

5-1

Ratios and Percents (pages 206–209)

<p>Writing a Fraction or Ratio as a Percent</p>	<p>A percent is a ratio that compares a number to 100.</p> <p>As a ratio: 4 out of 5</p> <p>As a fraction with a denominator of 100: $\frac{80}{100}$</p> <p>As a percent: 80%</p>
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EXAMPLES

- A** Write 7 students out of 10 as a percent.

Write the rate as a fraction. $\frac{7}{10}$

Multiply numerator and denominator by 10 to rename as a fraction with a denominator of

100. $\frac{70}{100}$

“Percent” means “per 100” so $\frac{70}{100}$ is 70%.

- B** Write 45% as a fraction in simplest form.

% means $\frac{\quad}{100}$.

45% is $\frac{45}{100}$.

The GCF of 45 and 100 is 5.

45% is $\frac{9}{20}$.

Try These Together

1. Write 3 out of 5 as a percent.

HINT: Write as a fraction. Then multiply numerator and denominator by the same number to rewrite as a number divided by 100.

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

HINT: Multiply numerator and denominator by the same number to rewrite as a number divided by 100.

PRACTICE

Write each ratio or fraction as a percent.

3. 3:10

4. 18:100

5. 3 out of 4

6. $\frac{8}{10}$

Write each ratio as a percent.

7. Twelve out of 20 students are involved in after-school activities.

8. One out of 10 instruments in the band is a flute.

Write each percent as a fraction in simplest form.

9. 20%

10. 35%

11. 50%

12. 40%

13. 85%

14. 25%

15. 8%

16. 38%



- 17. Standardized Test Practice** Jamal surveyed the students in his class. He found that 2 out of 5 of them read books other than school books for pleasure. What is this ratio expressed as a percent?

A 15%

B 50%

C 40%

D 80%

<p>Answers: 1. 60% 2. 25% 3. 30% 4. 18% 5. 75% 6. 80% 7. 60% 8. 10% 9. $\frac{5}{1}$ 10. $\frac{20}{7}$ 11. $\frac{2}{1}$ 12. $\frac{5}{2}$ 13. $\frac{20}{17}$ 14. $\frac{4}{1}$ 15. $\frac{25}{2}$ 16. $\frac{50}{19}$ 17. C</p>
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5-2

Fractions, Decimals, and Percents (pages 210–214)

The word *percent* also means *hundredths* or *per hundred* or *divided by 100*.

Decimals and Percents	<ul style="list-style-type: none"> • To write a percent as a decimal, divide by 100 and remove the % symbol. • To write a decimal as a percent, multiply by 100 and add the % symbol.
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EXAMPLES

A Write 47% as a decimal.

47% means $\frac{47}{100}$ or 0.47.

B Write $\frac{3}{16}$ as a percent.

$$\frac{3}{16} = \frac{n}{100} \quad \text{Write a proportion.}$$

$$300 = 16n \quad \text{Find the cross products.}$$

$$\frac{300}{16} = \frac{16n}{16} \quad \text{Divide each side by 16.}$$

$$18.75 = n$$

$$\frac{3}{16} = \frac{18.75}{100} \text{ or } 18.75\%$$

Try These Together

1. Write 27% as a decimal.

HINT: Divide by 100.

2. Write 6% as a decimal.

HINT: Divide by 100.

PRACTICE

Write each percent as a decimal.

3. 63% 4. 40% 5. 79% 6. 16%

Write each decimal as a percent.

7. 0.12 8. 0.84 9. 0.65 10. 0.04

Write each fraction as a percent.

11. $\frac{1}{5}$ 12. $\frac{7}{10}$ 13. $\frac{29}{50}$ 14. $\frac{21}{100}$

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

15. 58% ● 0.58 16. 8.9 ● 89% 17. 0.04 ● 40% 18. 14% ● 1.4

19. **Population** In 1997, about 3 out of 25 people in the world lived in Africa. Express this ratio as a percent.



20. **Standardized Test Practice** Jaryn and Blake decorated for a school party. They used the colors yellow and blue. Three out of 5 balloons were blue. What percent is this?

