

# Chapter 7

## Resource Masters



# Mathematics

Applications and Concepts

Course 2



New York, New York   Columbus, Ohio   Chicago, Illinois   Peoria, Illinois   Woodland Hills, California

**7-1****Study Guide and Intervention****Ratios**

Any ratio can be written as a fraction. To write a ratio comparing measurements, such as units of length or units of time, both quantities must have the same unit of measure. Two ratios that have the same value are **equivalent ratios**.

**EXAMPLE 1** Write the ratio 15 to 9 as a fraction in simplest form.

$$15 \text{ to } 9 = \frac{15}{9} \quad \text{Write the ratio as a fraction.}$$

$$= \frac{5}{3} \quad \text{Simplify.}$$

Written as a fraction in simplest form, the ratio 15 to 9 is  $\frac{5}{3}$ .

**EXAMPLE 2** Write 40 centimeters to 2 meters as a fraction in simplest form.

$$\frac{40 \text{ centimeters}}{2 \text{ meters}} = \frac{40 \text{ centimeters}}{200 \text{ centimeters}} \quad \text{Convert 2 meters to centimeters.}$$

$$= \frac{\cancel{40}^1 \text{ centimeters}}{\cancel{200}_5 \text{ centimeters}} \quad \text{Divide by the GCF, 40 centimeters.}$$

$$= \frac{1}{5} \quad \text{Simplify.}$$

**EXERCISES**

Write each ratio as a fraction in simplest form.

- |                         |                             |
|-------------------------|-----------------------------|
| 1. 30 to 12             | 2. 5:20                     |
| 3. 49:42                | 4. 15 to 13                 |
| 5. 28 feet:35 feet      | 6. 24 minutes to 18 minutes |
| 7. 75 seconds:2 minutes | 8. 12 feet:10 yards         |

Determine whether the ratios are equivalent. Explain.

9.  $\frac{3}{4}$  and  $\frac{12}{16}$       10. 12:17 and 10:15      11.  $\frac{25}{35}$  and  $\frac{10}{14}$

12. 2 lb:36 oz and 3 lb:44 oz      13. 3 ft:12 in. and 2 yd:2 ft

**7-1****Practice: Skills****Ratios**

Write each ratio as a fraction in simplest form.

1. 14 to 6

2. 18:3

3. 4:22

4. 7:21

5. 18:12

6. 20 to 9

7. 25 to 20

8. 4:10

9. 18:21

10. 84 to 16

11. 33 ounces to 11 ounces

12. 45 minutes:25 minutes

13. 77 cups:49 cups

14. 15 pounds to 39 pounds

15. 40 seconds to 6 minutes

16. 140 centimeters to 3 meters

17. 9 weeks:9 days

18. 1 yard to 11 feet

Determine whether the ratios are equivalent. Explain.

19.  $\frac{3}{16}$  and  $\frac{9}{48}$

20.  $\frac{7}{10}$  and  $\frac{8}{11}$

21. 18 in.:3 ft and 12 in.:2 ft

22. 6 mos:2 yr and 8 mos:3 yr

**7-1****Practice: Word Problems****Ratios**

|   |  |
|---|--|
| <p><b>1. ELECTIONS</b> In an election for sheriff, 210 people voted. If there were 1,260 possible voters, write a ratio to compare the number of people who voted to the number of possible voters.</p>                                   | <p><b>2. DENTAL CARE</b> Taru surveyed 60 dentists and found that 48 favored the use of fluoride toothpaste. Write a ratio to compare the number of dentists favoring the use of a fluoride toothpaste to all dentists surveyed.</p>                     |
| <p><b>3. E-MAIL</b> One morning, Mirna counted 15 junk E-mails out of 21 E-mails in her inbox. Write a ratio comparing the number of junk E-mails to the total number of E-mails.</p>   | <p><b>4. SURFING</b> One evening at his local surf spot, Jeff counted 28 surfers in the water. Among those, he counted 21 that had hoods on their wetsuits. Write a ratio comparing the number of surfers with hoods to the total number of surfers.</p> |
| <p><b>5. MUSIC</b> A music company signed 12 new artists to its label in 2002. Out of the 12, 10 artists have hit songs. Write a ratio to compare the number of artists with hit songs to the total number of artists signed in 2002.</p> | <p><b>6. COOKING</b> Charlene poured 18 fluid ounces of juice into a 1-quart pitcher. Write a ratio comparing the amount of juice in the pitcher to the total capacity of the pitcher.</p>   |
| <p><b>7. BASEBALL</b> In baseball, David has 10 hits out of 14 at bats. Adam has 15 hits out of 21 at bats. For each player, write a ratio that represents his total number of hits out of times at bat. Are these ratios equivalent?</p> | <p><b>8. DRIVING</b> Sarah can drive 198 miles on 11 gallons of gasoline. On 6 gallons of gasoline, Rachel can travel 138 miles. Write a ratio that compares miles traveled per gallon of gasoline for each car. Do the cars get the same mileage?</p>   |

**7-1****Reading to Learn Mathematics****Ratios**

**Pre-Activity** *Read the introduction at the top of page 288 in your textbook. Write your answers below.*

- Express the gear ratio as a fraction. Then write it as a fraction with a denominator of 1.
- How many times does the smaller gear turn for every turn of the larger gear?
- Describe some of the possible sizes of two gears that have a gear ratio of 3 to 1.

**Reading the Lesson**

**For Exercises 4 and 5, review the introduction to this lesson.**

- What two things are being compared?
- What is the comparison of the size of the larger gear to the size of the smaller gear called?
- When you simplify a ratio written as an improper fraction, should you rewrite the fraction as a mixed number?
- Review Example 3 at the top of page 289. Why has 2 feet been converted to 24 inches?

**Helping You Remember**

- Comparing measurements requires you to know how to convert measurements easily. Complete the following table to help you remember some common conversions.

| Unit     | Equivalent Unit |
|----------|-----------------|
| 1 foot   | _____ inches    |
| 1 yard   | _____ feet      |
| 1 year   | _____ weeks     |
| 1 pound  | _____ ounces    |
| 1 gallon | _____ quarts    |
| 1 quart  | _____ pints     |

## 7-1

## Enrichment

## Chien-Shiung Wu

American physicist Chien-Shiung Wu (1912–1997) was born in Shanghai, China. In 1936, she came to the United States to further her studies in science. She received her doctorate in physics in 1940 from the University of California, and became known as one of the world's leading physicists. In 1975, she was awarded the National Medal of Science.

Wu is most famous for an experiment that she conducted in 1957. The outcome of the experiment was considered the most significant discovery in physics in more than seventy years. The exercise below will help you learn some facts about it.

**Choose the value that makes each equation correct. The word or phrase following the solution will complete the statement correctly.**



1.  $\frac{10}{6} = \frac{m}{15}$  At the time of the experiment, Wu was a professor at \_\_\_\_?\_\_\_\_.

$m = 25$ : Columbia University

$m = 9$ : Stanford University

2.  $\frac{8}{2} = \frac{t}{2.5}$  The site of the experiment was the \_\_\_\_?\_\_\_\_ in Washington, D.C.

$t = 10$ : National Bureau of Standards

$t = 6.4$ : Smithsonian Institution

3.  $\frac{5}{y} = \frac{12}{3}$  The experiment involved a substance called \_\_\_\_?\_\_\_\_.

