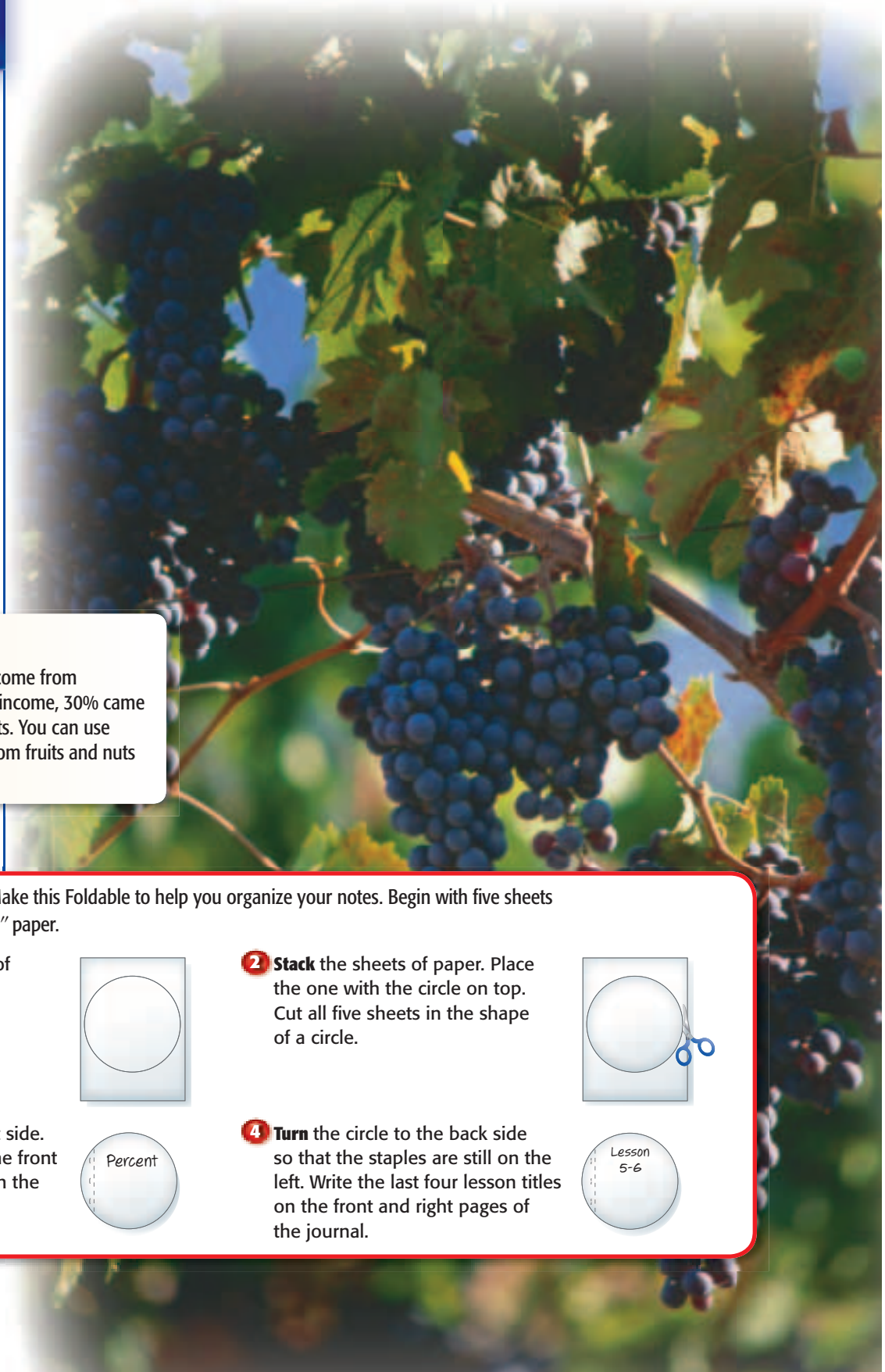
CHAPTER 5

Percent



BIG Idea

- **Standard 7NS1.0** Know the properties of, and compute with, rational numbers expressed in a variety of forms.

Key Vocabulary

percent (p. 252)
percent equation (p. 279)
percent of change (p. 284)
percent proportion (p. 263)

Real-World Link

Agriculture In 2004, California's income from agriculture was $31.8 billion. Of that income, 30% came from the production of fruits and nuts. You can use percents to determine the income from fruits and nuts produced in California.

FOLDABLES Study Organizer

Percent Make this Foldable to help you organize your notes. Begin with five sheets of $8\frac{1}{2}'' \times 11''$ paper.

1. **Draw** a large circle on one of the sheets of paper.

2. **Stack** the sheets of paper. Place the one with the circle on top. Cut all five sheets in the shape of a circle.

3. **Staple** the circles on the left side. Write the chapter title on the front and the four lesson titles on the inside right pages.

4. **Turn** the circle to the back side so that the staples are still on the left. Write the last four lesson titles on the front and right pages of the journal.

GET READY for Chapter 5

Diagnose Readiness You have two options for checking Prerequisite Skills.

Option 2

MathOnline Take the Online Readiness Quiz at ca.gr7math.com.

Option 1

Take the Quick Check below. Refer to the Quick Review for help.

QUICK Check

Compute each product mentally.
(Lesson 2-3)

1. $\frac{1}{3} \cdot 303$
2. $644 \cdot \frac{1}{2}$
3. $0.1 \cdot 550$
4. $64 \cdot 0.5$

Write each fraction as a decimal.
(Lesson 2-1)

5. $\frac{2}{5}$
6. $\frac{7}{8}$
7. $\frac{3}{4}$
8. $\frac{3}{8}$

9. **SCHOOL** Andrea answered 18 out of 20 questions correctly on a math quiz. Write her score as a decimal. (Lesson 2-1)

Solve each equation or proportion.
(Lessons 2-7 and 4-3)

10. $0.25d = 130$
11. $48r = 12$
12. $0.4m = 22$
13. $0.02n = 9$
14. $\frac{x}{10} = \frac{3}{5}$
15. $\frac{4}{9} = \frac{14}{b}$

16. **RECIPES** Ruben's chocolate chip cookie recipe uses 2 eggs for 2 dozen cookies. How many eggs does Ruben need to make 72 cookies? (Lesson 4-3)

QUICK Review

Example 1

Compute $\frac{1}{4} \cdot 820$ mentally.

$\frac{1}{4} \cdot 820$ is one-fourth of 820, or 205.

Example 2

Write $\frac{5}{8}$ as a decimal.

To change $\frac{5}{8}$ to a decimal, divide 5 by 8.

$$\begin{array}{r} 0.625 \\ 8\overline{)5.000} \\ -\,4\,8 \\ \hline 20 \\ -\,16 \\ \hline 40 \\ -\,40 \\ \hline 0 \end{array}$$

So, $\frac{5}{8} = 0.625$.

Example 3

Solve $\frac{w}{12} = \frac{5}{6}$.

$\frac{w}{12} = \frac{5}{6}$	Write the proportion.
$6 \cdot w = 12 \cdot 5$	Find cross products.
$6w = 60$	Simplify.
$\frac{6w}{6} = \frac{60}{6}$	Divide each side by 6.
$w = 10$	Simplify.

5-1 Ratios and Percents

Main IDEA

Write ratios as percents and vice versa.

Standard 7NS1.3 **Convert fractions to decimals and percents** and use these representations in estimations, computations, and applications.

NEW Vocabulary

percent

GET READY for the Lesson

POPULATION The table shows the ratio of people under 18 years of age to the total population for various states.

State	Ratio of People Under 18 to Total Population
Arkansas	1 out of 4
Hawaii	6 out of 25
Mississippi	27 out of 100
Utah	8 out of 25

Source: *Time Almanac*

1. Name two states from the table that have ratios in which the second numbers are the same.
2. How can you determine which of the four states has the greatest ratio of people under 18 to total population?

Ratios such as 27 out of 100 or 8 out of 25 can be written as percents.

KEY CONCEPT Percent

Words A **percent** is a ratio that compares a number to 100.

	Percent	Ratio	Fraction
Numbers	27%	27 out of 100	$\frac{27}{100}$
Algebra	x%	x out of 100	$\frac{x}{100}$

EXAMPLES Write Ratios as Percents

Write each ratio as a percent.

1 **POPULATION** **In a recent census, 26 out of every 100 people living in Illinois were younger than 18.**

26 out of 100 = 26% Definition of percent

2 **SPORTS** **At a recent triathlon, 180 women competed for every 100 women who competed ten years earlier.**

180 per 100 = 180% Definition of percent

STUDY TIP

Large Percents Notice that some percents, such as 180%, are greater than 100%. Since percent means *hundredths* or *per 100*, a percent like 180% means 180 per 100.

CHECK Your Progress

Write each ratio as a percent.

a. **BASEBALL** During his baseball career, Babe Ruth had a base hit about 34 out of every 100 times he came to bat.

b. **TECHNOLOGY** In a recent year, 50.5 out of 100 households in the United States had access to the Internet.

To write a fraction as a percent, find an equivalent fraction with a denominator of 100.

Real-World Link
The first law regulating the speed of cars was passed in the state of New York in 1904. It stated that the maximum speed was 10 miles per hour in populated areas and 20 miles per hour in the country.
Source: *The World Almanac*

Real-World EXAMPLES Write Fractions as Percents

Write each ratio or fraction as a percent.

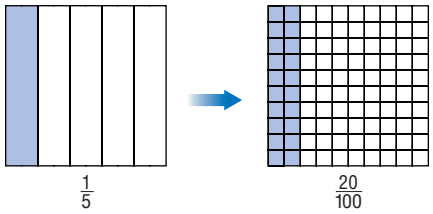
3 **CARS** **About 1 out of 5 sport utility vehicles manufactured in the United States is white.**

$\frac{1}{5} = \frac{x}{100}$

$\times 20$

$\frac{1}{5} = \frac{20}{100}$

$\times 20$



So, 1 out of 5 equals 20%.

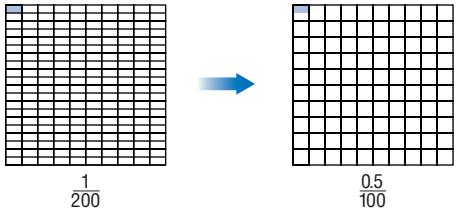
4 **TRAVEL** **About $\frac{1}{200}$ of travelers use scheduled buses.**

$\frac{1}{200} = \frac{x}{100}$

$\div 2$

$\frac{1}{200} = \frac{0.5}{100}$

$\div 2$



So, 1 out of 200 equals 0.5%.

STUDY TIP
Small Percents
In Example 4, notice that 0.5% is less than 1%. Percents can be even smaller, such as 0.001%, which is equal to $\frac{1}{100{,}000}$.

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CHECK Your Progress **Write each ratio or fraction as a percent.**

c. **TECHNOLOGY** In Finland, almost 3 out of 5 people have cell phones.

d. **ANIMALS** About $\frac{1}{4}$ of the mammals in the world are bats.

Personal Tutor at ca.gr7math.com

You can express a percent as a fraction by writing it as a fraction with a denominator of 100. Then write the fraction in simplest form.

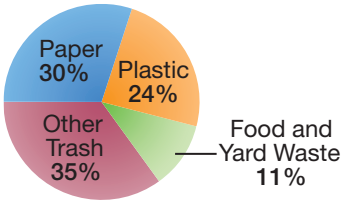
Real-World EXAMPLE Write Percents as Fractions

5 **ENVIRONMENT** **The circle graph shows an estimate of the percent of each type of trash in landfills. Write the percent for paper as a fraction in simplest form.**

Paper: $30\% = \frac{30}{100}$ Definition of percent

$= \frac{3}{10}$ Simplify.

Trash in Landfills



Source: Franklin Associates, Ltd.

CHECK Your Progress **Write as a fraction in simplest form.**

e. food and yard waste f. other trash g. plastic

CHECK Your Understanding

Examples 1, 2 (p. 252)

Write each ratio as a percent.

1. 17 out of 100
2. 237 per 100
3. **TAXES** In Illinois, the sales tax rate is 6.25 cents for every 100 cents spent.

Examples 3, 4 (p. 253)

Write each ratio or fraction as a percent.

4. 7:10
5. $\frac{9}{20}$
6. 1 out of 500

Example 5 (p. 253)

Write each percent as a fraction in simplest form.

7. 19%
8. 50%
9. 18%

Exercises

HOMEWORK HELP

For Exercises	See Examples
10, 11	1, 2
12–19	3, 4
20–27	5

Write each ratio or fraction as a percent.

10. 23 out of 100
11. 110 per 100
12. $\frac{17}{50}$
13. $\frac{7}{20}$
14. 8 out of 25
15. 54 out of 300
16. 2:5
17. 9:10

18. **TRAVEL** One out of every 50 visitors to the United States is from France. Write this ratio as a percent.

19. **PETS** Three out of 25 households in the United States have both a dog and a cat. Write this ratio as a percent.

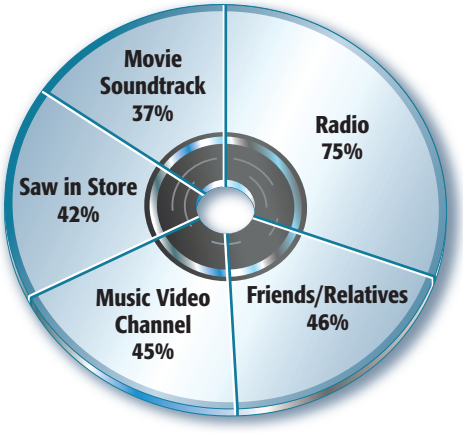
Write each percent as a fraction in simplest form.

20. 29%
21. 43%
22. 40%
23. 70%
24. 45%
25. 28%
26. 64%
27. 65%

28. **ENERGY** Germany uses about 4% of the world's energy. Write this percent as a fraction in simplest form.

29. **MUSIC** The influences in the purchase of CDs by buyers ages 12–44 are shown in the graphic. Write each percent as a fraction in simplest form.

CD Purchase Influences



Source: Edison Media Research

30. **POPULATION** According to a recent census, the population of Houston, Texas, is about $\frac{7}{1{,}000}$ of the United States population. Write this fraction as a percent.

31. **TEETH** Humans have $\frac{8}{5}$ more teeth as adults than when they are children. Write this fraction as a percent.

EXTRA PRACTICE

See pages 688, 712.

Math Online

Self-Check Quiz at ca.gr7math.com

H.O.T. Problems

32. **CHALLENGE** Explain how a student can receive an 86% on a test with 50 questions.

33. **OPEN ENDED** Find a percent that is between $\frac{1}{2}$ and $\frac{3}{4}$. Justify your answer.

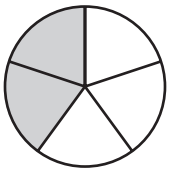
34. **Which One Doesn't Belong?** Identify the ratio that does not belong with the other three. Explain your reasoning.