- A** 30% **B** 15% **C** 60% **D** 45%

Answers: 1. 0.27 2. 0.06 3. 0.63 4. 0.4 5. 0.79 6. 0.16 7. 12% 8. 84% 9. 65% 10. 4% 11. 20% 12. 70% 13. 58% 14. 21% 15. = 16. < 17. < 18. > 19. 12% 20. C

5-3

The Percent Proportion (pages 216–219)

In a **percent proportion**, one of the numbers, called the **part**, is being compared to the whole quantity, called the **base**. The other ratio is the percent, written as a fraction, whose base is 100.

Percent Proportion	Words	$\frac{\text{part}}{\text{base}} = \frac{\text{percent}}{100}$
	Symbols	Arithmetic $\frac{2}{5} = \frac{40}{100}$ Algebra $\frac{a}{b} = \frac{p}{100}$, where a is the part, b is the base, and p is the percent.

EXAMPLES

A Find 15% of 78.

$$\frac{a}{78} = \frac{15}{100} \quad b = 78, p = 15$$

$$100a = 78(15) \quad \text{Find the cross products.}$$

$$100a = 1170$$

$$a = 11.7 \quad \text{Divide each side by 100.}$$

15% of 78 is 11.7.

B 30 is 60% of what number?

$$\frac{30}{b} = \frac{60}{100} \quad a = 30, p = 60$$

$$30(100) = b(60) \quad \text{Find the cross products.}$$

$$3,000 = 60b$$

$$50 = b \quad \text{Divide each side by 60.}$$

30 is 60% of 50.

Try These Together

1. Express $\frac{2}{5}$ as a percent. 2. Write a percent proportion and find 28% of 13.

HINT: Solve $\frac{2}{5} = \frac{p}{100}$ for p . *HINT: Use $\frac{a}{13} = \frac{28}{100}$.*

PRACTICE

Write each fraction as a percent.

- | | | | |
|-------------------|--------------------|--------------------|--------------------|
| 3. $\frac{3}{10}$ | 4. $\frac{11}{25}$ | 5. $\frac{17}{20}$ | 6. $\frac{7}{50}$ |
| 7. $\frac{1}{8}$ | 8. $\frac{13}{40}$ | 9. $\frac{5}{16}$ | 10. $\frac{2}{25}$ |

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

- | | |
|-------------------------------|-------------------------------|
| 11. What is 8% of 270? | 12. 12 is 20% of what number? |
| 13. 48 is what percent of 99? | 14. 25 is what percent of 45? |
| 15. 15 is 75% of what number? | 16. Find 16% of 40. |
17. **Pet Food** A birdseed blend is 65% blackoil sunflower seeds. How many pounds of blackoil sunflower seeds are in a 40-pound bag?



18. Standardized Test Practice What is 12% of 60?

- A** 0.2 **B** 6.2 **C** 6.8 **D** 7.2

Answers: 1. 40% 2. 3.64 3. 30% 4. 44% 5. 85% 6. 14% 7. 12.5% 8. 32.5% 9. 31.25% 10. 8% 11. 21.6 12. 60 13. 48.5% 14. 55.6% 15. 20 16. 6.4 17. 26 pounds 18. D
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5-4**Finding Percents Mentally** (pages 220–223)

You can find some percents using mental math. Some common percents can also be found using the equivalent fractions.

Finding Percents Mentally

- To find 1% of a number mentally, move the decimal point two places to the left (which is the same as dividing the number by 100).
- To find 10% of a number mentally, move the decimal point one place to the left (which is the same as dividing the number by 10).