$y = 20$ : carbon 14

$y = 1.25$ : cobalt 60

4.  $\frac{5}{4} = \frac{4}{n}$  In the experiment, the substance was cooled to \_\_\_\_?\_\_\_\_.

$n = 5$ :  $-100^{\circ}\text{C}$

$n = 3.2$ :  $-273^{\circ}\text{C}$

5.  $\frac{6}{c} = \frac{0.3}{9}$  The experiment proved that a physical reaction could \_\_\_\_?\_\_\_\_.

$c = 180$ : have a “right side” and a “left side”

$c = 0.2$ : occur at a temperature called “absolute zero”

6.  $\frac{24}{5.4} = \frac{6}{j}$  Before Wu's experiment, scientists had believed that all physical reactions \_\_\_\_?\_\_\_\_.

$j = 21.6$ : occurred at temperatures greater than  $-250^{\circ}\text{C}$

$j = 1.35$ : were perfectly symmetric

**7-2****Study Guide and Intervention****Rates**

A ratio that compares two quantities with different kinds of units is called a **rate**. When a rate is simplified so that it has a denominator of 1 unit, it is called a **unit rate**.

**EXAMPLE 1** **DRIVING** Alita drove her car 78 miles and used 3 gallons of gas. What is the car's gas mileage in miles per gallon?

Write the rate as a fraction. Then find an equivalent rate with a denominator of 1.

$$\begin{aligned} 78 \text{ miles using } 3 \text{ gallons} &= \frac{78 \text{ mi}}{3 \text{ gal}} && \text{Write the rate as a fraction.} \\ &= \frac{78 \text{ mi} \div 3}{3 \text{ gal} \div 3} && \text{Divide the numerator and the denominator by 3.} \\ &= \frac{26 \text{ mi}}{1 \text{ gal}} && \text{Simplify.} \end{aligned}$$

The car's gas mileage, or unit rate, is 26 miles per gallon.

**EXAMPLE 2** **SHOPPING** Joe has two different sizes of boxes of cereal from which to choose. The 12-ounce box costs \$2.54, and the 18-ounce box costs \$3.50. Which box costs less per ounce?

Find the unit price, or the cost per ounce, of each box. Divide the price by the number of ounces.

$$\begin{array}{ll} 12\text{-ounce box} & \$2.54 \div 12 \text{ ounces} \approx \$0.21 \text{ per ounce} \\ 18\text{-ounce box} & \$3.50 \div 18 \text{ ounces} \approx \$0.19 \text{ per ounce} \end{array}$$

The 18-ounce box costs less per ounce.

**EXERCISES**

**Find each unit rate. Round to the nearest hundredth if necessary.**

1. 18 people in 3 vans
2. \$156 for 3 books
3. 115 miles in 2 hours
4. 8 hits in 22 games
5. 65 miles in 2.7 gallons
6. 2,500 Calories in 24 hours

**Choose the best unit price.**

7. \$12.95 for 3 pounds of nuts or \$21.45 for 5 pounds of nuts
8. A 32-ounce bottle of apple juice for \$2.50 or a 48-ounce bottle for \$3.84.

**7-2****Practice: Skills****Rates**

**Find each unit rate. Round to the nearest hundredth if necessary.**

1. \$112 in 8 hours
2. 150 miles in 6 gallons
3. 49 points in 7 games
4. 105 students in 3 classes
5. 120 problems in 5 hours
6. 3 accidents in 12 months
7. 6 eggs in 7 days
8. 8 batteries in 3 months
9. 122 patients in 4 weeks
10. 51 gallons in 14 minutes
11. \$8.43 for 3 pounds
12. 357 miles in 6.3 hours
13. 25 letters in 4 days
14. \$99 for 12 CDs
15. 5 breaks in 8 hours
16. 3 trips in 14 months
17. 2 pay raises in 3 years
18. 7 errors in 60 minutes
19. 15 pounds in 6 weeks
20. 8 commercials in 15 minutes
21. 8 glasses every 24 hours
22. 13 feet in 5 steps

**Choose the best unit price.**

23. \$4.99 for 6 cans or \$7.99 for 10 cans
24. \$21.50 for 4 pounds of lunch meat or \$15.10 for 3 pounds of lunch meat

**7-2****Practice: Word Problems****Rates**

|   |   |
|---|---|
| <p><b>1. TRAVEL</b> During Sonia's trip across the country, she traveled 2,884 miles. Her trip took 7 days. Find a unit rate to represent the average miles she traveled per day during the trip.</p> | <p><b>2. BUDGET</b> Steve was offered \$5,025 per year for a weekend lifeguarding job at a local pool. He wants to know how much his monthly income will be at this salary level. What is his rate of pay in dollars per month?</p> |
| <p><b>3. MUSIC</b> Randall recorded 8 songs on his most recent CD. The total length of the CD is 49 minutes. Find a unit rate to represent the average length per song on the CD.</p>                 | <p><b>4. CARPETING</b> Hana paid \$1,200 for the carpet in her living room. The room has an area of 251.2 square feet. What was her unit cost of carpeting in dollars per square foot? Round to the nearest cent.</p>               |
| <p><b>5. SHOPPING</b> An 8-ounce can of tomatoes costs \$1.14. A 12-ounce can costs \$1.75. Which can of tomatoes has the better unit price?</p>  | <p><b>6. PETS</b> Last month, Hao's dog ate 40 cans of dog food in 31 days. How many cans should Hao buy to feed his dog for the next 6 days?</p>   |

**7-2****Reading to Learn Mathematics****Rates**

**Pre-Activity** *Do the Mini Lab at the top of page 292 in your textbook. Write your answers below.*

1. Count the number of words that each of you typed.
2. Write the ratio *number of words to number of minutes* as a fraction.
3. Simplify the fractions by dividing the numerator and the denominator by 2.

**Reading the Lesson**

4. A rate is a special kind of ratio. What makes it special?
5. Describe what makes a rate different from a unit rate. Give an example of a rate and its equivalent unit rate.
6. Write the ratios in words for each unit rate abbreviation.

| Abbreviation | Ratio |
|--------------|-------|
| m/s          |       |
| ft/s         |       |
| mi/h (mph)   |       |
| mi/gal (mpg) |       |

**Helping You Remember**

7. Go to a food store or find several different newspaper food advertisements. Compare prices for several different sizes of the same product, or compare prices for similar sizes of different brands of the same product. Which size or which brand costs the least per unit? Report your results to the class.

**7-2****Enrichment****An Educated Consumer**

Choosing a checking account is something that most people do at some point in their lives. Because checking accounts vary from institution to institution, and from one type of account to another, you will need to consider the options associated with each account before choosing one of them.

Suppose a bank offers two kinds of checking accounts.

**Account A:** a \$0.20 charge for writing each check and no service charge

**Account B:** a \$0.10 charge for writing each check and a monthly service charge of \$1.50

1. Which account would cost less if a person were to write 10 checks in a month?
2. Which account would cost less if a person were to write 20 checks in a month?
3. Using the guess-and-check strategy, find the number of checks that would have to be written for the cost of Account A to equal the cost of Account B. What is that cost?
4. Which account would cost less if a person were to write 250 checks in a year? By how much?
5. Diana Durbin wrote 300 checks in one year. Her total charge for the use of the account that year was \$72.00. The bank charges \$0.15 for writing one check and charges a fixed amount each month for the use of the account. What is that monthly service charge?