2 out of 5	40%	2:10	$\frac{10}{25}$

35. **WRITING IN MATH** Refer to the opener for this lesson. Express all of the ratios as percents. Explain how doing so helps determine which state has the greatest portion of its total population under 18.

STANDARDS PRACTICE

36. What percent of the circle is shaded?



A 10%
B 20%
C 30%
D 40%

37. A soccer team played twenty games, of which they won fourteen. What percent of the games did they win?

F 30%
G 60%
H 70%
J 80%

Spiral Review

ALGEBRA Determine whether the relationship between the two quantities described in each table is linear. If so, find the constant rate of change. If not, explain your reasoning. (Lesson 4-10)

38.

Pages Printed				
Page	5	10	15	20
Time (min)	1	2	3	4

39.

Cost of Bagels				
Bagels	6	12	18	24
Cost ($)	3	5	8	10

40. **CARS** After driving 150 miles, Mr. Ruiz has used 5 gallons of gasoline. He uses 3 gallons of gas driving another 100 miles. Find the rate of change in miles per gallon for the given distances. (Lesson 4-9)

41. Write 1.8, 1.07, $1\frac{8}{9}$, and $1\frac{1}{2}$ in order from least to greatest. (Lesson 2-2)

GET READY for the Next Lesson

PREREQUISITE SKILL Write each fraction as a decimal. (Lesson 2-1)

42. $\frac{3}{5}$
43. $\frac{3}{4}$
44. $\frac{5}{8}$
45. $\frac{1}{3}$

5-2 Comparing Fractions, Decimals, and Percents

Main IDEA

Write percents as fractions and decimals and vice versa.

Standard 7NS1.1 Read, write, and compare rational numbers in scientific notation (positive and negative powers of 10), **compare rational numbers in general.** **Standard 7NS1.3** **Convert fractions to decimals and percents** and use these representations in estimations, computations, and **applications.**

GET READY for the Lesson

PETS The table gives the percent of households with various pets.

1. Write each percent as a fraction. Do not simplify the fractions.
2. Write each fraction in Question 1 as a decimal.
3. How could you write a percent as a decimal without writing the percent as a fraction first?

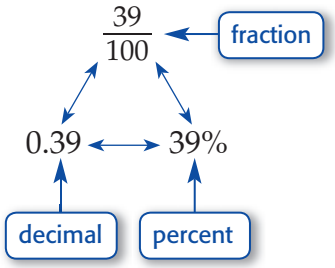
Households with Pets

Pet	Percent of Households
dog	39%
cat	34%
freshwater fish	12%
bird	7%
small animal	5%

Source: American Pet Products Manufacturers Association

Fractions, percents, and decimals are all different ways to represent the same ratio.

Remember that *percent* means *per hundred*. In Lesson 5-1, you wrote percents as fractions with 100 in the denominator. Similarly, you can write percents as decimals by dividing by 100.



STUDY TIP

Percents and Decimals To divide by 100, move the decimal point two places to the left.

CONCEPT Summary — Percents and Decimals

Percent → Decimal

To write a percent as a decimal, divide by 100 and remove the percent symbol.

$39\% = 39\% = 0.39$

Decimal → Percent

To write a decimal as a percent, multiply by 100 and add the percent symbol.

$0.39 = 0.39 = 39\%$

EXAMPLES Percents as Decimals

Write each percent as a decimal.

1 **35%**

$35\% = 35\%$ Divide by 100.

$= 0.35$ Remove the percent symbol.

2 **115%**

$115\% = 115\%$ Divide by 100.

$= 1.15$ Remove the percent symbol.

CHECK Your Progress **Write each percent as a decimal.**

a. 27% b. 145% c. 0.2%

Cydney Conger/CORBIS

MathOnline Extra Examples at ca.gr7math.com

EXAMPLES Decimals as Percents

Write each decimal as a percent.

3 **0.2**

$0.2 = 0.20$ Multiply by 100.

$= 20\%$ Add the percent symbol.

4 **1.66**

$1.66 = 1.66$ Multiply by 100.

$= 166\%$ Add the percent symbol.

STUDY TIP

Decimals Greater Than One Notice that decimals greater than 1 are equivalent to percents greater than 100.

CHECK Your Progress **Write each decimal as a percent.**

d. 0.83 **e.** 1.764 **f.** 0.005

You have learned to write a fraction as a percent by finding an equivalent fraction with a denominator of 100. This method works well if the denominator is a factor of 100. If the denominator is *not* a factor of 100, you can solve a proportion or you can write the fraction as a decimal and then write the decimal as a percent.

EXAMPLES Fractions as Percents

5 **Write $\frac{3}{8}$ as a percent.**

METHOD 1 **Use a proportion.**

$$\frac{3}{8} = \frac{x}{100}$$
$$3 \cdot 100 = 8 \cdot x$$
$$300 = 8x$$
$$\frac{300}{8} = \frac{8x}{8}$$
$$37.5 = x$$

METHOD 2 **Write as decimal.**

First write as a decimal. Then write as a percent.

$\frac{3}{8} = 0.375$

$= 37.5\%$

$$\begin{array}{r} 0.375 \\ 8\overline{)3.000} \\ -24 \\ \hline 60 \\ -56 \\ \hline 40 \\ -40 \\ \hline 0 \end{array}$$

So, $\frac{3}{8} = \frac{37.5}{100}$ or 37.5%.

6 **Write $\frac{2}{3}$ as a percent.**

$\frac{2}{3} = 0.66\overline{6}$

$= 66.\overline{6}\%$

$$\begin{array}{r} 0.66\ldots \\ 3\overline{)2.0} \\ -18 \\ \hline 20 \\ -18 \\ \hline 2 \end{array}$$

So, $\frac{2}{3} = 66.\overline{6}\%$.

STUDY TIP

Percents In real-world situations, $66.\overline{6}\%$ will usually be rounded to 67% or 66.7%.

CHOOSE Your Method **Write each fraction as a percent.**

g. $\frac{7}{25}$ **h.** $\frac{3}{16}$ **i.** $\frac{1}{9}$

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Real-World Link . . . . .
The average tax refund in 2005 was $2,144.
Source: irs.gov

Real-World EXAMPLE Compare Numbers

7 **TAXES** **In a recent survey, 0.6 of the people said they will use their tax refund to pay bills, and 7% said they will just spend it. Do more people pay bills or spend their refund?**

Since 0.6 = 60% and 60% > 7%, more people plan on using their tax refund to pay bills than for spending.

CHECK Your Progress

j. **GEOGRAPHY** About $\frac{3}{20}$ of Earth's land is covered by desert. North America is about 16% of Earth's total land surface. Is the area of Earth's deserts more or less than the total area of North America?

EXAMPLE Order Numbers

8 **Order 30%, $\frac{3}{100}$, $\frac{7}{20}$, and 0.33 from least to greatest.**

$\frac{3}{100} = 3\%$ $\frac{7}{20} = \frac{35}{100}$ or 35% $0.33 = 33\%$

From least to greatest, the percents are 3%, 30%, 33%, and 35%.
So, from least to greatest, the numbers are $\frac{3}{100}$, 30%, 0.33, and $\frac{7}{20}$.

CHECK Your Progress

Order each set of numbers from least to greatest.

k. 22%, $\frac{1}{10}$, $\frac{3}{25}$, 0.25 l. $\frac{1}{5}$, 40%, 0.401, $\frac{4}{25}$

CHECK Your Understanding

Examples 1, 2 (p. 256) **Write each percent as a decimal.**

1. 40% 2. 18% 3. 0.3%

Examples 3, 4 (p. 257) **Write each decimal as a percent.**

4. 0.725 5. 1.23 6. 0.3

Examples 5, 6 (p. 257) **Write each fraction as a percent.**

7. $\frac{11}{25}$ 8. $\frac{13}{40}$ 9. $\frac{5}{6}$

Example 7 (p. 258)

10. **HOMEWORK** At Hancock Middle School, 57% of the eighth-grade students spend at least 30 minutes a day on math homework. Of the seventh-grade students, 0.5 study this long. In which grade do a greater percent of students spend at least 30 minutes a day on math homework?

Example 8 (p. 258) **Order each set of numbers from least to greatest.**

11. $\frac{17}{25}$, 60%, 0.062, $\frac{13}{20}$ 12. 0.99, $\frac{9}{10}$, 9%, $\frac{19}{20}$

Exercises

HOMEWORK HELP	
For Exercises	See Examples
13–22	1, 2
23–32	3, 4
33–42	5, 6
43–46	7
47–52	8

Write each percent as a decimal.

13. 90%
14. 80%
15. 172%
16. 245%
17. 0.4%
18. 84.2%
19. 7%
20. 5%

21. **ENERGY** A recent study indicated that 8.4% of the United States' energy comes from nuclear power. Write this number as a decimal.

22. **WATER** Only about 0.5% of the world's water resources are drinkable by humans, animals, and plants. Write this number as a decimal.

Write each decimal as a percent.

23. 0.62
24. 0.94
25. 0.475
26. 0.832
27. 0.007
28. 0.009
29. 2.75
30. 1.38

31. **PETS** If 0.21 of adults own a cat, what percent of adults own a cat?

32. **SURVEYS** In a survey, 0.312 of teens said that their favorite sport was soccer or basketball. What percent of the teens chose soccer or basketball as their favorite sport?

Write each fraction as a percent.

33. $\frac{17}{20}$
34. $\frac{12}{25}$
35. $\frac{8}{5}$
36. $\frac{7}{4}$
37. $\frac{1}{40}$
38. $\frac{1}{125}$
39. $\frac{4}{9}$
40. $\frac{2}{3}$

41. **TIME** Research shows that $\frac{8}{25}$ of Americans set their clocks five minutes ahead to keep from being late. What percent of Americans set their clocks five minutes ahead?

42. **FOOD** About $\frac{3}{20}$ of Americans prefer cold pizza over hot pizza. What percent of Americans prefer cold pizza?

ANIMALS For Exercises 43 and 44, use the information about lions shown below.

A Day in the Life of a Lion	
Activities	4 hours
Resting	20 hours

43. What percent of a day does a lion spend resting?

44. What percent of a day does a lion spend doing activities?

45. **CAMPING** About 17% of kids will attend an overnight summer camp, $\frac{11}{50}$ will attend a day camp, and 0.59 will attend no summer camp at all. Which group of kids is the greatest?

46. **BAND** At Jeremy's high school, about $\frac{3}{16}$ of the students are in the band, 0.31 of high school students play at least one sport, and 13% are in the drama club. Of these three, which type of extra-curricular activity is most popular among students at Jeremy's high school?

Order each set of numbers from least to greatest.

47. $\frac{3}{4}$, 0.8, 8%, $\frac{7}{10}$

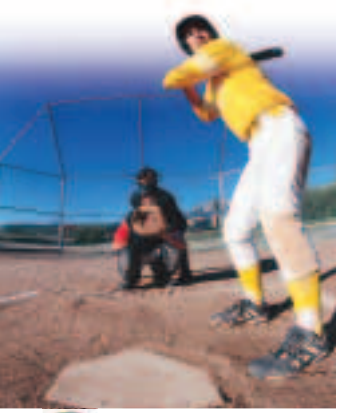
48. 0.2, $\frac{1}{4}$, 2%, $\frac{3}{20}$

49. $\frac{1}{20}$, 7%, 0.09, $\frac{2}{25}$

50. 84%, 0.88, $\frac{41}{50}$, $\frac{4}{5}$

51. 31%, $\frac{3}{10}$, $\frac{3}{13}$, 0.305

52. 6.5%, $\frac{3}{5}$, 0.556, $\frac{1}{6}$



53. **BASEBALL** In 2004, Major League Baseball player Jack Wilson's batting average was 0.308. Melvin Mora hit safely 17 out of every 50 at-bats and Bobby Abreu hit safely 30.1% of the time. Find Mora's and Abreu's batting averages and order all three averages from least to greatest.

Real-World Link . . . . .
A batting average is found by dividing the number of hits a batter has by the number of times the batter is at bat, not including times when a batter is walked or hit by a pitch.
Source: ehow.com

Replace each ● with <, >, or = to make a true sentence.

54. 0.035 ● $3\frac{1}{2}$%

55. $\frac{1}{250}$ ● $\frac{3}{4}$%

56. $\frac{7}{4}$ ● $1\frac{1}{4}$%

57. **ANALYZE TABLES** A nutrition label from a popular brand of soda is shown at the right. Would more or less than $\frac{1}{5}$ of a person's daily value of carbohydrates come from this can of soda? Explain your reasoning.

Nutrition Facts
Serving Size 1 can (360mL)

Amount Per Serving	
Calories 140	
	% Daily Value*
Total Fat 0g	0%
Sodium 20mg	1%
Total Carbohydrate 36g	12%
Sugars 36g	
Protein 0g	0%

* Percent Daily Values are based on a 2,000 calorie diet.

58. **TRAVEL** The projected number of household trips in 2010 is 50,000,000. About 14,000,000 of these trips will involve air travel. What percent of the trips will involve air travel?

SELECT A FORM **For Exercises 59 and 60, use the following information.**
Lisa ate $\frac{1}{8}$ of the cookies, gave 0.25 to her friend Kaitlyn, and gave 37.5% to her sister. To solve each problem below, select the form of number (fraction, decimal, or percent) that would be easiest to use. Explain your reasoning. Then use that form to solve the problem.

EXTRA PRACTICE
See pages 688, 712.
Math Online
Self-Check Quiz at ca.gr7math.com

59. Did Lisa eat more cookies than she gave to Kaitlyn?

60. Who was given more cookies, Kaitlyn or Lisa's sister?

H.O.T. Problems

61. **FIND THE ERROR** Kristin and Neva are changing 0.7 to a percent. Who is correct? Explain your reasoning.

Kristin

Neva

62. **CHALLENGE** Write $1\frac{3}{5}$ as a percent. Justify your answer.

63. **OPEN ENDED** Write a percent that is between $\frac{3}{5}$ and $\frac{2}{3}$.

64. **WRITING IN MATH** Is 0.04 less than or greater than 40%? Explain your reasoning.

STANDARDS PRACTICE

65. Mr. Lee asked his students how many hours they watched public television last week. The responses are shown in the table. Which number represents the portion of students who said they watched more than 1 hour?

Number of Hours Watched	% of Students
Less than or equal to 1 hour	92.5%
Between 1 and 2 hours	5%
More than 2 hours	2.5%

A 0.75 **C** $\frac{5}{100}$

B $\frac{75}{100}$ **D** 0.075

66. Between which two percents is $\frac{7}{40}$?

F 15% and 16%

G 16% and 17%

H 17% and 18%

J 19% and 20%

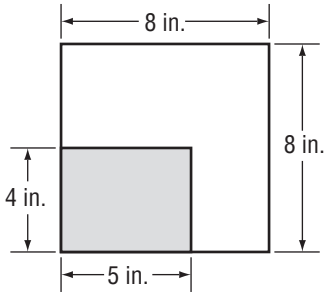
67. What percent of the square is shaded?