Equivalent Fractions, Decimals, and Percents

$\frac{1}{2}$, 0.5, 50%	$\frac{2}{3}$, $0.66\frac{2}{3}$, $66\frac{2}{3}\%$	$\frac{4}{5}$, 0.8, 80%	$\frac{7}{8}$, 0.875, 87.5%
$\frac{1}{4}$, 0.25, 25%	$\frac{1}{5}$, 0.2, 20%	$\frac{1}{8}$, 0.125, 12.5%	$\frac{3}{10}$, 0.3, 30%
$\frac{3}{4}$, 0.75, 75%	$\frac{2}{5}$, 0.4, 40%	$\frac{3}{8}$, 0.375, 37.5%	$\frac{7}{10}$, 0.7, 70%
$\frac{1}{3}$, $0.33\frac{1}{3}$, $33\frac{1}{3}\%$	$\frac{3}{5}$, 0.6, 60%	$\frac{5}{8}$, 0.625, 62.5%	$\frac{9}{10}$, 0.9, 90%

EXAMPLES

A Compute 1% of 325 mentally.

*Think: 1% is $\frac{1}{100}$ so move the decimal point in 325 two places to the left to make a smaller number.
1% of 325 is 3.25.*

B Compute 75% of 12 mentally.

*Think: 75% is $\frac{3}{4}$.
 $\frac{3}{4}$ of 12 is 9.*

Try These Together

1. Compute 10% of 200 mentally.

HINT: 10% is $\frac{1}{10}$. What is $\frac{200}{10}$?

2. Compute 50% of 80 mentally.

HINT: What fraction equals 50%?

PRACTICE**Compute mentally.**

3. 12.5% of 56

4. 1% of 21

5. 90% of 300

6. 30% of 120

7. 50% of 46

8. 40% of 40

Replace each \bullet with $>$, $<$, or $=$ to make a true sentence.

9. $5 \bullet 10\%$ of 100

10. 62.5% of 80 $\bullet 45$

11. Standardized Test Practice An advertising firm has small businesses and large corporations for clients. If they have 225 clients and 40% of them are small businesses, how many clients are small businesses?

A 80

B 90

C 70

D 100

Answers: 1. 20 2. 40 3. 7 4. 0.21 5. 270 6. 36 7. 23 8. 16 9. $>$ 10. $<$ 11. B

5-5**Percent and Estimation** (pages 228–231)

Compatible numbers are two numbers that are easy to divide mentally.

Estimating with Compatible Numbers

To estimate a percent using compatible numbers:

- Round to numbers that are easy to divide.
- Use those numbers to make an estimate.

EXAMPLES

A Estimate 18% of 50.

Think: 18% is about 20% and 20% is $\frac{1}{5}$.

$\frac{1}{5}$ of 50 is 10.

18% of 50 is about 10.

B Estimate what percent 13 out of 63 represents.

13 out of 63 is about 13 out of 65, or $\frac{13}{65}$.

Since $\frac{13}{65} = \frac{1}{5}$ or 20%, 13 out of 63 is about 20%.

Try These Together

1. Estimate 26% of 80.

HINT: 26% is about 25%, which equals $\frac{1}{4}$.

2. Estimate the percent represented by 11 out of 24.

HINT: $\frac{11}{24}$ is about $\frac{12}{24}$ which equals $\frac{1}{2}$.

PRACTICE**Estimate.**

3. 18% of 50

4. 73% of 48

5. 38% of 31

6. 89% of 10

7. 9% of 81

8. 48% of 52

Estimate each percent.

9. 3 out of 23

10. 15 out of 35

11. 10 out of 31

12. 11 out of 56

13. 9 out of 16

14. 32 out of 41

15. Estimate what percent 13 out of 27 represents.

16. **Money Matters** Gareth's restaurant bill was \$29.65. Estimate how much a 20% tip would be.



17. **Standardized Test Practice** 78% of the students at Willow Middle School ride the bus home. If there are 201 students, estimate how many of them ride the bus home.

A 180

B 160

C 120

D 80

Answers: 1–16. Sample answers are given. 1. 20 2. 50% 3. 10 4. 36 5. 12 6. 9 7. 8 8. 25 9. 12.5% 10. 40% 11. 33.3% 12. 20% 13. 50% 14. 80% 15. 50% 16. \$6.00 17. B

5-6

The Percent Equation (pages 232–235)

Another way to find a percent is to use the **percent equation**,
 Part = Percent · Base. Express the percent as a decimal and multiply.