**7-3****Study Guide and Intervention****Solving Proportions**

A **proportion** is an equation stating that two ratios are equivalent. Since rates are types of ratios, they can also form proportions. In a proportion, a **cross product** is the product of the numerator of one ratio and the denominator of the other ratio.

**EXAMPLE 1** Determine whether  $\frac{2}{3}$  and  $\frac{10}{15}$  form a proportion.

$$\frac{2}{3} \stackrel{?}{=} \frac{10}{15}$$

Write a proportion.

$$2 \times 15 \stackrel{?}{=} 3 \times 10$$

Find the cross products.

$$30 = 30 \quad \checkmark$$

Multiply.

The cross products are equal, so the ratios form a proportion.

**EXAMPLE 2** Solve  $\frac{8}{a} = \frac{10}{15}$ .

$$\frac{8}{a} = \frac{10}{15}$$

Write the proportion.

$$8 \times 15 = a \times 10$$

Find the cross products.

$$120 = 10a$$

Multiply.

$$\frac{120}{10} = \frac{10a}{10}$$

Divide each side by 10.

$$12 = a$$

Simplify.

The solution is 12.

**EXERCISES**

Determine whether each pair of ratios forms a proportion.

1.  $\frac{8}{10}$  and  $\frac{4}{5}$

2.  $\frac{9}{4}$  and  $\frac{11}{6}$

3.  $\frac{6}{14}$  and  $\frac{9}{21}$

4.  $\frac{15}{12}$  and  $\frac{9}{6}$

5.  $\frac{\$2.48}{4 \text{ oz}}$  and  $\frac{\$3.72}{6 \text{ oz}}$

6.  $\frac{125 \text{ mi}}{5.7 \text{ gal}}$  and  $\frac{120 \text{ mi}}{5.6 \text{ gal}}$

Solve each proportion.

7.  $\frac{y}{7} = \frac{16}{28}$

8.  $\frac{5}{15} = \frac{15}{w}$

9.  $\frac{20}{b} = \frac{70}{28}$

10.  $\frac{52}{8} = \frac{m}{9}$

**7-3****Practice: Skills****Solving Proportions**

Determine whether each pair of ratios forms a proportion.

1.  $\frac{9}{5}$  and  $\frac{27}{15}$

2.  $\frac{16}{10}$  and  $\frac{24}{15}$

3.  $\frac{6}{18}$  and  $\frac{9}{25}$

4.  $\frac{42}{63}$  and  $\frac{28}{42}$

5.  $\frac{11}{8}$  and  $\frac{13}{10}$

6.  $\frac{22}{33}$  and  $\frac{12}{18}$

7.  $\frac{14}{17}$  and  $\frac{29}{35}$

8.  $\frac{36}{22}$  and  $\frac{30}{19}$

9.  $\frac{32}{48}$  and  $\frac{10}{15}$

10.  $\frac{320 \text{ mi}}{6 \text{ h}}$  and  $\frac{420 \text{ mi}}{8 \text{ h}}$

11.  $\frac{\$4.96}{8 \text{ oz}}$  and  $\frac{\$3.72}{6 \text{ oz}}$

12.  $\frac{25 \text{ mg}}{1.5 \text{ c}}$  and  $\frac{100 \text{ mg}}{6 \text{ c}}$

Solve each proportion.

13.  $\frac{24}{13} = \frac{a}{26}$

14.  $\frac{18}{x} = \frac{3}{36}$

15.  $\frac{3}{u} = \frac{5}{15}$

16.  $\frac{650}{6.5} = \frac{z}{5}$

17.  $\frac{2.8}{4} = \frac{7}{q}$

18.  $\frac{c}{17} = \frac{0.01}{8.5}$

19.  $\frac{0.1}{8.2} = \frac{1.8}{b}$

20.  $\frac{300}{24} = \frac{18}{j}$

21.  $\frac{4.2}{t} = \frac{8}{5}$

22.  $\frac{120}{75} = \frac{8}{m}$

**7-3****Practice: Word Problems*****Solving Proportions***

|   |  |
|---|--|
| <p><b>1. COOKING</b> Theo wants to use a cookie recipe that makes 36 cookies but he wants to reduce the number of cookies to 24. If the recipe specifies using 2 cups of sugar, how much sugar should he use?</p> | <p><b>2. MEDICINE</b> In order to determine her pulse rate, June's nurse counted 18 beats in her pulse in 15 seconds. At this rate, how many beats would she have in 60 seconds?</p>                             |
| <p><b>3. LABOR</b> Ed earned \$112 for 8 hours of work. At this rate, how much will he earn for 40 hours of work?</p>   | <p><b>4. TRAVEL</b> Rita traveled 1,250 miles in the first 3 days of her trip. At this rate, how long will it take her to travel 1,875 miles?</p>  |
| <p><b>5. MODELS</b> An architect built a model of a 220-foot tall building he is designing. The model is 25 inches tall and 10 inches wide. How wide is the actual building?</p>                                  | <p><b>6. TESTING</b> Mary is preparing for her college entrance exams. In a practice test, she answered 12 problems in 30 minutes. At this rate, how many questions can she expect to answer in 150 minutes?</p> |

**7-3****Reading to Learn Mathematics****Solving Proportions**

**Pre-Activity** *Read the introduction at the top of page 297 in your textbook. Write your answers below.*

1. Write the ratio  $\frac{\text{vitamin C}}{\text{amount of cereal}}$  for a half-cup serving of cereal.
2. Rewrite the ratio in Exercise 1 to find the unit rate in milligrams per cup.
3. Simplify  $\frac{60 \text{ mg}}{2 \text{ c}}$  to find the unit rate.
4. **Make a conjecture** about the rates  $\frac{15 \text{ mg}}{0.5 \text{ c}}$  and  $\frac{60 \text{ mg}}{2 \text{ c}}$ .

**Reading the Lesson**

5. What symbol tells you that two ratios are equivalent?
6. What is true about the cross products of a proportion?
7. How are cross products useful in identifying a proportion?
8. How are cross products useful in solving a proportion?

**Helping You Remember**

9. Explain what it means to solve a proportion. Use an example to show what you mean.

# 7-3

## Enrichment

### What Am I?

Solve each proportion. Then, starting at the box marked with the heavy outline, draw an arrow to the adjacent box containing the variable with the least value. (You may move horizontally or vertically. You may use each box at most once.)