A 20%

B 31.25%

C 44%

D 62.5%



Spiral Review

Write each ratio as a percent. (Lesson 5-1)

68. 27 out of 100

69. 0.6 out of 100

70. 9:20

71. 33:50

72. **ALGEBRA** Determine whether the relationship between the two quantities described in the table is linear. If so, find the constant rate of change. If not, explain your reasoning (Lesson 4-10)

Data Transferred				
Megabits	375	750	1,125	1,500
Time (s)	1	2	3	4

73. **FOOD** Three-fourths of a pan of lasagna is to be divided equally among 6 people. What part of the lasagna will each person receive? (Lesson 2-4)

Order the integers in each set from least to greatest. (Lesson 1-3)

74. {−12, 5, −5, 13, −1}

75. {42, −56, −13, 101, 13}

76. {64, −58, −65, 57, −61}

GET READY for the Next Lesson

PREREQUISITE SKILL **Solve each proportion.** (Lesson 4-3)

77. $\frac{5}{6} = \frac{x}{24}$

78. $\frac{a}{12} = \frac{2}{15}$

79. $\frac{2}{7} = \frac{5}{t}$

80. $\frac{3}{n} = \frac{10}{8}$

READING Word Problems

Comparing Data

Standard 7AF1.4 **Use algebraic terminology** (e.g. variable, equation, term, coefficient, inequality, expression, constant) **correctly.**

When you are solving a word problem that involves comparing data, look for words such as *more than*, *times*, or *percent*. They give you a clue about what operation to use.

For example, the table shows the final standings for the Western Conference of the United Soccer League's W-League for the 2005 season.

W-League Western Conference					
Team	Games	Wins	Losses	Ties	Points
Vancouver	14	13	1	0	39
Arizona	14	10	3	1	31
Mile High	14	10	4	0	30
Denver	14	7	6	1	22
Seattle	14	5	8	1	16
Fort Collins	14	2	11	1	7
San Diego	14	0	14	0	0

Source: United Soccer Leagues

Josh Devins Photography

You can compare the data in several ways.

Difference Vancouver had *17 more points* than Denver.
$39 - 22 = 17$

Ratio Mile High won *5 times as many games* as Fort Collins.
$10 \div 2 = 5$

Percent Arizona lost about *21% of the games* they played.
$(3 \div 14) \times 100 \approx 21$

PRACTICE

Determine whether each problem asks for a *difference*, *ratio*, or *percent*. Write out the key words in each problem. Then solve each problem.

1. How many more games did Arizona win than lose or tie?
2. What percent of the time did Vancouver win its games?
3. How many times as many games did Mile High win than Seattle?
4. WRITING IN MATH Write three statements comparing the data in the table. One comparison should be a difference, one should be a ratio, and one should be a percent.

5-3 Algebra: The Percent Proportion

Main IDEA

Solve problems using the percent proportion.

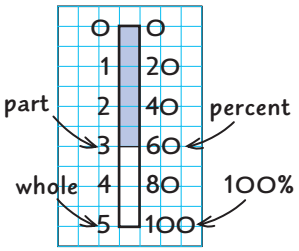
Standard 7NS1.3 Convert fractions to decimals and **percents** and **use these representations in** estimations, **computations, and applications.**

NEW Vocabulary

percent proportion

MINI Lab

You can use a proportion model to determine the percent represented by 3 out of 5.



STEP 1 Draw a 10-by-1 rectangle on grid paper. Label the units on the right from 0 to 100.

STEP 2 On the left side, mark equal units from 0 to 5, because 5 represents the whole quantity.

STEP 3 Draw a horizontal line from 3 on the left side of the model. The number on the right side is the percent.

For Questions 1–3, use the model above.

1. What is 40% of 5?
2. 4 is 80% of what number?
3. Draw a model and find what percent 7 is of 20.

In a **percent proportion**, one ratio compares part of a quantity to the whole quantity, also called the *base*. The other ratio is the equivalent percent written as a fraction with a denominator of 100.

3 out of 5 is 60%.

$$\left.\begin{matrix}\text{part} \rightarrow \\ \text{whole} \rightarrow\end{matrix}\right\} \frac{3}{5} = \frac{60}{100} \left.\vphantom{\frac{3}{5}}\right\} \text{percent}$$

EXAMPLE 1 Find the Percent

22 is what percent of 110?

Since 22 is being compared to 110, 22 is the part and 110 is the whole. You need to find the percent. Let n represent the percent.

$$\left.\begin{matrix}\text{part} \rightarrow \\ \text{whole} \rightarrow\end{matrix}\right\} \frac{22}{110} = \frac{n}{100} \left.\vphantom{\frac{22}{110}}\right\} \text{percent}$$ Write the percent proportion.

$22 \cdot 100 = 110 \cdot n$ Find the cross products.

$2{,}200 = 110n$ Multiply.

$\frac{2{,}200}{110} = \frac{110n}{110}$ Divide each side by 110.

$20 = n$ Simplify.

22 is 20% of 110.

READING in the Content Area

For strategies in reading this lesson, visit ca.gr7math.com

CHECK Your Progress

a. 17 is what percent of 68?

b. 41.4 is what percent of 92?

READING Math

Percents The whole usually follows the word *of*.

EXAMPLE 2 Find the Part

What number is 80% of 500?

The percent is 80 and the whole is 500. You need to find the part. Let p represent the part.

part → $\frac{p}{500} = \frac{80}{100}$ ← percent — Write the percent proportion.

$p \cdot 100 = 500 \cdot 80$ — Find the cross products.

$100p = 40{,}000$ — Multiply.

$\frac{100p}{100} = \frac{40{,}000}{100}$ — Divide each side by 100.

$p = 400$ — Simplify.

400 is 80% of 500.

CHECK Your Progress

c. What number is 35% of 48?

d. Find 12.5% of 88.

EXAMPLE 3 Find the Whole

14.4 is 32% of what number?

The percent is 32 and the part is 14.4. You need to find the whole. Let w represent the whole.

part → $\frac{14.4}{w} = \frac{32}{100}$ ← percent — Write the percent proportion.

$14.4 \cdot 100 = 32 \cdot w$ — Find the cross products.

$1{,}440 = 32w$ — Multiply.

$\frac{1{,}440}{32} = \frac{32w}{32}$ — Divide each side by 32.

$45 = w$ — Simplify.

14.4 is 32% of 45.

CHECK Your Progress

e. 23.4 is 30% of what number?

f. 19 is 62.5% of what number?

CONCEPT Summary — Types of Percent Problems

Type	Example	Proportion
Find the Percent	7 is what percent of 10?	$\frac{7}{10} = \frac{n}{100}$
Find the Part	What number is 70% of 10?	$\frac{p}{10} = \frac{70}{100}$
Find the Whole	7 is 70% of what number?	$\frac{7}{w} = \frac{70}{100}$

MathOnline Extra Examples at ca.gr7math.com

EXAMPLE Percents Greater than 100

4 **6 is what percent of 5?**

6 is being compared to 5, so 5 is the whole, and 6 is the part. You need to find the percent. Let n represent the percent.

$$\left.\begin{matrix}\text{part} \rightarrow \\ \text{whole} \rightarrow\end{matrix}\ \frac{6}{5} = \frac{n}{100}\right\} \text{percent}$$ Write the percent proportion.

$6 \cdot 100 = 5 \cdot n$ Find the cross products.

$600 = 5n$ Multiply.

$\frac{600}{5} = \frac{5n}{5}$ Divide each side by 5.

$120 = n$ Simplify.

6 is 120% of 5.

STUDY TIP

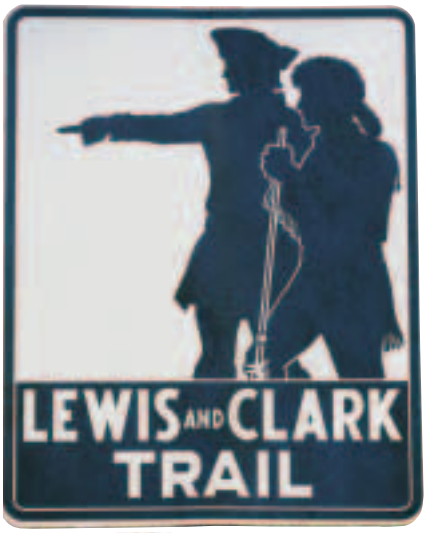
Check for Reasonableness
Since the part is greater than the whole, $6 > 5$, it makes sense that the percent would be greater than 100.

CHECK Your Progress

g. 12 is what percent of 6?

h. Find 175% of 18.

Real-World EXAMPLE



Real-World Link
The members of the Lewis and Clark Expedition spent the winter of 1805–1806 in Oregon.
Source: *Kids Discover*

5 **HISTORY** **The Lewis and Clark Expedition reported that it rained 94 days, which was about 89% of their days in Oregon. How many days did the Lewis and Clark Expedition spend in Oregon?**

The percent is 89, and the part is 94 days. You need to find the whole number of days.

Words 94 days is 89% of what number of days?

Variable Let w represent the whole.

Proportion
$$\left.\begin{matrix}\text{part} \rightarrow \\ \text{whole} \rightarrow\end{matrix}\ \frac{94}{w} = \frac{89}{100}\right\} \text{percent}$$

$\frac{94}{w} = \frac{89}{100}$ Write the percent proportion.

$94 \cdot 100 = w \cdot 89$ Find the cross products.

$9{,}400 = 89w$ Multiply.

$\frac{9{,}400}{89} = \frac{89w}{89}$ Divide each side by 89.

$105.6 \approx w$ Simplify.

The Lewis and Clark Expedition spent 106 days in Oregon.

CHECK Your Progress

i. **SCHOOL** Carmila answered 23 questions correctly on her science test and received a grade of 92%. How many questions were on the test?

Personal Tutor

Online Personal Tutor at ca.gr7math.com

CHECK Your Understanding

Write a percent proportion and solve each problem. Round to the nearest tenth if necessary.

Examples 1, 2 (pp. 263–264)

1. 70 is what percent of 280?
2. What percent of 49 is 7?

Examples 3, 4 (pp. 264–265)

3. What number is 60% of 90?
4. Find 72% of 200.
5. 151.5 is 75% of what number?
6. 126 is 30% of what number?
7. 48 is what percent of 30?
8. Find 118% of 19.

Example 5 (p. 265)

9. **ANIMALS** A tiger can eat food that weighs up to about 15% of its body weight. If a tiger can eat 75 pounds of food, how much does a tiger weigh?

Exercises

HOMEWORK HELP

For Exercises	See Examples
10, 11	1
12, 13	2
14, 15	3
16, 17	4
18, 19	5

Write a percent proportion and solve each problem. Round to the nearest tenth if necessary.

10. 3 is what percent of 15?
11. 120 is what percent of 360?
12. What is 15% of 60?
13. What is 17% of 350?
14. 18 is 45% of what number?
15. 95 is 95% of what number?
16. 15.12 is what percent of 12?
17. Find 250% of 57.
18. **BRACES** In a recent survey, 34% of kids said they will get dental braces. If nearly 28,800 kids were surveyed, about how many will get braces?
19. **PETS** There are about 68 million owned dogs in the United States. Of these, 13.6 million were adopted from an animal shelter. About what percent of owned dogs were adopted from an animal shelter?

Write a percent proportion to solve each problem. Then solve. Round to the nearest tenth if necessary.

20. What is 2.5% of 95?
21. 4 is what percent of 550?
22. 98 is 22.5% of what number?
23. Find 5.8% of 42.
24. What percent of 110 is 1?
25. 57 is 13.5% of what number?

GAMES For Exercises 26–28, use the following information.

At the start of a game of chess, each player has the pieces listed at the right.

Chess Pieces
1 king
1 queen
2 bishops
2 knights
2 rooks
8 pawns

26. What percent of each player's pieces are knights?
27. The king is what percent of each player's pieces?
28. What piece is 50% of each player's total pieces?

EXTRA PRACTICE

See pages 689, 712.

Math Online

Self-Check Quiz at ca.gr7math.com

H.O.T. Problems

29. **CHALLENGE** Choose any two numbers, x and y. Find x% of y and y% of x. Will the results always be the same? Explain.

30. **WRITING IN MATH** Roberto made 56% of his free throws in the first half of the basketball season. If he makes 7 shots out of the next 13 attempts, will it help or hurt his average? Explain your reasoning.

STANDARDS PRACTICE

31. A baseball stadium manager expects that 60% of the fans at a game will buy at least \$3.00 in concessions. If there are 5,600 fans at a game, which statement does *not* represent the manager's expectation?

A 3,360 fans each will buy at least \$3.00 in concessions.

B 2,240 fans each will buy fewer than \$3.00 in concessions.

C More than $\frac{1}{2}$ of the fans each will buy at least \$3.00 in concessions.

D Less than $\frac{2}{5}$ of the fans each will buy fewer than \$3.00 in concessions.

32. A pattern of equations is shown below.

1% of 100 = 1
2% of 50 = 1
4% of 25 = 1
8% of 12.5 = 1
16% of 6.25 = 1

Which statement best describes this pattern?

F If the percent is doubled and the whole is doubled, the answer is 1.

G If the percent is doubled and the whole is halved, the answer is 1.

H If the percent is increased by 2 and the whole is halved, the answer is 1.

J If the percent remains the same and the whole is halved, the answer is 1.

Spiral Review

33. Order the set of numbers $\frac{1}{6}$, 16%, and 0.016 from least to greatest. (Lesson 5-2)

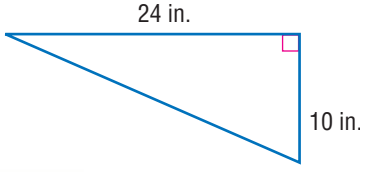
34. **LUNCH** Forty-eight percent of first period class buys a school lunch. Write this percent as a fraction in simplest form. (Lesson 5-1)

MEASUREMENT **Complete each conversion. Round to the nearest hundredth if necessary.** (Lesson 4-6)

35. 8 lb ≈ __?__ kg

36. 14 mi ≈ __?__ km

37. **GEOMETRY** Find the perimeter of the right triangle. (Lesson 3-5)



GET READY for the Next Lesson

PREREQUISITE SKILL **Compute each product mentally.** (Lesson 2-3)

38. $\frac{1}{2} \cdot 422$

39. $639 \cdot \frac{1}{3}$

40. $0.1 \cdot 722$

41. $0.5 \cdot 680$

5-4 Finding Percents Mentally

Main IDEA

Compute mentally with percents.

Standard 7NS1.3 **Convert fractions to decimals and percents and use these representations in** estimations, **computations, and applications.**

GET READY for the Lesson

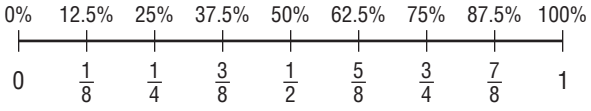
SCHOOL The table lists the enrollment at Roosevelt Middle School by grade level.