	Type	Example	Equation
The Percent Equation	Find the Part	What <u>number</u> is 25% of 60? <small>part</small>	$n = 0.25(60)$
	Find the Percent	15 is <u>what percent</u> of 60? <small>percent</small>	$15 = n(60)$
	Find the Base	15 is 25% of <u>what number</u> ? <small>base</small>	$15 = 0.25n$

EXAMPLES

A 15% of what number is 3?

Part = Percent · Base Use the percent equation.

$$3 = 0.15n$$

The part is 3, and the percent is 15%. Let n represent the base.

$$\frac{3}{0.15} = \frac{0.15n}{0.15}$$

Divide each side by 0.15.

$$n = 20$$

Simplify.
 15% of 20 is 3.

B 45 is what percent of 120?

Part = Percent · Base Use the percent equation.

$$45 = n(120)$$

The part is 45, and the base is 120. Let n represent the percent.

$$\frac{45}{120} = \frac{120n}{120}$$

Divide each side by 120.

$$n = 0.375$$

Simplify.
 Write the decimal as a %.
 45 is 37.5% of 120.

Try These Together

1. Find 15.5% of 90 using the percent equation.

HINT: 90 is the base and the percent is 0.155.

2. Find 33% of 77 using the percent equation.

HINT: The number following “of” is usually the base.

PRACTICE

Solve each problem using the percent equation.

- 12% of what number is 120?
- 42% of what number is 21?
- Find 82% of 30.
- 24 is what percent of 96?
- Find 40% of 37.
- 13 is what percent of 104?
- 61 is 50% of what number?
- Find 75% of 98.
- Find 12% of \$1.75.
- \$8.22 is 15% of what amount?
- Sports** Brian had 18 hits in 78 times at bat during the last baseball season. What percent of his times at bat were hits?

14. Standardized Test Practice What is 35% of 120?

A 42

B 38

C 34

D 30

Answers: 1. 13.95 2. 25.41 3–12. See Answer Key for equations. 13. about 23% 14. A

5-7**Percent of Change** (pages 236–240)

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

Finding Percent of Markup and Discount	<ul style="list-style-type: none"> The increase in price that a store adds to its cost is called the markup. The percent of markup is a percent of increase. The amount the customer pays is called the selling price. The amount by which a regular price is reduced is called the discount. The percent of the discount is a percent of decrease. Find the sale price by subtracting the discount.
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EXAMPLES

- A** Find the sale price for a \$424 item that is 20% off.

$$d = 0.20(424)$$

$$d = \$84.80$$

$$\$424 - \$84.80 = \$339.20$$

First use the percent equation to find the discount.
Find the sale price.

- B** A store paid \$18 for an item and used a 30% markup. What was the selling price?

$$m = 0.30(18)$$

$$m = \$5.40$$

$$\$18 + \$5.40 = \$23.40$$

First use the percent equation to find the markup.
Find the selling price.

Try These Together

- Find the percent of change (rounded to the nearest percent) if the original price is \$30 and the new price is \$24.
HINT: First find the amount of change (\$30 – \$24).
- Find the percent of change (rounded to the nearest percent) if the original is 35 and the new is 45.
HINT: First find the amount of change.

PRACTICE

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

- jeans: \$28.00, 50% off
- jacket: \$48.95, $\frac{1}{5}$ off
- paperback: \$7.50, 10% off
- watch: \$15.30, 15% off

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

- CD: \$9, 60% markup
- DVD: \$25, 40% markup
- TV: \$400, 45% markup
- bedroom set: \$2,400, 20% markup



- 11. Standardized Test Practice** What is the sale price of an \$80 CD player on sale at 25% off?

A \$20 **B** \$50 **C** \$60 **D** \$320

Answers: 1. 20% 2. 29% 3. \$14.00 4. \$39.16 5. \$6.75 6. \$13.01 7. \$14.40 8. \$35.00 9. \$580.00 10. \$2,880.00 11. C

5-8**Simple Interest** (pages 241–244)

Interest is the amount paid or earned for the use of money.