|  |   |  |   |   |
|--|---|--|---|---|
|  | $\frac{3.5}{\frac{1}{4}} = \frac{o}{2}$ | $\frac{n}{37} = \frac{54}{55\frac{1}{2}}$        | $\frac{5}{e} = \frac{2\frac{1}{2}}{21}$ | $\frac{16.5}{36} = \frac{11}{a}$  |
| $\frac{z}{2} = \frac{4}{1}$            | $\frac{0.7}{h} = \frac{2.1}{108}$       | $\frac{0.3}{0.4} = \frac{18}{o}$                 | $\frac{3}{5.82} = \frac{n}{48.5}$       | $\frac{p}{55} = \frac{\frac{2}{5}}{1}$                                  |
| $\frac{a}{5} = \frac{9}{15}$           | $\frac{2}{7} = \frac{p}{14}$            | $\frac{0.5}{i} = \frac{24}{384}$                 | $\frac{z}{32} = \frac{7}{8}$            | $\frac{43.2}{18} = \frac{u}{5}$   |
| $\frac{4}{o} = \frac{20}{30}$          | $\frac{3.4}{6.8} = \frac{2.5}{r}$       | $\frac{\frac{2}{9}}{\frac{1}{3}} = \frac{t}{18}$ | $\frac{1}{z} = \frac{\frac{2}{3}}{60}$  | $\frac{72}{\frac{1}{2}} = \frac{t}{\frac{1}{4}}$                        |
| $\frac{p}{\frac{1}{2}} = \frac{16}{2}$ | $\frac{o}{24} = \frac{10.5}{36}$        | $\frac{3.5}{5.5} = \frac{7}{r}$                  | $\frac{2\frac{1}{2}}{9} = \frac{5}{l}$  | <b>Stop here.</b><br>$\frac{e}{\frac{1}{5}} = \frac{12.5}{\frac{1}{2}}$ |
| $\frac{600}{150} = \frac{o}{3.5}$      | $1\frac{2}{5} = \frac{r}{20}$           | $\frac{0.2}{o} = \frac{0.5}{35}$                 | $\frac{3}{8} = \frac{6}{d}$             | $\frac{1}{4} = \frac{3}{96}$  |

Now fill in the table below with the letters in the order in which you found them. Now you can say what I am.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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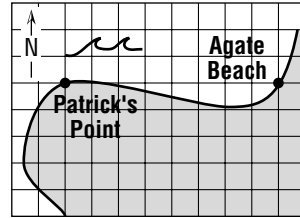
# 7-4

## Study Guide and Intervention

### Scale Drawings

A **scale drawing** represents something that is too large or too small to be drawn at actual size. Similarly, a **scale model** can be used to represent something that is too large or too small for an actual-size model. The **scale** gives the relationship between the drawing/model measure and the actual measure.

**EXAMPLE 1** On this map, each grid unit represents 50 yards. Find the distance from Patrick's Point to Agate Beach.



|  |   |  |
|--|---|--|
| $\begin{array}{l} \text{map} \longrightarrow \\ \text{actual} \longrightarrow \end{array} \frac{1 \text{ unit}}{50 \text{ yards}} =$ | $\frac{8 \text{ units}}{x \text{ yards}}$ | $\longleftarrow \begin{array}{l} \text{map} \\ \longleftarrow \text{actual} \end{array}$ |
| $1 \times x =$   | $50 \times 8$                             | Cross products   |
| $x =$  | $400$                                     | Simplify.  |

It is 400 yards from Patrick's Point to Agate Beach.

### EXERCISES

Find the actual distance between each pair of cities. Round to the nearest tenth if necessary.

|    | Cities                                | Map Distance | Scale                    | Actual Distance |
|----|---------------------------------------|--------------|--------------------------|-----------------|
| 1. | Los Angeles and San Diego, California | 6.35 cm      | 1 cm = 20 mi             |                 |
| 2. | Lexington and Louisville, Kentucky    | 15.6 cm      | 1 cm = 5 mi              |                 |
| 3. | Des Moines and Cedar Rapids, Iowa     | 16.27 cm     | 2 cm = 15 mi             |                 |
| 4. | Miami and Jacksonville, Florida       | 11.73 cm     | $\frac{1}{2}$ cm = 20 mi |                 |

Suppose you are making a scale drawing. Find the length of each object on the scale drawing with the given scale. Then find the scale factor.

5. an automobile 16 feet long; 1 inch:6 inches
6. a lake 85 feet across; 1 inch = 4 feet
7. a parking lot 200 meters wide; 1 centimeter:25 meters
8. a flag 5 feet wide; 2 inches = 1 foot

**7-4****Practice: Skills****Scale Drawings**

**ARCHITECTURE** The scale on a set of architectural drawings for a house is  $\frac{1}{2}$  inch =  $1\frac{1}{2}$  feet. Find the length of each part of the house.

|    | Room         | Drawing Length        | Actual Length |
|----|--------------|-----------------------|---------------|
| 1. | Living Room  | 5 inches              |               |
| 2. | Dining Room  | 4 inches              |               |
| 3. | Kitchen      | $5\frac{1}{2}$ inches |               |
| 4. | Laundry Room | $3\frac{1}{4}$ inches |               |
| 5. | Basement     | 10 inches             |               |
| 6. | Garage       | $8\frac{1}{3}$ inches |               |

**ARCHITECTURE** As part of a city building refurbishment project, architects have constructed a scale model of several city buildings to present to the city commission for approval. The scale of the model is 1 inch = 9 feet.

- The courthouse is the tallest building in the city. If it is  $7\frac{1}{2}$  inches tall in the model, how tall is the actual building?
- The city commission would like to install new flagpoles that are each 45 feet tall. How tall are the flagpoles in the model?
- In the model, two of the flagpoles are 4 inches apart. How far apart will they be when they are installed?
- The model includes a new park in the center of the city. If the dimensions of the park in the model are 9 inches by 17 inches, what are the actual dimensions of the park?
- Find the scale factor.

**7-4****Practice: Word Problems****Scale Drawings**

|   |   |
|---|---|
| <p><b>1. CARS</b> A scale drawing of an automobile has a scale of 1 inch = <math>\frac{1}{2}</math> foot. The actual width of the car is 8 feet. What is the width on the scale drawing?</p>                      | <p><b>2. MODELS</b> A model ship is built to a scale of 1 centimeter:5 meters. The length of the model is 30 centimeters. What is the length of the actual ship?</p>  |
| <p><b>3. BUILDING</b> Jose wants to build a model of a 180-meter tall building. He will be using a scale of 1.5 centimeters = 3.5 meters. How tall will the model be? Round your answer to the nearest tenth.</p> | <p><b>4. TRAVEL</b> Susan is driving to Mount Shasta. On her map, she is a distance of <math>7\frac{3}{4}</math> inches away. The scale of the map is <math>\frac{1}{2}</math> inch = 50 miles. How far must Susan travel to reach her destination?</p> |
| <p><b>5. MAPS</b> A map of Levi's property is being made with a scale of 2 centimeters: 3 meters. What is the scale factor?</p>   | <p><b>6. LANDSCAPING</b> A pond is being dug according to plans that have a scale of 1 inch = 6.5 feet. The maximum distance across the pond is 9.75 inches on the plans. What will be the actual maximum distance across the pond?</p>                 |

**7-4****Reading to Learn Mathematics****Scale Drawings**

**Pre-Activity** *Do the Mini Lab at the top of page 304 in your textbook. Write your answers below.*

1. Let 1 unit on the grid paper represent 1 foot. So, 6 units = 6 feet. Convert all of your measurements to units.
2. On grid paper, make a drawing of your classroom like the one shown at the top of page 304.

**Reading the Lesson**

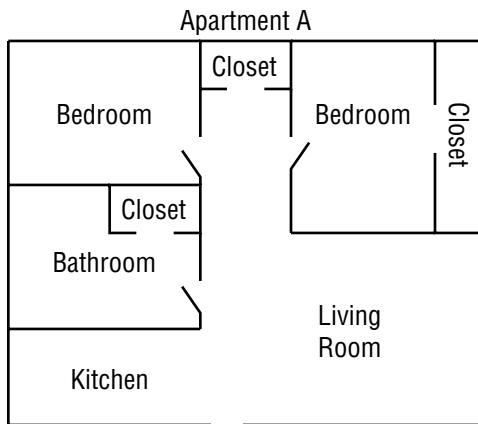
3. Look at the map in the middle of page 304. What is the scale? What does the scale mean?
4. In Example 1, could you find the actual distance if you did not know the scale? Explain your answer.
5. Give another example of a scale drawing or scale model that is different from the examples of scale drawings and scale models given in this lesson in your textbook.