1. 50% of the eighth-grade class are girls. How could you find 50% of 104 mentally?
2. Use mental math to find the number of girls in the eighth-grade class.
3. 25% of the sixth-grade class play basketball. Use mental math to find the number of students in the sixth grade who play basketball.

Roosevelt Middle School Enrollment

Grade Level	Number of Students
Sixth	84
Seventh	93
Eighth	104

When you compute with common percents like 50% or 25%, it may be easier to use the fraction form of the percent. This number line shows some fraction-percent equivalents.



STUDY TIP

Percents and Fractions Some percents are used more frequently than others. So, it is a good idea to be familiar with these percents and their equivalent fractions.

KEY CONCEPT Percent-Fraction Equivalents

$25\% = \frac{1}{4}$	$20\% = \frac{1}{5}$	$16\frac{2}{3}\% = \frac{1}{6}$	$12\frac{1}{2}\% = \frac{1}{8}$	$10\% = \frac{1}{10}$
$50\% = \frac{1}{2}$	$40\% = \frac{2}{5}$	$33\frac{1}{3}\% = \frac{1}{3}$	$37\frac{1}{2}\% = \frac{3}{8}$	$30\% = \frac{3}{10}$
$75\% = \frac{3}{4}$	$60\% = \frac{3}{5}$	$66\frac{2}{3}\% = \frac{2}{3}$	$62\frac{1}{2}\% = \frac{5}{8}$	$70\% = \frac{7}{10}$
$100\% = 1$	$80\% = \frac{4}{5}$	$83\frac{1}{3}\% = \frac{5}{6}$	$87\frac{1}{2}\% = \frac{7}{8}$	$90\% = \frac{9}{10}$

EXAMPLES Use Fractions to Compute Mentally

1 **Compute 20% of 45 mentally.**

$20\% \text{ of } 45 = \frac{1}{5} \cdot 45 \text{ or } 9$ Use the fraction form of 20%, which is $\frac{1}{5}$.

2 **Compute $33\frac{1}{3}\%$ of 93 mentally.**

$33\frac{1}{3}\%$ of $93 = \frac{1}{3} \cdot 93$ or 31 Use the fraction form of $33\frac{1}{3}\%$, which is $\frac{1}{3}$.

CHECK Your Progress **Compute mentally.**

a. 25% of 32 b. $12\frac{1}{2}\%$ of 160 c. 80% of 45

You can also use decimals to find percents mentally. Remember that $10\% = 0.1$ and $1\% = 0.01$.

EXAMPLES Use Decimals to Compute Mentally

STUDY TIP

Multiplying by Decimals To multiply by 0.1, move the decimal point one place to the left. To multiply by 0.01, move the decimal point two places to the left.

Compute mentally.

3 **10% of 98**

10% of $98 = 0.1 \cdot 98$ or 9.8

4 **1% of 235**

1% of $235 = 0.01 \cdot 235$ or 2.35

CHECK Your Progress **Compute mentally.**

d. 10% of 65 e. 1% of 450 f. 3% of 22

Real-World EXAMPLE

5 **ELECTIONS** **At Madison Middle School, 60% of the students voted in an election for student council officers. There are 1,500 students. How many students voted in the election?**

Real-World Link
In the 2004 presidential election, about 55% of the nearly 174.8 million registered voters in the U.S. turned out to vote.
Source: infoplease.com

METHOD 1 **Use a fraction.**

60% of $1{,}500 = \frac{3}{5}$ of 1,500 THINK $\frac{1}{5}$ of 1,500 is 300. So, $\frac{3}{5}$ of 1,500 is $3 \cdot 300$ or 900.

60% of 1,500 is 900.

METHOD 2 **Use a decimal.**

60% of $1{,}500 = 0.6$ of 1,500 THINK 0.1 of 1,500 is 150. So, 0.6 of 1,500 is $6 \cdot 150$ or 900.

60% of 1,500 is 900.

There were 900 students who voted in the election.

CHOOSE Your Method

g. **TIPPING** Alan and his brother ate lunch at the local café. They left a tip that was 20% of the bill. If the bill was $15.50, how much did Alan and his brother leave for the tip?

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CHECK Your Understanding

Examples 1–4 (pp. 268–269)

Compute mentally.

1. 50% of 120
2. $33\frac{1}{3}$% of 60
3. $37\frac{1}{2}$% of 72
4. 1% of 52
5. 10% of 350
6. 2% of 630

Example 5 (p. 269)

7. **BOOKS** An author receives a payment, or commission, equal to 25% of the total sales of her book. Determine the amount of money she will receive if the total sales are $48,000.

Exercises

HOMEWORK HELP

For Exercises	See Examples
8–15	1–2
16–23	3–4
24, 25	5

Compute mentally.

8. 25% of 44
9. 50% of 62
10. $12\frac{1}{2}$% of 64
11. $16\frac{2}{3}$% of 54
12. 40% of 35
13. 60% of 15
14. $66\frac{2}{3}$% of 120
15. $62\frac{1}{2}$% of 160
16. 10% of 57
17. 10% of 125
18. 1% of 81
19. 1% of 28.3
20. 3% of 130
21. 7% of 210
22. 10% of 17.1
23. 10% of 10.2

24. **PEOPLE** The average person has about 100,000 hairs on his or her head. However, people with red hair average only 90% of this number. What is the average number of hairs on the head of a person with red hair?

25. **TRAVEL** About 10% of travel trips in the United States include a visit to an amusement park. If there were 920 million travel trips in the United States, how many of those included a visit to an amusement park?

Replace each ● with <, >, or = to make a true statement.

26. $66\frac{2}{3}$% of 18 ● 60% of 15
27. 1% of 150 ● 10% of 15

28. **MEASUREMENT** The Amazon is the second longest river in the world with a length of about 4,000 miles. If the longest river in the world, the Nile, is about 104% of the length of the Amazon, find the length of the Nile River.

BASEBALL For Exercises 29 and 30, use the following information.

The graphic shows the results of a survey asking women about their interest in Major League Baseball. Suppose 1,000 women were surveyed.

Women's Interest in Major League Baseball

Source: ESPN

29. How many women said they were interested in Major League Baseball?
30. How many women said they were *not* interested in Major League Baseball?

EXTRA PRACTICE

See pages 689, 712.

Math Online

Self-Check Quiz at ca.gr7math.com

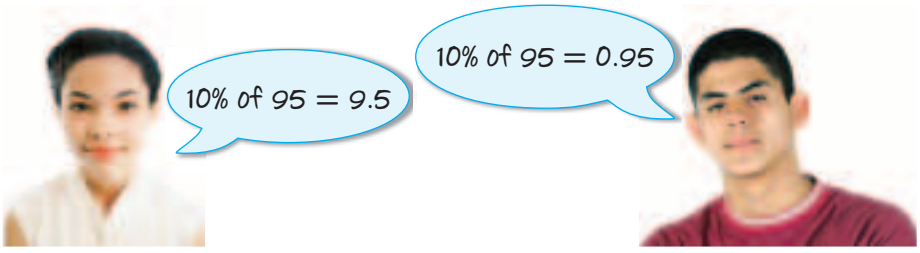
31. **FIND THE DATA** Refer to the California Data File on pages 16–19. Choose some data and write a real-world problem in which you could mentally compute a percent.

H.O.T. Problems

32. **CHALLENGE** Find two numbers, a and b, such that 10% of a is the same as 30% of b. Explain your reasoning.

33. **OPEN ENDED** Suppose you wish to find $33\frac{1}{3}\%$ of x. List two values of x for which you could do the computation mentally. Explain your reasoning.

34. **FIND THE ERROR** Candace and Pablo are finding 10% of 95. Who is correct? Justify your choice.



35. **WRITING IN MATH** Explain how to find 75% of 40 mentally.

STANDARDS PRACTICE

36. Allison, Raul, and Theo drove from Austin, Texas, to Los Angeles, California, a distance of 1,224 miles. Allison drove $\frac{1}{3}$ of the total distance, Raul drove 40%, and Theo drove the remainder. How many miles were driven by the person who drove the greatest distance?

A 330.5 **C** 489.6

B 408 **D** 734.4

37. Etu bought the items listed below. How much money did he save if each item was 20% off the regular price?

Item	Regular Price ($)
Shirt	19
Ties	9
Belt	8
Shoes	29

F \$52 **H** \$24

G \$36 **J** \$13

Spiral Review

38. **FOOTBALL** Eleven of the 48 members of the football team are on the field. What percent of the team members are on the field? (Lesson 5-3)

Write each fraction as a percent. (Lesson 5-2)

39. $\frac{9}{20}$ 40. $\frac{7}{8}$ 41. $\frac{3}{500}$ 42. $\frac{2}{9}$

43. **MEASUREMENT** A snail travels one mile in about 30 hours. At this rate, how far can a snail travel in 1 day? (Lesson 2-4)

GET READY for the Next Lesson

PREREQUISITE SKILL **Draw the next three figures in the pattern.** (Lesson 2-8)

44.

5-5 Problem-Solving Investigation

MAIN IDEA: Determine a reasonable answer.

STANDARD 7MR3.1 **Evaluate the reasonableness of the solution in the context of the original situation.**
STANDARD 7NS1.3 Convert fractions to decimals and **percents** and **use these representations in** estimations, **computations, and applications.**

P.S.I. TEAM +

e-Mail: REASONABLE ANSWERS

YOUR MISSION: Determine a reasonable answer to solve the problem.

THE PROBLEM: Will Carla have to pay more or less than $25?

> Carla: Because I work at the Jean Shack, I can buy a $50 jacket there for 60% of its price.

EXPLORE	You know the cost of the jacket. Carla can buy the jacket for 60% of the price. You want to know if the jacket will cost more or less than $25.
PLAN	Use mental math to determine a reasonable answer.
SOLVE	THINK $\frac{25}{50} = \frac{1}{2}$ or 50% Since Carla will pay 60% of the cost, she will have to pay more than $25.
CHECK	Find 60% of $50. 60% of 50 $= \frac{3}{5}$ of 50 Since $\frac{1}{5}$ of 50 is 10, $\frac{3}{5}$ of 50 is 3×10 or 30. Carla will pay $30, which is more than $25.

Analyze The Strategy

1. Explain why determining a reasonable answer was an appropriate strategy for solving the above problem.
2. **WRITING IN MATH** Explain why mental math skills are important when finding the reasonable answers.

Mixed Problem Solving

For Exercises 3–5, determine a reasonable answer.

3. **SCHOOL** There are 750 students at Monroe Middle School. If 64% of the students have purchased yearbooks, would the number of yearbooks purchased be about 200, 480, or 700? Explain.

4. **MONEY** Spencer took $40 to the mall. He spent $12.78 at the music store. He wants to buy two items at the bookstore for $7.25 and $15.78. Does he have enough money with him to make these two purchases? Explain.

5. **BABY-SITTING** Cameron is paid $8.50 an hour to watch his nephew. If he is saving to buy a new skateboard that costs $325, should he baby-sit for about 20, 30, or 40 hours? Explain.

Use any strategy to solve Exercises 6–11. Some strategies are shown below.

PROBLEM-SOLVING STRATEGIES
- Use the four-step plan.
- Work backward.
- Look for a pattern.

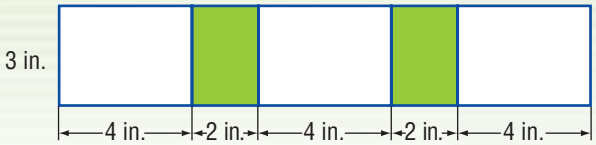
6. **BAKING** Desiree spilled $1\frac{1}{2}$ cups of sugar, which she discarded. She then used half of the remaining sugar to make cookies. If she had $4\frac{1}{2}$ cups left, how much sugar did she have initially?

7. **NUMBER THEORY** Study the pattern.

$$1 \times 1 = 1$$
$$11 \times 11 = 121$$
$$111 \times 111 = 12{,}321$$
$$1111 \times 1111 = 1{,}234{,}321$$

Without doing the multiplication, find 1111111×1111111.

8. **GEOMETRY** What percent of the large rectangle is green?



9. **CARS** Seth is saving to buy a car. He wants to have a down payment of 10% for a car that costs $13,000. So far he has saved $850. If he saves $75 each week for the down payment, how soon can he buy the car?

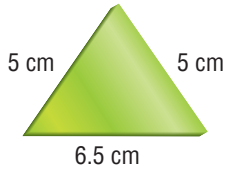
10. **PETS** In a recent survey, 44% of students at Davison High School own a cat. If there are 1,532 students in the school, is 600, 675, or 715 a reasonable estimate for the number of students who own a cat? Explain.

11. **POPULATION** About 12.25% of the people in the U.S. live in California. If the U.S. population is about 297,000,000, estimate the population of California.

Select the Operation

For Exercises 12 and 13, select the appropriate operation(s) to solve the problem. Justify your selection(s) and solve the problem.

12. **MEASUREMENT** Juanita is designing isosceles triangles for a mosaic. The sides of the larger triangle are $1\frac{1}{2}$ times larger than the sides of the triangle shown. Find the perimeter of the larger triangle.



13. **MEASUREMENT** The entrance of a new convention center will need 2.3×10^5 square feet of ceramic tile. The tiles measure 2 feet by 2 feet and are sold in boxes of 24. How many boxes of tiles are needed to tile the entrance?

CHAPTER 5

Mid-Chapter Quiz

Lessons 5-1 through 5-5

Write each ratio or fraction as a percent. (Lesson 5-1)

1. 3 out of 16
2. 8:10
3. $\frac{13}{25}$
4. $\frac{7}{20}$

5. **STANDARDS PRACTICE** Fifteen percent of the dogs at a show were Labrador retrievers. Which is *not* true? (Lesson 5-1)

   A $\frac{3}{20}$ of the dogs were Labrador retrievers.

   B 15 out of every 100 dogs were Labrador retrievers.

   C 85% of the dogs were not Labrador retrievers.

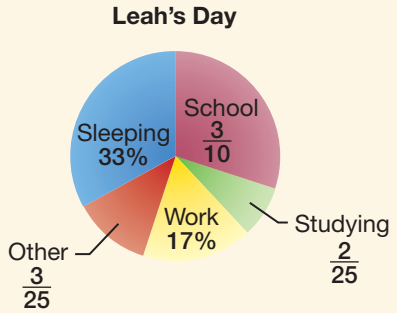
   D 1 out of every 15 dogs was a Labrador retriever.

Write each decimal or fraction as a percent. (Lesson 5-2)

6. 0.325
7. $\frac{3}{200}$
8. $\frac{4}{15}$
9. 1.72

10. **SCHOOL** Santos answered 37 out of 40 questions correctly on an English exam. On the same exam, Chantal scored 87.5% and David correctly answered $\frac{9}{10}$ of the questions. Which student correctly answered the most questions? (Lesson 5-2)

11. **TIME** Use the graph below. Does Leah spend more of her day sleeping or at school? Explain your reasoning. (Lesson 5-2)



Write a percent proportion to solve each problem. Then solve. Round to the nearest tenth if necessary. (Lesson 5-3)

12. 63 is what percent of 84?
13. Find 41% of 700.
14. 294 is 35% of what number?
15. What number is 134% of 62?

