios. Fraction and decimal notation will be used to express rates and ratios and to solve problems.

Ratios compare quantities that have the same unit. These units cancel each other in the comparison, so the resulting ratio has no units. For example, the fraction $\frac{2}{20}$ could mean that 2 out of 20 people in a class got an A on a test or that 20,000 out of 200,000 people voted for a certain candidate in an election.

Another frequent use of ratios is to indicate relative size. For example, a picture in a dictionary drawn to $\frac{1}{10}$ scale means that every length in the picture is $\frac{1}{10}$ the corresponding length in the actual object. Students will use ratios to characterize relative size as they examine map scales and compare geometric figures.

Rates, on the other hand, compare quantities that have different units. For example, rate of travel, or speed, may be expressed in miles per hour (55 mph); food costs may be expressed in cents per ounce (17 cents per ounce) or dollars per pound ($2.49 per pound).

Easy ratio and rate problems can be solved intuitively by making tables, such as *What's My Rule?* tables. Problems requiring more complicated calculations are best solved by writing and solving proportions. Students will learn to solve proportions by cross multiplication. This method is based on the idea that two fractions are equivalent if the product of the denominator of the first fraction and the numerator of the second fraction is equal to the product of the numerator of the first fraction and the denominator of the second fraction. For example, the fractions $\frac{4}{6}$ and $\frac{6}{9}$ are equivalent because $6 * 6 = 4 * 9$. This method is especially useful because proportions can be used to solve any ratio and rate problem. It will be used extensively in algebra and trigonometry.

$9 * 4 = 36$ $6 * 6 = 36$

$$\frac{4}{6} = \frac{6}{9}$$

Students will apply these rate and ratio skills as they explore nutrition guidelines. The class will collect nutrition labels and design balanced meals based on recommended daily allowances of fat, protein, and carbohydrate. You might want to participate by planning a balanced dinner together and by examining food labels while shopping with your child. Your child will also collect and tabulate various kinds of information about your family and your home and then compare the data by converting them to ratios. In a final application lesson, your child will learn about the Golden Ratio—a ratio found in many works of art and architecture.

Vocabulary

Important terms in Unit 8:

Golden Ratio The *ratio* of the length of the long side to the length of the short side of a Golden Rectangle, approximately equal to 1.618 to 1. The Greek letter ϕ (phi) sometimes stands for the Golden Ratio. The Golden Ratio is an irrational number equal to $\frac{1 + \sqrt{5}}{2}$.

***n*-to-1 ratio** A *ratio* of a number to 1. Every ratio *a:b* can be converted to an *n*-to-1 ratio by dividing *a* by *b*. For example, a ratio of 3 to 2 is a ratio of 3 / 2 = 1.5, or a 1.5-to-1 ratio.

part-to-part ratio A *ratio* that compares a part of a whole to another part of the same whole. For example, *There are 8 boys for every 12 girls* is a part-to-part ratio with a whole of 20 students. Compare to *part-to-whole ratio.*

part-to-whole ratio A *ratio* that compares a part of a whole to the whole. For example, *8 out of 20 students are boys* and *12 out of 20 students are girls* are part-to-whole ratios. Compare to *part-to-part ratio.*

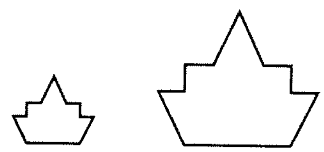
per-unit rate A *rate* with 1 unit of something in the denominator. Per-unit rates tell how many of one thing there are for one unit of another thing. For example, *3 dollars per gallon, 12 miles per hour,* and *1.6 children per family* are per-unit rates.

proportion A number sentence equating two fractions. Often the fractions in a proportion represent *rates* or *ratios.*

rate A comparison by division of two quantities with different units. For example, traveling 100 miles in 2 hours is an average rate of $\frac{100 \text{ mi}}{2 \text{ hr}}$ or 50 miles per hour. Compare to *ratio.*

ratio A comparison by division of two quantities with the same units. Ratios can be fractions, decimals, percents, or stated in words. Ratios can also be written with a colon between the two numbers being compared. For example, if a team wins 3 games out of 5 games played, the ratio of wins to total games is $\frac{3}{5}$, 3 / 5, 0.6, 60%, 3 to 5, or 3:5 (read "three to five"). Compare to *rate.*

similar figures Figures that have the same shape, but not necessarily the same size. For example, all squares are similar to one another, and the preimage and image of a *size-change* are similar. The *ratio* of lengths of corresponding parts of similar figures is a *scale* or *size-change factor.* In the example below, the lengths of the sides of the larger polygon are 2 times the lengths of the corresponding sides of the smaller polygon. Compare to congruent.



Similar polygons

size-change factor Same as *scale factor.*

scale factor (1) The *ratio* of lengths on an image and corresponding lengths on a preimage in a *size-change.* Same as *size-change factor.* (2) The *ratio* of lengths in a scale drawing or scale model to the corresponding lengths in the object being drawn or modeled.

Do-Anytime Activities

To work with your child on the concepts taught in this unit and in previous units, try these interesting and rewarding activities:

1. Look with your child through newspapers and magazines for photos, and check them to see if a size-change factor is mentioned in the caption: that is, 2X for an enlarged photo 2 times life-size; or $\frac{1}{2}$X for a photo reduced by half. You might find photos of insects, stars, bacteria, and so on. Have your child explain to you what the size-change factor means.
2. Encourage your child to read nutrition labels and calculate the percent of fat in the item.

$$\frac{\text{fat calories}}{\text{total calories}} = \frac{?}{100} = ?\text{\% of calories from fat}$$

   If your child enjoys this activity, extend it by figuring the percent of calories from protein and carbohydrate.
3. Help your child distinguish between part-to-part and part-to-whole ratios. When comparing a favorite sports team's record, decide which ratio is being used. For example, wins to losses (such as 5 to 15) or losses to wins (15 to 5) are part-to-part ratios. Part-to-whole ratios are used to compare wins to all games played (5 out of 20) or losses to all games played (15 out of 20).

Building Skills through Games

In Unit 8, your child will continue to review concepts from previous units and prepare for topics in upcoming units by playing games such as:

***Division Top-It* (Advanced Version)** See *Student Reference Book,* page 336
Two to four people can play this game using number cards 1–9. Players apply place-value concepts, division facts, and estimation strategies to generate whole-number division problems that will yield the largest quotient.

Spoon Scramble See *Student Reference Book,* page 333
Playing *Spoon Scramble* helps students practice finding fraction, decimal, and percent parts of a whole. Four players need a deck of 16 *Spoon Scramble* cards and 3 spoons to play this game.

As You Help Your Child with Homework

As your child brings assignments home, you may want to go over the instructions together, clarifying them as necessary. The answers listed below will guide you through some of the Study Links in this unit.

Study Link 8•1

2. a. 13 **b.** $6.50

3. a.

Words	1	2	4	5
Minutes	75	150	300	375

b. 375 words **c.** 14 minutes

4. 0.6 hours **5.** About 44

6. −1 **7.** −1.856

Study Link 8•2

1. $\frac{3}{15} = \frac{a}{125}$; 25

2. $\frac{30}{48} = \frac{w}{64}$; 40

3. $\frac{240}{10} = \frac{216}{g}$; 9

4. $\frac{60.96}{2} = \frac{c}{3}$; 91.44

Sample estimates are given.

5. 600; 674 **6.** 100; 91 **7.** 40; 35