**Helping You Remember**

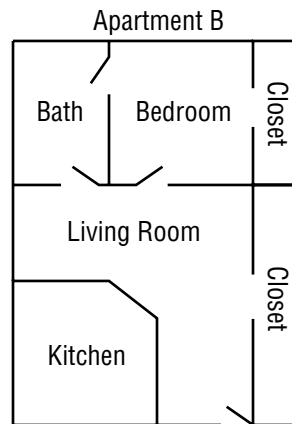
6. How is a scale drawing similar to a scale model? How is it different?

**7-4****Enrichment****Scale Drawings**

Use the scale drawings of two different apartments to answer the questions.



Scale: 1 inch = 12 feet



Scale: 1 inch = 16 feet

1. Which apartment has the greater area?
2. What is the difference in square feet between Apartment A and Apartment B?
3. How much more closet space is offered by Apartment B than Apartment A?
4. How much more bathroom space is offered by Apartment B than Apartment A?
5. A one-year lease for Apartment A costs \$450 per month. A one-year lease for Apartment B costs \$525 per month. Which apartment offers the greatest value in terms of the cost per square foot?

**7-5****Study Guide and Intervention**  
*Fractions, Decimals, and Percents***EXAMPLE 1** Write  $4\frac{3}{8}\%$  as a fraction in simplest form.

$$4\frac{3}{8}\% = \frac{4\frac{3}{8}}{100} \quad \text{Write a fraction.}$$

$$= 4\frac{3}{8} \div 100 \quad \text{Divide.}$$

$$= \frac{35}{8} \div 100 \quad \text{Write } 4\frac{3}{8} \text{ as an improper fraction.}$$

$$= \frac{35}{8} \times \frac{1}{100} \quad \text{Multiply by the reciprocal of 100, which is } \frac{1}{100}.$$

$$= \frac{35}{800} \text{ or } \frac{7}{160} \quad \text{Simplify.}$$

**EXAMPLE 2** Write  $\frac{5}{16}$  as a percent.

$$\frac{5}{16} = \frac{n}{100} \quad \text{Write a proportion using } \frac{n}{100}.$$

$$500 = 16n \quad \text{Find the cross products.}$$

$$\frac{500}{16} = \frac{16n}{16} \quad \text{Divide each side by 16.}$$

$$31\frac{1}{4} = n \quad \text{Simplify.}$$

So,  $\frac{5}{16} = 31\frac{1}{4}\%$  or  $31.25\%$ .

**EXERCISES**

Write each percent as a fraction in simplest form.

1.  $60\%$

2.  $68\frac{3}{4}\%$

3.  $27\frac{1}{2}\%$

4.  $37.5\%$

Write each fraction as a percent. Round to the nearest hundredth if necessary.

5.  $\frac{2}{5}$

6.  $\frac{5}{8}$

7.  $\frac{9}{16}$

8.  $\frac{2}{3}$

**7-5****Practice: Skills*****Fractions, Decimals, and Percents***

Write each percent as a fraction in simplest form.

1. 18%

2. 67.5%

3. 21.25%

4. 87.5%

5.  $31\frac{1}{4}\%$

6. 17.5%

7.  $18\frac{3}{4}\%$

8.  $68\frac{3}{4}\%$

9. 7.5%

10. 12.5%

11. 36.75%

12.  $5\frac{1}{2}\%$

Write each fraction as a percent. Round to the nearest hundredth if necessary.

13.  $\frac{3}{5}$

14.  $\frac{3}{8}$

15.  $\frac{2}{18}$

16.  $\frac{3}{16}$

17.  $\frac{7}{9}$

18.  $\frac{21}{50}$

19.  $\frac{1}{3}$

20.  $\frac{40}{42}$

21.  $\frac{7}{16}$

22.  $\frac{64}{125}$

23.  $\frac{11}{12}$

24.  $\frac{11}{15}$

**7-5****Practice: Word Problems*****Fractions, Decimals, and Percents***

**INTERNET** For Exercises 1–4, use the table. It shows the percents of online shopping purchases made by all Internet users and the percents made by Internet users over age 55.

| Most Popular Online Purchases |                        |                    |
|-------------------------------|------------------------|--------------------|
|                               | Internet Users Over 55 | All Internet Users |
| computer software             | 43%                    | 19%                |
| books                         | 43%                    | 21%                |
| computer hardware             | 24%                    | 13%                |
| music CDs                     | 29%                    | 22%                |
| clothing                      | 19%                    | 8%                 |

|   |  |
|---|--|
| 1. What fraction of Internet users over 55 bought clothing online?  | 2. What fraction of all Internet users bought clothing online?   |
| 3. What fraction of all Internet users bought music CDs online?   | 4. Is the fraction of Internet users over 55 who bought books online greater or less than $\frac{22}{50}$ ? Explain.                                       |
| 5. <b>FOOTBALL</b> In 2001 San Francisco quarterback Jeff Garcia completed 316 out of 504 passes. What was his pass completion percentage to the nearest tenth? | 6. <b>COMPUTERS</b> In Joan's math class, there are 20 computers and 32 students. What percent of students will be able to use a computer without sharing? |
| 7. <b>VEHICLES</b> In the town of Orick, 5 out of 13 vehicles are trucks. What percent of the vehicles are trucks? Round to the nearest tenth.                  | 8. <b>DENTISTRY</b> Dana has fillings in 4 of her 32 teeth. What percent of her teeth have fillings?   |

**7-5****Reading to Learn Mathematics*****Fractions, Decimals, and Percents***

**Pre-Activity** *Read the introduction at the top of page 312 in your textbook. Write your answers below.*

1. What percent of the teens said that the personal computer was the most important invention?
2. How is this percent written as a ratio?
3. Simplify the ratio.

**Reading the Lesson**

4. Look at Example 1. Why is  $\frac{16.8}{100}$  multiplied by  $\frac{10}{10}$ ?
5. Example 2 says to multiply by the reciprocal of 100. What is a reciprocal?
6. How do you write 100 as a fraction?
7. If the denominator is not a factor of 100, you can write fractions as percents by using a proportion. In Examples 3 and 4, why is the ratio  $\frac{n}{100}$  used as part of the proportions?

**Helping You Remember**

8. Complete the following table of equivalent fractions. Look for patterns in each column. How do the percents increase? How do the fractions increase? Work with a partner. Figure out ways to remember the equivalents.

| Common Fraction/Decimal/Percent Equivalents |         |                   |               |         |                   |
|---|---------|-------------------|---------------|---------|-------------------|
| Fraction                                    | Decimal | Percent           | Fraction      | Decimal | Percent           |
| $\frac{1}{3}$                               |         |                   | $\frac{3}{8}$ |         | $37\frac{1}{2}\%$ |
|   |         | $66\frac{2}{3}\%$ | $\frac{5}{8}$ | 0.625   |                   |
| $\frac{1}{8}$                               |         |                   |               | 0.875   | $87\frac{1}{2}\%$ |

# 7-5

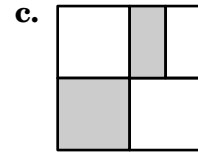
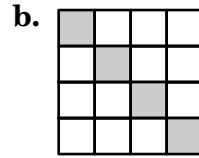
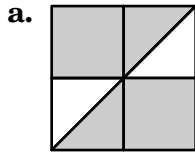
## Enrichment

### Shaded Regions

The fractions or percents listed below each represent one of the shaded regions.