16. **STANDARDS PRACTICE** A study showed that 37.5% of residents in a certain neighborhood use public transportation. If there are 168 residents in the neighborhood, which statement is *not* supported by this study? (Lesson 5-3)

   F More than half the residents do not use public transportation.

   G Less than 62.5% of the residents do not use public transportation.

   H 63 residents use public transportation.

   J Less than $\frac{2}{5}$ of the residents use public transportation.

Compute mentally. (Lesson 5-4)

17. 25% of 64
18. 1% of 58.5
19. $66\frac{2}{3}$% of 45
20. 3% of 600

21. **HOMEWORK** Sean has 192 pages of reading to do in the next three days. He wants to complete $33\frac{1}{3}$% of the reading tonight. Compute mentally how many pages Sean should read tonight. Explain your reasoning. (Lesson 5-4)

22. **FOOD** In one month, the Schaffer family spent \$121.59, \$168.54, \$98.67, and \$141.78 on groceries. If their grocery budget is \$500 per month, did they stay within their budget? Explain. (Lesson 5-5)

5-6 Percent and Estimation

In Motion | In Motion for MAC

Concepts in Motion
BrainPOP® ca.gr7math.com

Main IDEA

Estimate by using equivalent fractions and percents.

Standard 7NS1.3 **Convert fractions to** decimals and **percents and use these representations in estimations,** computations, **and applications.**

NEW Vocabulary

compatible numbers

GET READY for the Lesson

GEOGRAPHY The total area of Earth is 196,800,000 square miles. The graphic shows the percent of the area of Earth that is land and the percent that is water.

Source: *World Book*

1. Round the total area of Earth to the nearest hundred million square miles.
2. Round the percent of Earth that is land to the nearest ten percent.
3. Use mental math to estimate the area of the land on Earth.

When an exact answer is not needed, you can estimate a percent of a number by using compatible numbers. **Compatible numbers** are two numbers that are easy to divide mentally.

READING Math

≈ *is approximately equal to*

EXAMPLES Estimate Percents of Numbers

1 **Estimate 19% of 30.**

$19\% \approx 20\%$ or $\frac{1}{5}$. 5 and 30 are compatible numbers.

$\frac{1}{5}$ of 30 is 6. So, 19% of 30 is about 6.

2 **25% of 41**

25% is $\frac{1}{4}$, and 41 is about 40. $\frac{1}{4}$ and 40 are compatible numbers.

$\frac{1}{4}$ of 40 is 10. So, 25% of 41 is about 10.

3 **Estimate 65% of 76.**

$65\% \approx 66\frac{2}{3}\%$ or $\frac{2}{3}$, and 76 is about 75. 3 and 75 are compatible numbers.

$\frac{1}{3}$ of 75 is 25, and $\frac{2}{3}$ of 75 is $2 \cdot 25$ or 50. So, 65% of 76 is about 50.

CHECK Your Progress

Estimate. Justify your answer.

a. 24% of 44 b. 40% of 49 c. 13% of 65

Sometimes estimation provides the best answer to a real-world problem.

Real-World EXAMPLE

4 **LEFT–HANDEDNESS** **About 11% of the population is left-handed. If there are about 36 million people in California, about how many Californians are left-handed?**

$11\% \text{ of } 36 \text{ million} \approx 10\% \text{ or } \frac{1}{10} \text{ of } 36 \text{ million}$ 11% is about 10%.

$= 3.6 \text{ million}$ $\frac{1}{10} \times 36 = 3.6$

So, about 3.6 million Californians are left-handed.

CHECK Your Progress

d. **MONEY** A circulating \$5 bill in the United States lasts about 22% as long as a \$100 bill. If a \$100 bill lasts nine years, estimate how long a \$5 bill lasts.

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You can use similar techniques to estimate a percent.

EXAMPLES Estimate Percents

Estimate each percent.

5 **8 out of 25**

$\frac{8}{25} \approx \frac{8}{24} \text{ or } \frac{1}{3}$ 25 is close to 24.

$\frac{1}{3} = 33\frac{1}{3}\%$

So, 8 out of 25 is about $33\frac{1}{3}\%$.

STUDY TIP

Estimation When estimating, estimate so that you change the ratio the least.

6 **14 out of 25**

$\frac{14}{25} \approx \frac{15}{25} \text{ or } \frac{3}{5}$ 14 is close to 15.

$\frac{3}{5} = 60\%$

So, 14 out of 25 is about 60%.

7 **89 out of 121**

$\frac{89}{121} \approx \frac{90}{120} \text{ or } \frac{3}{4}$ 89 is close to 90, and 121 is close to 120.

$\frac{3}{4} = 75\%$

So, 89 out of 121 is about 75%.

CHECK Your Progress

Estimate each percent. Justify your answer.

e. 7 out of 57 **f.** 9 out of 25 **g.** 7 out of 79

CHECK Your Understanding

Examples 1–3 (p. 275)

Estimate.

1. 49% of 160
2. $66\frac{2}{3}$% of 20
3. 73% of 65

Example 4 (p. 276)

4. **SCHOOL** Math is the favorite subject of about 28% of students, according to a recent study. If there are 30 students in your class, estimate the number of students who would pick math as their favorite subject.

Examples 5–7 (p. 276)

Estimate each percent.

5. 6 out of 35
6. 8 out of 79
7. 14 out of 19

Exercises

HOMEWORK HELP

For Exercises	See Examples
8–15	1–3
16–23	5–7
24–25	4

Estimate.

8. 29% of 50
9. 67% of 93
10. 20% of 76
11. 25% of 63
12. 21% of 71
13. 92% of 41
14. 48% of 159
15. 73% of 81

Estimate each percent.

16. 7 out of 29
17. 6 out of 59
18. 2 out of 15
19. 5 out of 36
20. 8 out of 23
21. 7 out of 11
22. 4 out of 21
23. 9 out of 55

24. **MEASUREMENT** The length of an object, in inches, is about 39% of its length in centimeters. Estimate the length, in inches, of an object 50 centimeters long.

25. **SPORTS** A place kicker made 73% of his field goal attempts last season. If he had 46 attempts, estimate the number of field goals that he made.

26. **ANIMALS** In 2003, 1,072 species of animals were endangered or threatened. Of these species, 342 were mammals. Estimate the percent of endangered or threatened animals that were mammals.

27. **ANALYZE TABLES** Estimate the percent of the population of each state that lives in each city. Then determine which city has the greatest percent of its state's population.

2003 Population		
City	City Population	Entire State Population
New York, NY	8,085,742	19,190,115
Los Angeles, CA	3,819,951	35,484,453
Chicago, IL	2,869,121	12,653,544

Source: *World Almanac*

EXTRA PRACTICE

See pages 690, 712.

Math Online

Self-Check Quiz at ca.gr7math.com

Estimate.

28. 26.5% of 123
29. 124% of 41
30. 249% of 119

Purestock/SuperStock

H.O.T. Problems

31. **NUMBER SENSE** Use mental math to determine which is greater: 24% of 240 or 51% of 120. Explain your reasoning.

CHALLENGE Determine whether each statement about estimating percents of numbers is *sometimes*, *always*, or *never* true. Explain.

32. If both the percent and the number are rounded up, the estimate will be greater than the actual answer.

33. If the percent is rounded up and the number is rounded down, the estimate will be greater than the actual answer.

34. **WRITING IN MATH** Explain how you could use fractions and compatible numbers to estimate 26% of $98.98.

STANDARDS PRACTICE

35. Rick took his father to dinner for his birthday. When the bill came, Rick's father reminded him that it is customary to tip the server 15% of the bill. If the bill was $19.60 and Rick estimated the tip to be $3, which of the following shows his method of estimation?

A 15% of $19.60 ≈ 15% of $15.

B 15% of $19.60 ≈ 10% of $20.

C 15% of $19.60 ≈ 20% of $20.

D 15% of $19.60 ≈ 15% of $20.

36. There are 150 students that participate in athletics at Southland High School. If there are 325 total students, about what part of the student body participates in athletics?

F 40%

G 45%

H 50%

J 55%

Spiral Review

37. **LIFE EXPECTANCY** The average life expectancy in the United States is about 77 years of age. In 1901, the average life expectancy was about 63% of this number. Would 30, 48, or 60 years of age be a reasonable life expectancy for the year 1901? Explain. (Lesson 5-5)

38. **BUSES** Of the 840 students at Moyer Middle School, 75% ride the bus. Use mental math to find the number of students who ride the bus. (Lesson 5-4)

39. **SEATING** A teacher would like to make a square seating chart. If there are 25 students in the class, how many students should be in each row? (Lesson 3-1)

GET READY for the Next Lesson

PREREQUISITE SKILL Solve each equation. (Lesson 2-7)

40. $0.2a = 7$

41. $20s = 8$

42. $0.35t = 140$

43. $30n = 3$

5-7 Algebra: The Percent Equation

Main IDEA

Solve problems using a percent equation.

Standard 7NS1.3 **Convert fractions to decimals and percents and use these representations in** estimations, **computations, and applications.**

Standard 7NS1.7 **Solve problems that involve** discounts, markups, **commissions, and profit** and compute simple and compound interest.

NEW Vocabulary

percent equation

REVIEW Vocabulary

equation a mathematical sentence that contains the equals sign (Lesson 1-2)

GET READY for the Lesson

GEOGRAPHY The approximate area of New York is 55,000 square miles. Of this area, 13% is water.

Total Area (sq mi)	Percent of Area Occupied by Water
55,000	13%

Source: infoplease.com

1. Use a percent proportion to find the area of water in New York.
2. Express the percent for New York as a decimal. Multiply the total area of New York by this decimal.
3. How are the answers for Exercises 1 and 2 related?

A **percent equation** is an equivalent form of a percent proportion in which the percent is written as a decimal.

$$\frac{\text{part}}{\text{whole}} = \text{percent}$$ ← The percent is written as a decimal.

$$\frac{\text{part}}{\text{whole}} \cdot \text{whole} = \text{percent} \cdot \text{whole}$$ Multiply each side by the whole.

$$\text{part} = \text{percent} \cdot \text{whole}$$ ← This form is called the percent equation.

EXAMPLE 1 Find the Part

Find 6% of 525.

Estimate 1% of 500 is 5. So, 6% of 500 is 6 • 5 or 30.

The percent is 6. The whole is 525. You need to find the part. Let p represent the part.

$$\underbrace{\text{part}}_{p} = \underbrace{\text{percent}}_{0.06} \cdot \underbrace{\text{whole}}_{525}$$

$p = 0.06 \cdot 525$ Write the percent equation. Note that the percent has been written as a decimal.

$p = 31.5$ Multiply.

Check for Reasonableness $31.5 \approx 30$ ✓

CHECK Your Progress

Write a percent equation to solve each problem. Then solve. Round to the nearest tenth if necessary.

a. What number is 35% of 88?

b. Find 15% of 275.

In some instances the percent or the whole are unknown. Solve the percent equation for the missing value.

EXAMPLE 2 Find the Percent

420 is what percent of 600?

Estimate $\frac{420}{600} \approx \frac{400}{600}$ or $66\frac{2}{3}\%$

The part is 420. The whole is 600. You need to find the percent. Let n represent the percent.

$\underbrace{\text{part}} = \underbrace{\text{percent}} \cdot \underbrace{\text{whole}}$

$420 = n \cdot 600$ Write the percent equation.

$\frac{420}{600} = \frac{n \cdot 600}{600}$ Divide each side by 600.

$0.7 = n$ Simplify.

Since $0.7 = 70\%$, 420 is 70% of 600. Note that the answer, a decimal, must be converted to a percent.

Check for Reasonableness $70\% \approx 66\frac{2}{3}\%$ ✓

STUDY TIP

Decimals and Percents
When finding the percent, be sure to place the decimal point correctly when writing your answer.

CHECK Your Progress

Write a percent equation to solve each problem. Then solve. Round to the nearest tenth if necessary.

c. 62 is what percent of 186?

d. What percent of 750 is 6?

EXAMPLE 3 Find the Whole

65 is 52% of what number?

Estimate 65 is 50% of 130.

The part is 65. The percent is 52. You need to find the whole. Let w represent the whole.

$\underbrace{\text{part}} = \underbrace{\text{percent}} \cdot \underbrace{\text{whole}}$

$65 = 0.52 \cdot w$ Write the percent equation. Note that the percent has been written as a decimal.

$\frac{65}{0.52} = \frac{0.52w}{0.52}$ Divide each side by 0.52.

$125 = w$ Simplify.

So, 65 is 52% of 125.

Check for Reasonableness $125 \approx 130$ ✓

CHECK Your Progress

Write a percent equation to solve each problem. Then solve. Round to the nearest tenth if necessary.

e. 210 is 75% of what number?

f. 54 is 18% of what number?

MathOnline **Extra Examples at** ca.gr7math.com

CONCEPT Summary — The Percent Equation

Type	Example	Equation
Find the Part	What number is 25% of 60?	$p = 0.25(60)$
Find the Percent	15 is what percent of 60?	$15 = n(60)$
Find the Whole	15 is 25% of what number?	$15 = 0.25w$

Juan Silva/Getty Images

Real-World Link
State sales tax rates range from 0% in Alaska, Delaware, Montana, New Hampshire, and Oregon, to 7.25% in California.
Source: www.taxadmin.org

Real-World EXAMPLE

4 **SALES TAX** **A television costs $350. If a 7% sales tax is added, what is the total cost of the television?**

METHOD 1 **Find the amount of tax first.**

The whole is $350. The percent is 7%. You need to find the amount of the tax, or the part. Let t represent the amount of tax.

$$\underbrace{\text{part}}_{t} = \underbrace{\text{percent}}_{0.07} \cdot \underbrace{\text{whole}}_{350}$$

$t = 0.07 \cdot 350$ Write the percent equation, writing 7% as a decimal.

$t = 24.5$ Multiply.

The tax is $24.50. The total cost of the television is $350.00 + $24.50 or $374.50.

METHOD 2 **Find the total percent first.**

Find 100% + 7% or 107% of $350 to find the total cost, including tax. Let t represent the total cost.

$$\underbrace{\text{part}}_{t} = \underbrace{\text{percent}}_{1.07} \cdot \underbrace{\text{whole}}_{350}$$

$t = 1.07 \cdot 350$ Write the percent equation, writing 107% as a decimal.

$t = 374.5$ Multiply.

The total cost of the television is $374.50.

CHOOSE Your Method

g. **PROFIT** Mrs. Dunn bought a house for $275,000. Three years later, she sold it for a 35% profit. What was the sale price of the house?

h. **PAYCHECKS** Paige earned $250 before taxes working at a movie theater. If 23% of her pay is withheld for taxes, how much is her take-home pay?

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CHECK Your Understanding

Examples 1–3 (pp. 279–280)

Solve each problem using a percent equation.