Using the Simple Interest Formula

In the formula for simple interest, $I = prt$,

- I is the interest,
- p is the amount of money invested, or principal,
- r is the annual interest rate, and
- t is the time in years.

EXAMPLES

- A** Find the simple interest for \$650 at 11% for 4 months.

Use the formula $I = prt$. Notice that the time, 4 months, is $\frac{1}{3}$ of a year.

$$I = 650(0.11)\left(\frac{1}{3}\right)$$

$$I = \$23.83$$

- B** Find the simple interest for \$545 at 9.5% for 18 months.

Use the formula $I = prt$. Notice that the time, 18 months, is 1.5 years.

$$I = 545(0.095)(1.5)$$

$$I = \$77.66$$

Try These Together

1. Find the simple interest for \$175 at 12% for 1.5 years.

HINT: $r = 0.12$

2. Find the simple interest for \$820 at 6.5% for 16 months.

HINT: Notice that the time is $\frac{16}{12}$ or $1\frac{1}{3}$ years.

PRACTICE

Find the simple interest to the nearest cent.

- | | |
|--------------------------------|--------------------------------|
| 3. \$98 at 9.25% for 3 years | 4. \$340 at 12% for 1.25 years |
| 5. \$318 at 8.75% for 6 months | 6. \$420 at 9% for 6 months |
| 7. \$514 at 10% for 2 years | 8. \$816 at 7% for 9 months |

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

- | | |
|-------------------------------|---|
| 9. \$839 at 21% for 1 year | 10. \$325 at 8.5% for 1 year |
| 11. \$120 at 9% for 9 months | 12. \$100 at 2.5% for 3 months |
| 13. \$672 at 5.5% for 2 years | 14. \$300 at 6.45% for 15 months |
| 15. \$400 at 4% for 6 months | 16. \$230 at 7.35% for $1\frac{1}{2}$ years |



- 17. Standardized Test Practice** What is the simple interest on \$1,000 at 8% for 2 years?

A \$1,600

B \$160

C \$40

D \$20

Answers: 1. \$31.50 2. \$71.07 3. \$27.20 4. \$51.00 5. \$13.91 6. \$18.90 7. \$102.80 8. \$42.84 9. \$1,015.19 10. \$352.63 11. \$128.10 12. \$100.63 13. \$745.92 14. \$324.19 15. \$408.00 16. \$255.36 17. B

5**Chapter 5 Review****Carnival Math**

You and your parent or a partner can play this game. Your partner asks you for the information requested in the parentheses under each blank in the following paragraph. Then your partner writes your answer in each blank. Read the paragraph and then answer the questions that follow.

_____ and _____ out of _____ friends went to a carnival
 1. (your name) 2. (write a ratio)
 one afternoon. _____ tried the Test of Strength and could
 3. (name a friend)
 only get the bell ringer to raise _____ feet high.
 4. (decimal greater than 1)
 _____ spent _____ trying to win a teddy
 5. (name a friend) 6. (dollars and cents)
 bear. At the dunking booth _____ dunked the heckler
 7. (name a friend)
 _____ out of _____ times. _____ and a friend raced
 8. (write a ratio) 9. (your name)
 against each other and _____ won by a margin of
 10. (your name)
 _____ second. By the end of the afternoon, they had all spent
 11. (decimal less than 1)
 _____ of their money and they decided it was time to go home.
 12. (percent less than 100)

- _____ 13. Express the ratio in Exercise 8 as a decimal. Estimate, if necessary.
- _____ 14. Express the ratio in Exercise 2 as a percent. Estimate, if necessary.
- _____ 15. Express the percent in Exercise 12 as a fraction.
- _____ 16. If 2 drinks at the carnival cost \$1.50, how much will 5 drinks cost?
- _____ 17. If 300 people attended the carnival that day, and 2 out of 5 of them were adults, how many of the attendees that day were adults?
- _____ 18. Suppose you took \$20 with you to the carnival and came home with \$5. \$5 is what percent of \$20?

Answers are located on page 108.