Match each fraction or percent with the shaded region it represents.

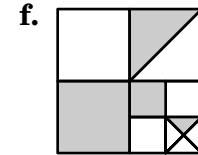
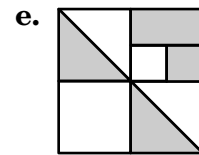
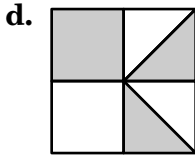
1.  $\frac{1}{2}$



2.  $\frac{25}{64}$

3.  $\frac{11}{16}$

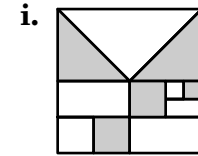
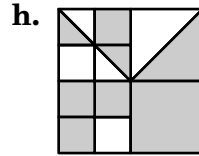
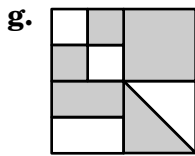
4. 25%



5.  $\frac{3}{4}$

6.  $62\frac{1}{2}\%$

7.  $\frac{29}{64}$



8. 37.5%

9.  $\frac{7}{16}$

**7-6****Study Guide and Intervention****Percents Greater Than 100%  
and Percents Less Than 1%**

A percent greater than 100% equals a number greater than 1. A percent less than 1% equals a number less than 0.01 or  $\frac{1}{100}$ .

**EXAMPLES**

Write each percent as a decimal and as a mixed number or fraction in simplest form.

**1** 280%

$$\begin{aligned} 280\% &= \frac{280}{100} && \text{Definition of percent} \\ &= 2.8 \text{ or } 2\frac{4}{5} \end{aligned}$$

**2** 0.12%

$$\begin{aligned} 0.12\% &= \frac{0.12}{100} && \text{Definition of percent} \\ &= 0.0012 \text{ or } \frac{3}{2,500} \end{aligned}$$

**EXAMPLES**

Write each decimal as a percent.

**3** 2.17

$$\begin{aligned} 2.17 &= && \text{Multiply by 100.} \\ &= \frac{217}{100} && \\ &= 217\% \end{aligned}$$

**4** 0.0034

$$\begin{aligned} 0.0034 &= && \text{Multiply by 100.} \\ &= \frac{0.34}{100} && \\ &= 0.34\% \end{aligned}$$

**EXERCISES**

Write each percent as a decimal and as a mixed number or fraction in simplest form.

1. 200%

2. 750%

3. 325%

4. 0.3%

5. 0.8%

6. 0.48%

Write each decimal as a percent.

7. 2.6

8. 19

9. 5.14

10. 0.008

11. 0.0014

12. 0.0067

**7-6****Practice: Skills*****Percents Greater Than 100%  
and Percents Less Than 1%***

Write each percent as a decimal and as a mixed number or fraction in simplest form.

1. 900%

2. 150%

3. 675%

4. 245%

5. 120%

6. 0.2%

7. 0.08%

8. 0.12%

9. 0.35%

Write each decimal as a percent.

10. 3.9

11. 81

12. 25

13. 6.75

14. 2.81

15. 0.001

16. 0.0046

17. 0.0069

18. 0.0083

Write each number as a percent.

19.  $6\frac{1}{2}$

20.  $2\frac{1}{2}$

21.  $5\frac{1}{4}$

22.  $\frac{1}{200}$

23.  $\frac{2}{250}$

24.  $\frac{3}{500}$

**7-6****Practice: Word Problems**  
***Percents Greater Than 100%***  
***and Percents Less Than 1%***

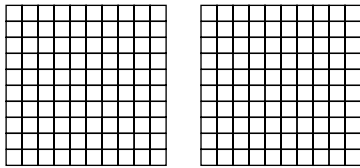
|  |   |
|--|---|
| <p><b>1. INTERNET</b> Kilroy found that 0.70% of the documents from the Internet had names that ended in “.txt” or “.text”. Write this percent as a decimal and as a fraction.</p>   | <p><b>2. BUSINESS</b> Jocelyn expects her new software company to increase its sales next year <math>2\frac{3}{8}</math> times their present value. Write this increase as a percent.</p>                                 |
| <p><b>3. UTILITIES</b> City records showed that 0.8% of new homes had no access to electricity. Write this percent as a decimal and as a fraction in simplest form.</p>  | <p><b>4. PETS</b> Berto got a puppy 8 weeks ago. In this time, the puppy’s weight increased 215%. Write this percent as a decimal and as a fraction.</p>  |
| <p><b>5. MANUFACTURING</b> The Quality Assurance department at a gear company found that there were 3 defective gears for every 675 produced. Write this as a fraction and as a percent. Round to the nearest hundredth.</p> | <p><b>6. MEDICINE</b> Estelle’s pharmacist said that the medicine Estelle was taking contained no more than <math>\frac{1}{500}</math> gram of impurities per gram of total weight. Write this fraction as a percent.</p> |

**7-6****Reading to Learn Mathematics*****Percents Greater Than 100%  
and Percents Less Than 1%***

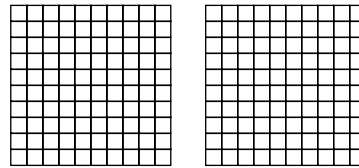
**Pre-Activity** *Do the Mini Lab at the top of page 316 in your textbook. Write your answers below.*

- Which model represents a percent greater than 100%? What is the percent?
- Which model represents a percent less than 1%? What is the percent?
- Shade grids to represent each percent.

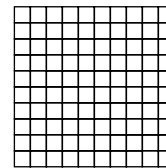
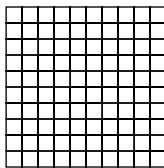
a. 150%



b. 215%



c.  $\frac{1}{4}\%$

**Reading the Lesson**

- If you are converting from a percent to a fraction or mixed number and the percent is greater than 100%, is the result a fraction or a mixed number? Explain.
- In converting between decimals and percents, when do you use multiplication? When do you use division?

**Helping You Remember**

- Have you ever heard a coach encourage his or her team to “Give it a 110%!”? Describe what it means when a percent is greater than 100%. Describe what it means when a percent is less than 1%.

**7-6****Enrichment*****Juan de la Cierva***

Helicopters became widely used in the early 1950s. However, did you know that a similar aircraft was developed in Spain nearly thirty years earlier? The inventor was Juan de la Cierva (1895–1936), and for many years his aircraft were used in rescue work. The modern helicopter is faster and more versatile, but it retains many features of Cierva's design.

Fill in the blanks below to find what Cierva called his aircraft. On the line next to the decimal, fraction, or mixed number, write the letter matching the answer. If you have found the percents correctly, the letters read downward will spell out the name of the aircraft.