1. Find 85% of 920.
2. What number is 4% of 30?
3. 25 is what percent of 625?
4. What percent of 800 is 2?
5. 680 is 34% of what number?
6. 25% of what number is 10?

Example 4 (p. 281)

7. **PROFIT** A dealership sets car prices so that there is a 40% profit. If the dealership paid $5,300 for a car, for how much should they sell the car?

Exercises

HOMEWORK HELP

For Exercises	See Examples
8, 9, 14, 15	1
10, 11, 16, 17	2
12, 13, 18, 19	3
20–23	4

Solve each problem using a percent equation.

8. Find 60% of 30.
9. What is 40% of 90?
10. What percent of 90 is 36?
11. 45 is what percent of 150?
12. 75 is 50% of what number?
13. 15% of what number is 30?
14. What number is 13% of 52?
15. Find 24% of 84.
16. 6 is what percent of 3,000?
17. What percent of 5,000 is 6?
18. 3% of what number is 9?
19. 50 is 10% of what number?
20. **CLOTHING** A sweater costs $45. If a 6.5% sales tax is added, what is the total cost of the sweater?
21. **FUEL MILEAGE** A car can travel 32 miles per gallon of gasoline. When the tires are under-inflated, the car gets 15% fewer miles per gallon. What is the fuel mileage of the car with under-inflated tires?
22. **REAL ESTATE** A *commission* is a fee paid to a salesperson based on a percent of sales. Suppose a real estate agent earns a 3% commission. How much commission would be earned on the sale of a $150,000 house?
23. **BASKETBALL** In a recent National Basketball Association season, LeBron James made about 47.18% of his field-goal attempts. If he made 386 field goals, about how many attempts did he make?
24. **MUSEUMS** Which museum uses the greater percent of its area for exhibits?

Guggenheim Museum in New York
Total area: 79,600 square feet
Exhibition space: 49,600 square feet

Guggenheim Museum in Bilbao, Spain
Total area: 257,000 square feet
Exhibition space: 110,000 square feet

EXTRA PRACTICE
See pages 690, 712.
Math Online
Self-Check Quiz at ca.gr7math.com

Solve each problem using a percent equation.

25. Find $6\frac{1}{4}\%$ of 150.

26. 360 is what percent of 270?

H.O.T. Problems

27. **CHALLENGE** Determine whether $a\%$ of b is *sometimes*, *always*, or *never* equal to $b\%$ of a. Explain your reasoning.

28. **CHALLENGE** Mrs. McGary budgeted a certain amount of money for new shoes. Before she could buy them, there was a 20% increase in price. She waited for a month, and the store discounted the shoes 20%. She bought the shoes, thinking that they would cost less than the original price. Was she correct? Explain your reasoning.

29. **WRITING IN MATH** Explain, using an example, how a 5% discount plus 5% sales tax on an item does *not* result in the original price of the item.

STANDARDS PRACTICE

30. Mr. Dempsey receives a 7% commission for every appliance he sells. If he sells a refrigerator for \$1,299, what is his commission?

A \$9.09 **C** \$92.93

B \$90.93 **D** \$909.30

31. Shirley purchased an antique dresser for \$350. She restored the dresser and sold it for a 50% profit. For how much did Shirley sell the dresser?

F \$175 **H** \$525

G \$367.50 **J** \$700

Spiral Review

32. **FOOTBALL** A quarterback completed 19 out of 30 attempts to pass the football. Estimate his percent of completion. (Lesson 5-5)

Compute mentally. (Lesson 5-4)

33. 20% of \$200

34. 62.5% of 96

35. 75% of 84

36. 6% of 150

GEOMETRY **Find the distance between each pair of points. Round to the nearest tenth, if necessary.** (Lesson 3-7)

37. $S(2, 3)$, $T(0, 6)$

38. $E(-1, 1)$, $F(3, -2)$

39. $W(4, -6)$, $V(-3, -5)$

40. **WEATHER** Ruben read that the low temperature for the day was expected to be −5°F and the high temperature was expected to be 8°F. What was the difference in the expected high and low temperatures? (Lesson 1-5)

ALGEBRA **Evaluate each expression if $f = -9$, $g = -6$, and $h = 8$.** (Lesson 1-2)

41. $-5fg$

42. $2gh$

43. $-10fh$

GET READY for the Next Lesson

PREREQUISITE SKILL **Evaluate each expression.** (Lesson 1-3)

44. $|17 - 24|$

45. $|340 - 253|$

46. $|531 - 487|$

47. $|352 - 581|$

5-8 Percent of Change

Main IDEA

Find and use the percent of increase or decrease.

Standard 7NS1.6 Calculate the percentage of increases and decreases of a quantity.

Standard 7NS1.7 Solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest.

NEW Vocabulary

percent of change
percent of increase
percent of decrease
markup
selling price
discount

GET READY for the Lesson

MONEY MATTERS Over the years, some prices increase. Study the change in gasoline prices from 1930 to 1960.

Price of a Gallon of Gasoline	
Year	Price (¢)
1930	10
1940	15
1950	20
1960	25

Source: Senior Living

1. How much did the price increase from 1930 to 1940?
2. Write the ratio $\frac{\text{amount of increase}}{\text{price in 1930}}$. Then write the ratio as a percent.
3. How much did the price increase from 1940 to 1950? Write the ratio $\frac{\text{amount of increase}}{\text{price in 1940}}$. Then write the ratio as a percent.
4. How much did the price increase from 1950 to 1960? Write the ratio $\frac{\text{amount of increase}}{\text{price in 1950}}$. Then write the ratio as a percent.
5. **MAKE A CONJECTURE** Why are the amounts of increase the same but the percents different?

The percent that an amount changes from its original amount is called the **percent of change**.

KEY CONCEPT — Percent of Change

Words A percent of change is a ratio that compares the change in quantity to the original amount.

Symbols $\text{percent of change} = \frac{\text{amount of change}}{\text{original amount}}$

To find the percent of change, do the following:

Step 1 Subtract to find the amount of change.

Step 2 Write the ratio $\frac{\text{amount of change}}{\text{original amount}}$ as a decimal.

Step 3 Write the decimal as a percent.

When the new amount is greater than the original, the percent of change is a **percent of increase**. When the new amount is less than the original, the percent of change is called a **percent of decrease**.

Real-World EXAMPLES Find Percent of Change

STUDY TIP

Percent of Change
When finding percent of change, always use the original amount as the whole.

1 **CLUBS** **The Science Club had 25 members. Now it has 30 members. Find the percent of change. State whether the change is an *increase* or *decrease*.**

Step 1 The amount of change is 30 − 25 or 5.

Step 2

$$\text{percent of change} = \frac{\text{amount of change}}{\text{original amount}}$$ Definition of percent of change

$$= \frac{5}{25}$$ The amount of change is 5. The original amount is 25.

$$= 0.2$$ Divide.

Step 3 The decimal 0.2 written as a percent is 20%. So, the percent of change is 20%.

Since the new number of members is greater than the original, it is a percent of increase.

Real-World Link
In 1940, the average comic book sold for $0.10, but today it is worth more than $700. That's a 6,999% increase in value!
Source: antiqueweb.com

2 **COMIC BOOKS** **Consuela had 20 comic books. She gave some to her friend. Now she has 13 comic books. Find the percent of change. State whether the percent of change is an *increase* or a *decrease*.**

Step 1 The amount of change is 20 − 13 or 7.

Step 2

$$\text{percent of change} = \frac{\text{amount of change}}{\text{original amount}}$$ Definition of percent of change

$$= \frac{7}{20}$$ The amount of change is 7. The original amount is 20.

$$= 0.35$$ Divide.

Step 3 The decimal 0.35 written as a percent is 35%. So, the percent of change is 35%.

The new amount is less than the original. It is a percent of decrease.

CHECK Your Progress

Find each percent of change. Round to the nearest tenth if necessary. State whether the percent of change is an *increase* or a *decrease*.

a. original: 6 hours
new: 10 hours

b. original: 80 water bottles
new: 55 water bottles

c. original: 15 meters
new: 6 meters

d. original: 1.25 hours
new: 3.5 hours

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A store sells an item for more than it paid for that item. The extra money is used to cover the expenses and to make a profit. The increase in the price is called the **markup**. The percent of markup is a percent of increase. The amount the customer pays is called the **selling price**.

EXAMPLE 3 Find the Selling Price

MARKETING **Shonny is selling some embroidered jackets on a Web site. She wants to price the jackets 25% over her cost, which is $35. Find the selling price for a jacket.**

STUDY TIP

Check for Reasonableness
To estimate the selling price, think 25% of 35 is about $\frac{1}{4}$ of 36 or 9. The selling price should be about $35 + $9, or $44.

METHOD 1 Find the amount of the markup first.

The whole is $35. The percent is 25. You need to find the amount of the markup, or the part. Let m represent the amount of the markup.

$$\underbrace{\text{part}}_{m} = \underbrace{\text{percent}}_{0.25} \cdot \underbrace{\text{whole}}_{35}$$

$m = 0.25 \cdot 35$ Write the percent equation.

$m = 8.75$ Multiply.

Add the markup $8.75 to Shonny's cost $35 to find the selling price.
$35 + $8.75 = $43.75

METHOD 2 Find the total percent first.

The customer will pay 100% of Shonny's cost plus an extra 25% of the cost. Find 100% + 25% or 125% of Shonny's cost. Let p represent the price.

$$\underbrace{\text{part}}_{p} = \underbrace{\text{percent}}_{1.25} \cdot \underbrace{\text{whole}}_{35}$$

$p = 1.25 \cdot 35$ Write the percent equation.

$p = 43.75$ Multiply.

The selling price of the jacket is $43.75.

CHOOSE Your Method

Find the selling price for each item given the percent of markup.

e. digital camera: $120, 55% markup

f. sunglasses: $7, 30% markup

g. **SHIPPING** Cheng-Yu ordered a book that cost $24 from an online store. Her total with the shipping charge was $27. What was the percent of markup charged for shipping?

The amount by which a regular price is reduced is called the **discount**. The percent of change is a percent of decrease.

MathOnline **Extra Examples at** ca.gr7math.com

Real-World Link
Snowboarding is one of the fastest growing sports with over 7.2 million participants.
Source: about.com

EXAMPLE Find the Sale Price

4 **SHOPPING** **The Sport Chalet is having a sale. A snowboard has an original price of $95. It is on sale for 35% off the original price. Find the sale price of the snowboard.**

METHOD 1 Find the amount of the discount first.

The percent is 35, and the whole is 95. We need to find the amount of the discount, or the part. Let d represent the amount of discount.

$\underbrace{\text{part}} = \underbrace{\text{percent}} \cdot \underbrace{\text{whole}}$

$d = 0.35 \cdot 95$ Write the percent equation.

$d = 33.25$ Multiply.

Subtract the amount of the discount from the original price to find the sale price. $95 − $33.25 = $61.75.

METHOD 2 Find the percent paid first.

If the amount of the discount is 35%, the percent paid is 100% − 35% or 65%. Find 65% of $95. Let s represent the sale price.

$\underbrace{\text{part}} = \underbrace{\text{percent}} \cdot \underbrace{\text{whole}}$

$s = 0.65 \cdot 95$ Write the percent equation.

$s = 61.75$ Multiply.

The sale price of the snowboard is $61.75.

CHOOSE Your Method

Find the sale price of each item to the nearest cent.

h. CD: $14.50, 10% off

i. sweater: $39.95, 25% off

CHECK Your Understanding

Examples 1–2 (p. 285) **Find each percent of change. Round to the nearest tenth if necessary. State whether the percent of change is an *increase* or a *decrease*.**

1. original: $40
   new: $32
2. original: 25 CDs
   new: 32 CDs
3. original: 325 miles
   new: 400 miles

Example 3 (p. 286) **Find the selling price for each item given the percent of markup.**

4. roller blades: $60, 35% markup
5. coat: $87, 33% markup

Example 4 (p. 287)

6. **BICYCLES** Find the sale price of a bicycle that is regularly $140 and is on sale for 40% off the original price.

Exercises

HOMEWORK HELP

For Exercises	See Examples
7–14	1, 2
15–18	3
19–22	4

Find each percent of change. Round to the nearest tenth if necessary. State whether the percent of change is an *increase* or a *decrease*.

7. original: 6 tickets
   new: 9 tickets
8. original: 27 guests
   new: 39 guests
9. original: $80
   new: $64
10. original: $560
    new: $420
11. original: 68°F
    new: 51°F
12. original: 150 e-mails
    new: 98 e-mails

13. **TELEVISION** On Tuesday night, 17.8 million households watched a popular television show. On Wednesday night, 16.6 million households watched the same show. Find the percent of decrease in the number of households watching the show from Tuesday to Wednesday.

14. **STOCK** Patrice invested $300 into a particular stock. The amount doubled within a few weeks. Find the percent of increase.

Find the selling price for each item given the cost to the store and the markup.

15. computer: $700, 30% markup
16. CD player: $120, 20% markup
17. jeans: $25, 45% markup
18. baseball cap: $12, 48% markup

Find the sale price of each item to the nearest cent.

19. video game: $75, 25% off
20. trampoline: $399, 15% off
21. skateboard: $119.95, 30% off
22. earrings: $19.50, 35% off

23. **INTERNET** An Internet service provider offers connection speed that is 35% faster than dial-up. If it takes Brad 8 seconds to connect to the Internet using dial-up, how long would it take using this provider?

24. **ANIMALS** At birth, a giraffe was 62 inches tall and grew at the highly unusual rate of 0.5 inch per hour. By what percent did the height of the giraffe increase in the first 24 hours?

25. **FIND THE DATA** Refer to the California Data File on pages 16–19. Choose some data and write a real-world problem in which you would need to find the percent of change.

26. **BUSINESS** The table gives the price of milk for various years. During which ten-year period did the price of milk have the greatest percent of increase?

Price of a Gallon of Milk	
Year	Price ($)
1970	1.23
1980	1.60
1990	2.15
2000	2.78

Source: Senior Living

27. **ALGEBRA** Students receive a 20% discount off the price of an adult ticket at the theater. If a student ticket is $6.80, find the price of an adult ticket. (*Hint*: Let p represent the part and $p + 6.80$ represent the whole.)

EXTRA PRACTICE

See pages 690, 712.

Math Online

Self-Check Quiz at ca.gr7math.com

H.O.T. Problems

28. **CHALLENGE** Blake bought a computer listed for $\$x$ at a 15% discount. He also paid a 5% sales tax. After 6 months, he decided to sell the computer for $\$y$, which was 55% of what he paid originally. Express y in terms of x.

29. **FIND THE ERROR** Jared and Sidney are solving the following problem: *The price of a school play ticket rose from \$5.75 to \$6.25. What is the percent of increase for the price of a ticket?* Who is correct? Explain your reasoning.

Jared

$$\text{percent of change} = \frac{0.50}{5.75} = 0.087 \text{ or } 8.7\%$$

$$\text{percent of change} = \frac{0.50}{6.25} = 0.08 \text{ or } 8\%$$

Sidney

30. **WRITING IN MATH** Write and solve a real-world problem involving a 25% increase or decrease in some quantity.

STANDARDS PRACTICE

31. A television originally cost \$1,250. Samuel bought it at 30% off. How much was deducted from the original amount?

A \$875

B \$675

C \$425

D \$375

32. Grace and her two brothers shared the cost of a new video game system equally. The original price of the system was \$179. They received a 15% discount off the original price and paid 7.5% sales tax on the discounted price. Find the approximate amount that each paid for the video game system.

F \$51

G \$55

H \$60

J \$66

Spiral Review

33. **TAXES** An average of 40% of the cost of gasoline goes to state and federal taxes. If gasoline sells for \$2.15 per gallon, how much goes to taxes? (Lesson 5-7)

Estimate. (Lesson 5-6)

34. 21% of 60

35. 25% of 83

36. 12% of 31

37. 34% of 95

Express each rate as a unit rate. (Lesson 4-1)

38. \$36 in 3 hours

39. 1.5 inches of rain in 5 months

GET READY for the Next Lesson

PREREQUISITE SKILL **Solve each equation.** (Lesson 2-7)

40. $45 = 300 \cdot a \cdot 3$

41. $24 = 200 \cdot 0.04 \cdot y$

42. $21 = 60 \cdot m \cdot 5$

5-9 Simple Interest

Main IDEA

Solve problems involving simple interest.

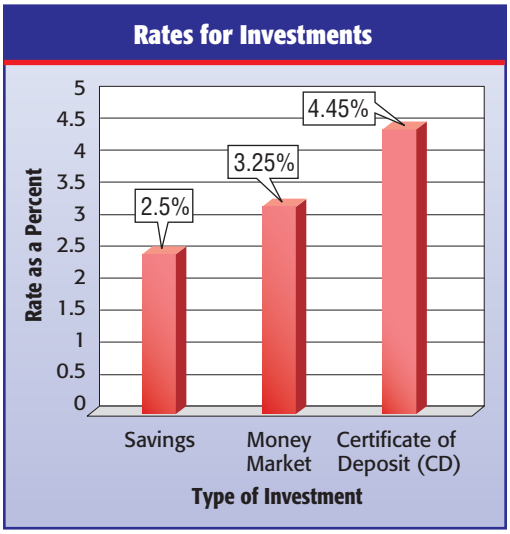
Standard 7NS1.7 Solve problems that involve discounts, markups, commissions, and profit and **compute simple** and compound **interest.**

NEW Vocabulary

interest
principal

GET READY for the Lesson

COLLEGE SAVINGS
Hector received $1,000 from his grandparents. He plans to save it for college expenses. The graph shows rates for various investments for one year.



1. If Hector puts his money in a savings account, he will receive 2.5% of $1,000 in interest for one year. Find the interest Hector will receive.
2. Compare the interest Hector can receive in one year from a money market and from a certificate of deposit.

Interest is the amount of money paid or earned for the use of money. For a savings account, you earn interest from the bank. For a credit card, you pay interest to the bank. To solve problems involving simple interest, use the following formula.

Interest is the amount of money paid or earned. — The annual interest rate is expressed as a decimal.

$$I = prt$$

The **principal** is the amount of money invested or borrowed. — The time is written in years.

EXAMPLE 1 Find Simple Interest

Find the simple interest for $500 invested at 6.25% for 3 years.

$I = prt$ Write the simple interest formula.

$I = 500 \cdot 0.0625 \cdot 3$ Replace p with 500, r with 0.0625, and t with 3.

$I = 93.75$ The simple interest is $93.75.

STUDY TIP
Reading Math
$I = prt$ is read *interest equals principal times rate times time.*

CHECK Your Progress **Find the simple interest to the nearest cent.**

a. $400 at 3.67% for 2 years

b. $770 at 16% for 6 months

STANDARDS EXAMPLE Find the Total Amount

2 What is the total amount of money in dollars in an account where $95 is invested at a simple interest rate of 7.5% for 8 months?

A $152.50 **B** $152 **C** $142.50 **D** $99.75

Test-Taking Tip

Converting Units
When using the formula $I = prt$, remember that time is in years. Eight months is $\frac{8}{12}$ or $\frac{2}{3}$ year.

Read the Item
You need to find the total amount in an account.

Solve the Item

$I = prt$ Simple interest formula

$I = 95 \cdot 0.075 \cdot \frac{2}{3}$ $p = 95$, $r = 0.075$, $t = \frac{2}{3}$

$I = 4.75$ Simplify.

The amount in the account is 95 + 4.75 or $99.75.
The answer is D.

CHECK Your Progress

c. What is the total amount of money owed on a credit card with a balance of $1,500 at a simple interest rate of 22% after 1 month?

F $1,502.75 **G** $1,527.50 **H** $1,533 **J** $1,830

Personal Tutor

Online **Personal Tutor at** ca.gr7math.com

Real-World EXAMPLE Find the Interest Rate

3 **CAR SALES** **Tonya borrowed $3,600 to buy a used car. She will be paying $131.50 each month for the next 36 months. Find the simple interest rate for her loan.**

Use the formula $I = prt$. First find the total that Tonya will pay.

$$\$131.50 \cdot 36 = \$4{,}734$$

She will pay $4,734 − $3,600 or $1,134 in interest. So, $I = 1{,}134$.

The principal is $3,600. So, $p = 3{,}600$.

The loan will be for 36 months or 3 years. So, $t = 3$.

$I = prt$ Write the simple interest formula.

$1{,}134 = 3{,}600 \cdot r \cdot 3$ Replace I with 1,134, p with 3,600, and t with 3.

$1{,}134 = 10{,}800r$ Simplify.

$\frac{1{,}134}{10{,}800} = \frac{10{,}800r}{10{,}800}$ Divide each side by 10,800.

$0.105 = r$ The simple interest rate is 0.105 or 10.5%.

Real-World Career . . .
How Does a Car Salesperson Use Math?
A car salesperson must calculate the price of a car including any discounts, dealer preparation cost, and state taxes. They may also help customers by determining the amount of their car payments.

MathOnline
For more information, go to ca.gr7math.com

CHECK Your Progress

d. **SAVINGS BOND** Louie purchased a $200 savings bond. After 5 years, it is worth $232.50. Find the simple interest rate for his bond.

Aaron Haupt

CHECK Your Understanding

Example 1 (p. 290)

Find the simple interest to the nearest cent.

1. $300 at 7.5% for 5 years
2. $230 at 12% for 8 months

Example 2 (p. 291)

Find the total amount in each account to the nearest cent.

3. $660 at 5.25% for 2 years
4. $385 at 12.6% for 9 months
5. **STANDARDS PRACTICE** Nina invested $100 in a savings account for 4 years. Find the total amount in her account if it earns a simple interest of 2.75%.

   A $109 **B** $110 **C** $111 **D** $112

Example 3 (p. 291)

6. **LOANS** Jose's brother paid off his $5,000 student loan in $1\frac{1}{2}$ years. If he paid a total of $5,225, what was the simple interest rate for the loan?

Exercises

HOMEWORK HELP

For Exercises	See Examples
7–10	1
11–14	2
15, 16	3

Find the simple interest to the nearest cent.

7. $250 at 6% for 3 years
8. $725 at 4.5% for 4 years
9. $834 at 7.25% for 2 months
10. $3,070 at 8.65% for 24 months

Find the total amount in each account to the nearest cent.

11. $2,250 at 5% for 3 years
12. $5,060 at 7.2% for 5 years
13. $575 at 4.25% for 6 months
14. $950 at 7.85% for 10 months
15. **INVESTMENTS** Over the summer, Booker earned $1,200, which he invested in stocks that increased in value to $1,335 in only 9 months. Find the simple interest rate for the investment.
16. **HOUSING** The prices of a ranch in Levittown, New York, are given at the right. Determine the simple interest rate for the investment of a ranch in Levittown from 1947 to 2007.

Year	Price ($)
1947	9,500
2007	280,000

17. **CARS** Felicia took out a 5-year loan for $15,000 to buy a car. If the simple interest rate was 11%, how much total will she pay including interest?

Find the simple interest to the nearest cent.

18. $1,000 at $7\frac{1}{2}$% for 30 months
19. $5,200 at $13\frac{1}{5}$% for $1\frac{1}{2}$ years
20. **CREDIT CARDS** The balance on a credit card was $500. Mr. Cook paid the minimum monthly payment of $25. The remaining balance was charged a simple interest rate of 18%. If no additional purchases were made, what was the balance the next month?
21. **HOUSING** The Turners need to borrow $100,000 to purchase a home. The credit union is offering a 30-year mortgage loan at 5.38% interest while the community bank has a 25-year mortgage loan at 6.12% interest. Assuming simple interest, which loan will result in less total interest?

EXTRA PRACTICE

See pages 691, 712.

Math Online

Self-Check Quiz at ca.gr7math.com

H.O.T. Problems

22. **CHALLENGE** What will be the monthly payments on a loan of $25,000 at 9% interest so that it will be paid off in 15 years? How much will the total interest be?

23. **OPEN ENDED** Give a principal and interest rate where the amount of simple interest earned in two years would be $50. Justify your answer.

24. **WRITING IN MATH** Explain what each variable in the simple interest formula represents.

STANDARDS PRACTICE

25. Mr. and Mrs. Owens placed $1,500 in a college savings account with a simple interest rate of 4% when Lauren was born. How much will be in the account in 18 years when Lauren is ready to go to college? Assume no more deposits or withdrawals were made.

A $1,080

B $2,580

C $10,800

D $12,300

26. Dave borrowed $4,000 at 9% simple interest for one year. He made no payments during that year. How much interest is owed at the end of the year?

F $90

G $180

H $270

J $360

Spiral Review

27. **SALES** What is the sale price of a $200 cell phone on sale at 10% off the regular price? (Lesson 5-8)

Solve each problem using a percent equation. (Lesson 5-7)

28. What percent of 70 is 17.5?

29. 18 is 30% of what number?

30. **HEALTH** Shashawn's heart beats 18 times in 15 seconds. Write and solve a proportion to determine how many times her heart beats in 1 minute or 60 seconds. (Lesson 4-3)

31. Express 0.000084 in scientific notation. (Lesson 2-10)

Cross-Curricular Project

Math and Art

It's a Masterpiece It's time to complete your project. Use the information and data you have gathered about your artist and the Golden Ratio to prepare a Web page or poster. Be sure to include your reports and calculations with your project.

MathOnline **Cross-Curricular Project at** ca.gr7math.com

Extend 5-9

Spreadsheet Lab
Compound Interest

Main IDEA

Find compound interest.

Standard 7NS1.7 **Solve problems that** involve discounts, markups, commissions, and profit and **compute** simple and **compound interest.** **Standard 7MR2.2** Apply strategies and results from simpler problems to more complex problems.

NEW Vocabulary

compound interest

Simple interest, which you studied in Lesson 5-9, is paid only on the initial principal of a savings account or a loan. **Compound interest** is paid on the initial principal and on interest earned in the past. You can use a spreadsheet to investigate the growth of compound interest.

ACTIVITY

SAVINGS **Find the value of a $2,000 savings account after four years if the account pays 8% interest compounded semiannually.**

8% interest compounded semiannually means that the interest is paid twice a year. The interest rate is 8% ÷ 2 or 4% for each 6 months.

The interest rate is entered as a decimal.

The spreadsheet evaluates the formula A4 × B1.

The interest is added to the principal every 6 months. The spreadsheet evaluates the formula A4 + B4.

Compound Interest.xls

	A	B	C	D
1	Rate	0.04		
2				
3	Principal	Interest	New Principal	Time (YR)
4	$2000.00	$80.00	$2080.00	0.5
5	$2080.00	$83.20	$2163.20	1
6	$2163.20	$86.53	$2249.73	1.5
7	$2249.73	$89.99	$2339.72	2
8	$2339.72	$93.59	$2433.31	2.5
9	$2433.31	$97.33	$2530.64	3
10	$2530.64	$101.23	$2631.86	3.5
11	$2631.86	$105.27	$2737.14	4
12	$2737.14	$109.49	$2846.62	4.5
13	$2846.62	$113.86	$2960.49	5
14	$2960.49	$118.42	$3078.91	5.5
15	$3078.91	$123.16	$3202.06	6

Sheet 1 Sheet 2 Sheet 3

The value of the savings account after four years is $2,737.14.

EXERCISES

1. Use a spreadsheet to find the value of a savings account if $2,000 is invested for four years at 8% interest compounded quarterly.
2. Suppose you leave $1,000 in each of three bank accounts paying 6% interest per year. One account pays simple interest, one pays interest compounded semiannually, and one pays interest compounded quarterly. Use a spreadsheet to find the amount of money in each account after three years.
3. **MAKE A CONJECTURE** How does the amount of interest change if the compounding occurs more frequently? Explain your reasoning.

CHAPTER 5

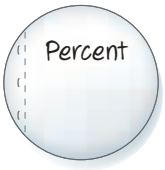
Study Guide and Review

Download Vocabulary Review from ca.gr7math.com

FOLDABLES Study Organizer

GET READY to Study

Be sure the following Key Concepts are noted in your Foldable.



Key Concepts

Percent (Lessons 5-1 and 5-2)

- A percent is a ratio that compares a number to 100.
- To write a percent as a decimal, divide by 100 and remove the percent symbol.
- To write a decimal as a percent, multiply by 100 and add the percent symbol.

Percent Proportion (Lesson 5-3)

- A percent proportion is $\frac{\text{part}}{\text{whole}} = \text{percent}$, where the percent is written as a fraction.

Percent–Fraction Equivalents			
$25\% = \frac{1}{4}$	$50\% = \frac{1}{2}$	$75\% = \frac{3}{4}$	$100\% = 1$
$20\% = \frac{1}{5}$	$40\% = \frac{2}{5}$	$60\% = \frac{3}{5}$	$80\% = \frac{4}{5}$
$16\frac{2}{3}\% = \frac{1}{6}$	$33\frac{1}{3}\% = \frac{1}{3}$	$66\frac{2}{3}\% = \frac{2}{3}$	$83\frac{1}{3}\% = \frac{5}{6}$
$12\frac{1}{2}\% = \frac{1}{8}$	$37\frac{1}{2}\% = \frac{3}{8}$	$62\frac{1}{2}\% = \frac{5}{8}$	$87\frac{1}{2}\% = \frac{7}{8}$
$10\% = \frac{1}{10}$	$30\% = \frac{3}{10}$	$70\% = \frac{7}{10}$	$90\% = \frac{9}{10}$

Percent Equation (Lesson 5-7)

- A percent equation is part = percent · whole, where the percent is written as a decimal.

Percent of Change (Lesson 5-8)

- A percent of change is a ratio that compares the change in quantity to the original amount.