1.  $\frac{3}{2}$  \_\_\_\_\_ **A** 150%
  
2. 0.006 \_\_\_\_\_ **G** 0.029%
  
3. 3.2 \_\_\_\_\_ **I** 0.006%
  
4. 2.9 \_\_\_\_\_ **O** 350%
  
5. 0.00029 \_\_\_\_\_ **O** 290%
  
6. 0.00006 \_\_\_\_\_ **R** 0.5%
  
7.  $\frac{1}{200}$  \_\_\_\_\_ **T** 320%
  
8.  $3\frac{1}{2}$  \_\_\_\_\_ **U** 0.6%

**7-7****Study Guide and Intervention****Percent of a Number**

You can use a proportion or multiplication to find the percent of a number.

**EXAMPLE 1** **SURVEY** A survey asked 2,415 people whether they would buy the restored version of *The Beatles's A Hard Day's Night*. 74.95% of the people said they would *not* buy it. How many people would not buy the restored version of this movie?

|   |   |                       |  |
|---|---|-----------------------|--|
| $\frac{x}{2,415} = \frac{74.95}{100}$       | number that would not buy $\rightarrow x$<br>total number in survey $\rightarrow 2,415$ | $= \frac{74.95}{100}$ | percent of people who would not buy the restored movie |
|   | Write the proportion.   |                       |  |
| $x \cdot 100 = 2,415(74.95)$                | Find the cross products.  |                       |  |
| $100x = 181,004.25$                         | Multiply.   |                       |  |
| $\frac{100x}{100} = \frac{181,004.25}{100}$ | Divide each side by 100.  |                       |  |
| $x = 1,810.0425$                            | Simplify.   |                       |  |

So, about 1,810 of the 2,415 people surveyed would not buy the restored version of *A Hard Day's Night*.

**EXAMPLE 2** **What number is 15% of 200?**

|  |  |
|--|--|
| $\begin{aligned} 15\% \text{ of } 200 &= 15\% \times 200 \\ &= 0.15 \times 200 \\ &= 30 \end{aligned}$ | Write a multiplication expression.<br>Write 15% as a decimal.<br>Multiply. |
| So, 15% of 200 is 30.  |  |

**EXERCISES**

**Find each number.**

- |   |   |
|---|---|
| <p>1. Find 20% of 50.</p> <p>3. 5% of 1,500 is what number?</p> <p>5. What is 24% of \$500?</p> <p>7. What is 12.5% of 60?</p> <p>9. Find 3% of \$800.</p> <p>11. 0.25% of 42 is what number?</p> | <p>2. What is 55% of \$400?</p> <p>4. Find 190% of 20.</p> <p>6. 8% of \$300 is how much?</p> <p>8. Find 0.2% of 40.</p> <p>10. What is 0.5% of 180?</p> <p>12. What is 0.02% of 280?</p> |
|---|---|

**7-7****Practice: Skills*****Percent of a Number*****Find each number.**

1. Find 80% of 80.
2. What is 95% of 600?
3. 35% of 20 is what number?
4. Find 60% of \$150.
5. What is 75% of 240?
6. 380% of 30 is what number?
7. Find 40% of 80.
8. What is 30% of \$320?
9. 12% of 150 is what number?
10. Find 58% of 200.
11. What is 18% of \$450?
12. What is 70% of 1,760?
13. Find 92% of 120.
14. 45% of 156 is what number?
15. What is 12% of 12?
16. Find 60% of 264.
17. 37.5% of 16 is what number?
18. What is 82.5% of 400?
19. What is 0.25% of 900?
20. Find 1.5% of 220.

**7-7**

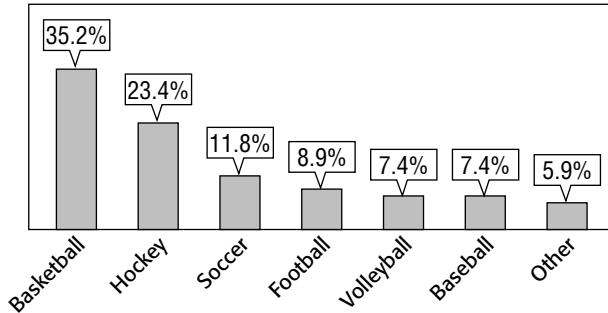
**Practice: Word Problems**

**Percent of a Number**

**SPORTS** For Exercises 1 and 2, use the graph below. It shows the results of a poll of 440 ninth grade students. Round answers to the nearest whole number.

**PETS** For Exercises 3 and 4, use the table below. It shows the pet ownership in Los Angeles, California. Assume that the same percents apply to a town of 1,650 households. Round answers to the nearest whole number.

**Favorite Sports of Students**



| Pets in Household            | Percent |
|------------------------------|---------|
| at least one dog or cat      | 26.7    |
| at least one dog             | 19.9    |
| at least one cat             | 13      |
| at least one dog and one cat | 6.19    |

- |  |  |
|--|--|
| <p><b>1.</b> Write a proportion that can be used to find how many students surveyed chose hockey as their their favorite sport. Then solve.</p>  | <p><b>2.</b> How many students surveyed chose basketball as their favorite sport?</p>  |
| <p><b>3.</b> Write a proportion that can be used to find how many households have at least one dog. Then solve.</p>  | <p><b>4.</b> How many households have at least one dog or cat?</p>   |
| <p><b>5. VOTING</b> Going into a recent election, only about 62% of people old enough to vote were registered. In a community of about 55,200 eligible voters, how many people are registered?</p> | <p><b>6. COLLEGE</b> A local college recently reported that enrollment increased to 108% percent of last year. If enrollment last year was at 17,113, about how many students enrolled this year? Round to the nearest whole number.</p> |

**7-7****Reading to Learn Mathematics*****Percent of a Number***

**Pre-Activity** *Read the introduction at the top of page 319 in your textbook. Write your answers below.*

1. About how many of them said they were afraid of snakes?
2. How did you estimate?
3. Suppose you pass 50 people at a mall. Based on the results of the survey, do you think more or less than 25 of them are afraid of mice? Explain.

**Reading the Lesson**

4. What are two methods for finding the percent of a number?
5. The question states that 1,016 people were surveyed. Where did this information come from?
6. When the proportion is set up in Example 1, why is the variable  $x$  written above the number 1,016?
7. In Examples 2 and 3, before multiplying, how is the percent changed?

**Helping You Remember**

8. Suppose one of your friends said to you, "I want to pay for lunch and I know I'm supposed to leave a 15% tip, but I don't know how to figure out how much to leave." Write in your words what you would say to your friend to explain how to figure out the tip.

**7-7**

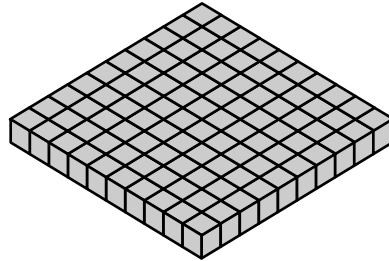
**Enrichment**

**Model Behavior**

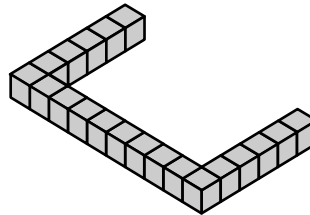
When a block is painted and then separated into small cubes, some of the faces of the cubes will have paint on them and some will not.

**For each set of blocks determine the percent of cubes that are painted on the given number of faces.**

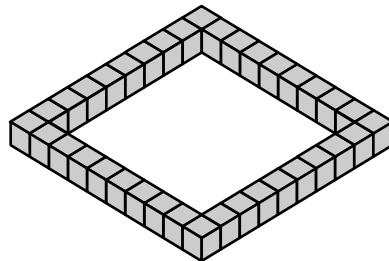
- 1. 0 faces
- 2. 1 face
- 3. 2 faces
- 4. 3 faces
- 5. 4 faces
- 6. 5 faces
- 7. 6 faces



- 8. 0 faces
- 9. 1 face
- 10. 2 faces
- 11. 3 faces
- 12. 4 faces
- 13. 5 faces
- 14. 6 faces



- 15. 0 faces
- 16. 1 face
- 17. 2 faces
- 18. 3 faces
- 19. 4 faces
- 20. 5 faces
- 21. 6 faces



**7-8****Study Guide and Intervention****The Percent Proportion**

A **percent proportion** compares **part** of a quantity to the whole quantity, called the **base**, using a percent. In symbols, the percent proportion can be written as  $\frac{a}{b} = \frac{p}{100}$ , where  $a$  is the part,  $b$  is the base, and  $p$  is the percent.

**EXAMPLE 1** What percent of 24 is 18?

18 is the part, and 24 is the base. You need to find the percent  $p$ .

$$\frac{a}{b} = \frac{p}{100}$$

Percent proportion

$$\frac{18}{24} = \frac{p}{100}$$

Replace  $a$  with 18 and  $b$  with 24.

$$18 \cdot 100 = 24 \cdot p$$

Find the cross products.

$$1,800 = 24p$$

Simplify.

$$\frac{1,800}{24} = \frac{24p}{24}$$

Divide each side by 24.

$$75 = p$$

Simplify.

So, 75% of 24 is 18.

**EXAMPLE 2** What number is 60% of 150?

60 is the percent, and 150 is the base. You need to find the part.

$$\frac{a}{b} = \frac{p}{100}$$

Percent proportion

$$\frac{a}{150} = \frac{60}{100}$$

Replace  $b$  with 150 and  $p$  with 60.

$$a \cdot 100 = 150 \cdot 60$$

Find the cross products.

$$100a = 9000$$

Simplify.

$$\frac{100a}{100} = \frac{9,000}{100}$$

Divide each side by 100.

$$a = 90$$

Simplify.

So, 60% of 150 is 90.

**EXERCISES**

Find each number. Round to the nearest tenth if necessary.

1. What number is 25% of 20?

2. What percent of 50 is 20?

3. 30 is 75% of what number?

4. 40% of what number is 36?

5. What number is 20% of 625?

6. 12 is what percent of 30?

**7-8****Practice: Skills*****The Percent Proportion***

**Find each number. Round to the nearest tenth if necessary.**

1. 50 is 20% of what number?
2. What percent of 20 is 4?
3. What number is 70% of 250?
4. 10 is 5% of what number?
5. What number is 45% of 180?
6. 40% of what number is 82?
7. What percent of 90 is 36?
8. 60 is 25% of what number?
9. What number is 32% of 1,000?
10. What percent of 125 is 5?
11. 73 is 20% of what number?
12. 57% of 109 is what number?
13. What percent of 185 is 35?
14. 25 is what percent of 365?
15. 85% of 190 is what number?
16. 12.5 is 25% of what number?
17. What percent of 128 is 24?
18. 5.25% of 170 is what number?
19. What is 82% of 230?
20. What percent of 49 is 7?

**7-8****Practice: Word Problems*****The Percent Proportion***

|   |   |
|---|---|
| <p><b>1. DRIVING</b> David installed a device on his car that guaranteed to increase his gas mileage by 15%. He currently gets 22 miles per gallon. How much will the gas mileage increase after installing the device?</p> | <p><b>2. POPULATION</b> The number of students at Marita's school decreased to 98% of last year's number. Currently, there are 1,170 students. How many students were there last year? Round to the nearest whole number.</p>                   |
| <p><b>3. VOTING</b> Yolanda's club has 35 members. Its rules require that 60% of them must be present for any vote. At least how many members must be present to have a vote?</p>   | <p><b>4. GARBAGE</b> This month, Chun's office produced 690 pounds of garbage. Chun wants to reduce the weight of garbage produced to 85% of the weight produced this month. What is the target weight for the garbage produced next month?</p> |
| <p><b>5. SALARIES</b> Alma just received a 6% raise in salary. Before the raise, she was making \$52,000 per year. How much more will Alma earn next year?</p>  | <p><b>6. SPORTS</b> Sally's soccer team played 25 games and won 17 of them. What percent did the team win?</p>  |

**7-8****Reading to Learn Mathematics*****The Percent Proportion***

**Pre-Activity** *Read the introduction at the top of page 323 in your textbook. Write your answers below.*

1. Write the ratio of engine weight to total weight as a fraction.
2. Use a calculator to write the fraction as a decimal to the nearest hundredth.
3. What percent of the space shuttle's weight is the engine?

**Reading the Lesson**

4. What is a percent proportion?
5. In the formula  $\frac{a}{b} = \frac{P}{100}$ , what does each letter stand for?
6. Select the information that can be found by solving each percent problem.
 

|                                 |                             |
|---------------------------------|-----------------------------|
| _____ What number is 30% of 15? | <b>a.</b> Find the base.    |
| _____ 18 is 65% of what number? | <b>b.</b> Find the percent. |
| _____ What percent of 40 is 17? | <b>c.</b> Find the part.    |

**Helping You Remember**

7. Write an example of each type of percent problem in the table below. (Be sure the examples are different from the ones given in the lesson and on this page.) Write the example in words and set up the correct proportion for each example.

| Type             | Example | Proportion |
|------------------|---------|------------|
| Find the Percent |         |            |
| Find the Part    |         |            |
| Find the Base    |         |            |

**7-8****Enrichment*****Working Backward***

Working backward can be a helpful problem-solving tool, especially in problems where the answer is given and information you would expect to have is omitted.

A large corporation reports that  % of its employees exercise on a regular basis. If 2,120 employees exercise regularly, how many employees does the corporation have? Answer: 2,650 employees

Use the percent proportion to solve for the missing percent.

$$\frac{2,120}{2,650} = \frac{x}{100}$$

$$2,120 \times 100 = 2,650x$$

$$x = 80$$

80% of the employees exercise on a regular basis.

**Write the missing information for each exercise.**

1. A progressive community states that 96% of its households recycle materials at least once monthly. If  households recycle at least once monthly, how many households are in the community? Answer: 15,480 households
2. The purchase price of a cassette tape deck is \$139.00. The sales tax rate is  %. Find the cost of the cassette tape deck. Answer: \$148.73
3. In a seventh grade class, 60% of the students participate in extra-curricular activities. The class has  students. How many students participate in extra-curricular activities? Answer: 15 students
4. Claims by a manufacturer state that 3 out of 4 people prefer their product when compared to a similar product of another manufacturer. If  people were surveyed, how many did not prefer the product? Answer: 35
5. Seventy percent of the students entering a certain high school complete their studies and graduate. If  students did not complete their studies and graduate, how many students earned a diploma? Answer: 455
6. A middle school survey discovered that 15% of the student body watched two hours or less of television each week and 45% watched ten or more hours each week. If  students were surveyed, how many students watched between 2 and 10 hours of television each week? Answer: 48.