Key Vocabulary

- compatible numbers (p. 275)
- compound interest (p. 294)
- discount (p. 286)
- interest (p. 290)
- markup (p. 286)
- percent (p. 252)
- percent of change (p. 284)
- percent of decrease (p. 285)
- percent equation (p. 279)
- percent of increase (p. 285)
- percent proportion (p. 263)
- principal (p. 290)
- selling price (p. 286)

Vocabulary Check

Choose the correct term or numbers to complete each sentence.

1. A (proportion, percent) is a ratio that compares a number to 100.
2. (Percents, Compatible numbers) are numbers that are easy to divide mentally.
3. A (markup, discount) is an increase in price.
4. 25% of 16 is (4, 40).
5. The (interest, principal) is the amount borrowed.
6. In the proportion $\frac{6}{5} = \frac{120}{100}$, the (part, whole) is 6.
7. A (markup, discount) is a decrease in price.
8. The interest formula is ($I = prt$, $p = Irt$).
9. The number 0.015 written as a percent is (0.15%, 1.5%).
10. The (interest, principal) is the money paid for the use of money.

CHAPTER 5

Study Guide and Review

Lesson-by-Lesson Review

5-1 Ratios and Percents (pp. 252–255)

Write each ratio or fraction as a percent.

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

12. 16.5 out of 100

13. **WEATHER** There is a 1 in 5 chance of rain tomorrow. Write this as a percent.

Write each percent as a fraction in simplest form.

14. 90%

15. 120%

Example 1 Write $\frac{1}{4}$ as a percent.

$\frac{1}{4} = \frac{25}{100}$ (× 25 above and below) So, $\frac{1}{4} = 25\%$.

Example 2 Write 35% as a fraction in simplest form.

$35\% = \frac{35}{100}$ or $\frac{7}{20}$

5-2 Comparing Fractions, Decimals, and Percents (pp. 256–261)

Write each percent as a decimal.

16. 4.3%

17. 147%

18. 0.7%

Write each decimal as a percent.

19. 0.7

20. 0.015

21. 2.55

Write each fraction as a percent.

22. $\frac{3}{40}$

23. $\frac{24}{25}$

24. $\frac{1}{6}$

25. **CELL PHONES** Adam used $\frac{7}{8}$ of his total monthly minutes while Andrea used 88%. Which friend used the greater part of his or her minutes?

Example 3 Write 24% as a decimal.

$24\% = 24\%$ Divide by 100 and remove the percent symbol.
$= 0.24$

Example 4 Write 0.04 as a percent.

$0.04 = 0.04$ Multiply by 100 and add the percent symbol.
$= 4\%$

Example 5 Write $\frac{9}{25}$ as a percent.

$\frac{9}{25} = 0.36$ Write as a decimal.
$= 36\%$ Change the decimal to percent.

5-3 Algebra: The Percent Proportion (pp. 263–267)

Write a percent proportion and solve each problem. Round to the nearest tenth if necessary.

26. 15 is 30% of what number?

27. Find 45% of 18.

28. 75 is what percent of 250?

29. **SCHOOL** A band charges $3,000 and requires a 20% deposit to play at a school. How much money does the school need for the deposit?

Example 6 18 is what percent of 27?

The whole is 27, and the part is 18. Let n represent the percent.

$\frac{18}{27} = \frac{n}{100}$ Percent proportion
$18 \cdot 100 = 27 \cdot n$ Find the cross products.
$1{,}800 = 27n$ Multiply.
$\frac{1{,}800}{27} = \frac{27n}{27}$ Divide each side by 27.
$66.7 \approx n$ Simplify.

So, 18 is 66.7% of 27.

Mixed Problem Solving
For mixed problem-solving practice, see page 712.

5-4 Finding Percents Mentally (pp. 268–271)

Compute mentally.

30. 90% of 100
31. 10% of 18.3
32. $66\frac{2}{3}$% of 24
33. 6% of 200

34. **ANIMALS** Compute mentally the number of hours a day a Koala bear sleeps if it spends $83\frac{1}{3}$% of a day asleep.

Example 7 **Compute 50% of 42 mentally.**

50% of 42 = $\frac{1}{2}$ of 42 or 21 $\quad 50\% = \frac{1}{2}$

5-5 PSI: Reasonable Answers (pp. 272–273)

Determine a reasonable answer.

35. **ECOLOGY** In a survey of 1,413 consumers, 6% said they would be willing to pay more for recycled products in order to protect the environment. Is 8.4, 84, or 841 a reasonable estimate for the number of consumers willing to pay more? Explain.

36. **PIZZA** Twelve friends share three large pizzas. If they split the cost evenly among themselves, and each pizza cost $11.95, will each person pay about $2, $3, or $4? Explain.

Example 8 **Philip's flight departed at 9:10 A.M. and arrived at 3:15 P.M., Eastern Standard Time. While in flight, Philip checked his watch and estimated that he had completed about 63% of the trip. Is 11 A.M., 12 P.M., or 1 P.M. a reasonable estimate for the time that Philip checked his watch?**

The total duration of the trip is 365 minutes, or 6 hours and 5 minutes. One half, or 50%, of the trip would be 3 hours and $2\frac{1}{2}$ minutes after departure, or about 12:12 P.M. Since 63% is greater than 50%, 1 P.M. is the only reasonable answer.

5-6 Percent and Estimation (pp. 275–278)

Estimate.

37. 67% of 60
38. 41% of 39

Estimate each percent.

39. 33 out of 98
40. 19 out of 52

41. **MEASUREMENT** The average temperature of Earth is about 8% of Venus' average temperature of 850°F. Estimate Earth's average temperature.

Example 9 **Estimate 8% of 104.**

104 is about 100.
8% of 100 is 8.
So, 8% of 104 is about 8.

CHAPTER 5

Study Guide and Review

5-7 Algebra: The Percent Equation (pp. 279–283)

Solve each problem using the percent equation.

42. What is 66% of 7,000?
43. Find 15% of 82.
44. 25 is what percent of 125?
45. **MOVIES** India produces an average of 1,000 movies each year. The United States averages 63.3% of this amount. On average, how many movies are produced in the United States yearly?

Example 10 **70 is 25% of what number?**

The part is 70, and the percent is 25. You need to find the whole. Let n represent the whole.

$70 = 0.25n$ Write the percent equation.

$\frac{70}{0.25} = \frac{0.25n}{0.25}$ Divide each side by 0.25.

$280 = n$ Simplify.

So, 70 is 25% of 280.

5-8 Percent of Change (pp. 284–289)

Find each percent of change. Round to the nearest tenth if necessary. State whether the percent of change is an *increase* or a *decrease*.

46. original: 10
    new: 15
47. original: 8
    new: 10
48. original: 37.5
    new: 30
49. original: 18
    new: 12
50. **HOBBIES** Mariah collects comic books. Last year she had 50 comic books. If she now has 74 comic books, what is the percent of increase?

Example 11 **Find the percent of change if the original amount is 900 and the new amount is 725. Round to the nearest tenth.**

The amount of change is 900 − 725 or 175.

$$\text{percent of change} = \frac{\text{amount of change}}{\text{original amount}} = \frac{175}{900} \approx 0.194 \text{ or } 19.4\%$$

5-9 Simple Interest (pp. 290–293)

Find the simple interest to the nearest cent.

51. \$100 at 8.5% for 2 years
52. \$350 at 5% for 3 years
53. \$260 at 17.5% for 18 months
54. **RETIREMENT** At age 20, Mark invested \$500 into a retirement account with a simple interest rate of 6.5%. He makes no more deposits or withdrawals. Find the account value at age 65.

Example 12 **Find the simple interest for \$250 invested at 5.5% for 2 years.**

$I = prt$ Simple interest formula

$I = 250 \cdot 0.055 \cdot 2$ Write 5.5% as 0.055.

$I = 27.50$ Simplify.

The simple interest is \$27.50.

CHAPTER 5

Practice Test

Write each ratio or fraction as a decimal and as a percent.

1. 74 per 100
2. 3:50
3. $\frac{4}{22}$

4. **FIELD TRIPS** Seventeen students brought their permission slips to go to the zoo. If there are 18 students in the class, what percent of the class brought their permission slip? Round to the nearest tenth.

Express each percent as a decimal.

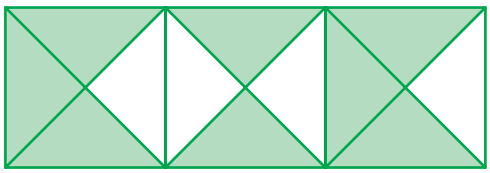
5. 135%
6. 14.6%
7. 0.97%

8. Order the set of numbers 38%, $\frac{3}{8}$, and 0.038 from least to greatest.

Compute mentally.

9. 30% of 60
10. 1% of 99
11. $33\frac{1}{3}$% of 90
12. $62\frac{1}{2}$% of 48

13. **STANDARDS PRACTICE** The figure below shows 8 shaded isosceles triangles formed by the diagonals of three adjacent squares.



If the total area of the figure is 12 square feet, which statement is true?

A The shaded area is more than 75% of the area of the figure.
B The unshaded area is $\frac{2}{3}$ of the area of the figure.
C The shaded area is 6 square feet.
D The unshaded area is 4 square feet.

Estimate.

14. 23% of 16
15. 9% of 81

16. **TAXES** Sandra estimated that about 35% of her $420 paycheck was deducted for taxes and insurance. Did about $100, $150, or $200 get deducted from her pay?

Write a percent proportion and solve each problem. Round to the nearest tenth.

17. What is 2% of 3,600?
18. 62 is 90% of what number?

Solve using the percent equation.

19. Find 45% of 600.
20. 75 is what percent of 30?

21. **MEDICINE** About 37% of the people in the United States have type O^+ blood. If there are 250 million people in the United States, how many have type O^+ blood?

Find each percent of change and state whether it is an *increase* or *decrease*. Round to the nearest tenth if necessary.

22. original: $15
new: $12
23. original: 40 cars
new: 55 cars

24. **BUSINESS** A sporting goods store prices items at a 30% markup rate. If the store purchases a tennis racket for $165, find the selling price of the racket.

25. **STANDARDS PRACTICE** Kevin invested $125 into a savings account that earns 5.2% simple interest annually. If he does not deposit or withdraw any money for 18 months, which statement is *not* supported by this information?

F The interest earned will be $117.
G The interest earned will be $9.75.
H The total amount will be $134.75.
J The interest earned in this time will be greater than 5.2% of the principal.

CHAPTER 5

California Standards Practice

Cumulative, Chapters 1–5

Read each question. Then fill in the correct answer on the answer document provided by your teacher or on a sheet of paper.

1 If a pair of inline skates is on sale for 35% off the regular price of $120, what is the sale price of the skates?

A $48

B $78

C $94

D $140

2 Alan is buying a television that is regularly priced at $149.99. It is on sale for $\frac{1}{5}$ off the original price. Which expression can he use to estimate the discount on the television?

F $0.02 \times \$150$

G $0.05 \times \$150$

H $0.2 \times \$150$

J $0.5 \times \$150$

3 Andrew purchased a coat for $67.20 that regularly sells for $84.00. What was the percent discount that Andrew received?

A 16.8%

B 20%

C 25%

D 80%

TEST-TAKING TIP

Question 3 To find the percent of discount, you can use the proportion $\frac{\text{percent discount}}{100\%} = \frac{\text{amount of discount}}{\text{regular price}}$.

4 Find $-17 - (5)$.

F -22

G -12

H 22

J 85

5 Jeanne's grandfather gave her money for her birthday. She bought 4 CDs at $12.99 each and a sweater for $25.99. Then she spent $2.70 on an ice cream cone. She had $4.35 left over. Which expression can be used to find how much money Jeanne received from her grandfather?

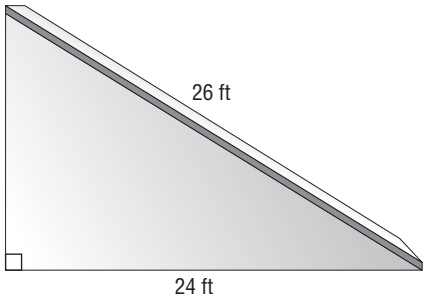
A $4(12.99 + 25.99 + 2.70 + 4.35)$

B $12.99 + 25.99 + 2.70 + 4.35$

C $4(12.99) + 25.99 + 2.70 + 4.35$

D $4(12.99) + 4(25.99) + 4(2.70) + 4(4.35)$

6 Find the height, in feet, of the skateboarding ramp shown below.



F 10 ft

G 22 ft

H 25 ft

J 34 ft

7 Rosa can read about 21 pages in about 20 minutes. If she continues to read at this rate, about how many pages can she read in 4 hours?

A 220

B 230

C 240

D 250

8 Eliza purchased a dress off the clearance rack. The original cost for the dress was $35. The dress had been marked down 50%, but the sign on the rack said to take an additional 20% off the discounted price. What was the final sale price Eliza paid for the dress?

F $3.50

G $10.50

H $14.00

J $17.50

9 Adrian swam 75 meters in 45 seconds, and Carlos swam 125 meters in 75 seconds. Based on these rates, which statement is true?

A Adrian's average speed was 2 meters per second faster than Carlos' average speed.

B Carlos' average speed was equal to Adrian's average speed.

C Carlos' average speed was 2 meters per second faster than Adrian's average speed.

D Adrian's average speed was 3 meters per second faster than Carlos' average speed.

10 In 2003, a new planet was discovered beyond Pluto. This new planet is 10^{10} miles from the sun. Which of the following represents this number in standard notation?

F 10,000,000,000 mi

G 10,000,000 mi

H 10,000 mi

J 100 mi

11 Martin and his sister agreed to split the cost of a new board game. They received a 25% discount on the board game and paid 5.5% sales tax on the discounted price. If the original price of the board game was $30, how much did Martin and his sister each put toward the cost of the board game?

A $20.57

B $11.87

C $10.29

D $9.77

12 The widths of a race track are shown below. What is the percent of increase in the track width from the straightaway to the turn?

Part of Track	Width (feet)
straightaway	50
turn	60

F 8.3%

G 10%

H 16.7%

J 20%

13 If $m = 7$ and $n = 4$, then $3(2m - 3n) =$

A 2

B 6

C 12

D 30

Pre-AP

Record your answers on a sheet of paper. Show your work.

14 The Dow Jones Average is used to measure changes in stock values on the New York Stock Exchange. Three major drops in the Dow Jones Average for one day are listed in the table.

Date	Opening	Closing
10-29-1929	261.07	230.07
10-19-1987	2246.74	1738.74
9-17-2001	9605.51	8920.70

a. Which day had the greatest decrease in amount?

b. Did this decrease represent the biggest percent of decrease of the three drops? Explain your reasoning.

NEED EXTRA HELP?														
If You Missed Question...	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Go to Lesson...	5-8	5-6	5-3	1-5	1-2	3-5	4-1	5-8	4-1	2-10	5-8	5-8	1-2	5-8
For Help with Standard...	NS1.7	NS1.3	NS1.7	NS1.2	AF1.1	MG3.3	AF4.2	NS1.7	AF4.2	NS1.1	NS1.7	NS1.6	AF1.2	NS1.6