Review What You Know!

3 Alaska has the greatest amount of land area in the U.S. How can you express this amount as a decimal, fraction, and percent? You will find out in Lesson 17-3.

4 About 12% of the U.S. population lives in California. How can this percent be used to find the number of people who live in California? You will find out in Lesson 17-4.

Vocabulary

Choose the best term from the box.

- denominator
- equivalent fractions
- fraction
- numerator

1. The number below the fraction bar is called __?__ and the number above the fraction bar is called the __?__.

2. A __?__ can be used to name part of a whole.

3. Two different fractions that represent the same amount are called __?__.

Simplest Form

Write each fraction in simplest form.

4. $\frac{2}{4}$ 5. $\frac{16}{4}$ 6. $\frac{7}{21}$

7. $\frac{5}{25}$ 8. $\frac{9}{6}$ 9. $\frac{8}{10}$

Decimals and Fractions

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

10. 0.25   11. 0.4   12. 0.01

13. 0.72   14. 4.5   15. 2.75

Fractions

Writing to Explain Write an answer for each question.

16. How can you find a fraction equivalent to a given fraction?

17. How can you change a fraction to a decimal?

Lesson

17-1

NS 1.2 Grade 6
Interpret and use ratios in different contexts (e.g., batting averages, miles per hour) to show the relative sizes of two quantities, using appropriate notations ($\frac{a}{b}$, a to b, a:b).

Understanding Ratios

What are ratios and when are they equal?

Todd is using a recipe to make fruit salad. What is the ratio of cups of cantaloupe to cups of apples? Cups of peaches to cups of fruit in the salad?

If Todd has 2 cups of strawberries, how many cups of cantaloupe should he use?

Fruit Salad
6 c cantaloupe
4 c strawberries
3 c apples
2 c blueberries
3 c peaches

Another Example **How can you find equal ratios?**

Equal ratios show the same comparison.

You can find equal ratios by multiplying or dividing both terms by the same number.

Use multiplication.

		6×2	6×3
Cups of cantaloupe	6	12	18
Total cups of fruit	18	36	54
		18×2	18×3

Equal ratios: $\frac{6}{18} = \frac{12}{36} = \frac{18}{54}$

Use division.

		$6 \div 2$	$6 \div 3$	$6 \div 6$
Cups of cantaloupe	6	3	2	1
Total cups of fruit	18	9	6	3
		$18 \div 2$	$18 \div 3$	$18 \div 6$

Equal ratios: $\frac{6}{18} = \frac{3}{9} = \frac{2}{6} = \frac{1}{3}$

Guided Practice*

Do you know HOW?

In **1** through **4**, write each ratio. Then write two other ratios that are equal to each ratio.

△△□○△□△□○△□△

1. circles to squares

2. triangles to circles

3. all shapes to squares

4. circles to all shapes

Do you UNDERSTAND?

5. Writing to Explain Is the ratio 6 to 3 the same as the ratio 3 to 6? Why or why not?

6. If Todd wanted to double the cups of apples, how many cups of cantaloupe would he need to keep the same ratio of fruit?

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*For another example, see Set A on page 398.

A <mark>ratio</mark> is a comparison where for every x units of one quantity there are y units of another quantity. A ratio can compare a part to a part, a part to a whole, or the whole to a part.

The ratio of cups of cantaloupe to cups of apples can be written as 6 to 3, 6:3, or $\frac{6}{3}$.

The ratio of cups of peaches to cups of fruit in the salad can be written as 3 to 18, 3:18, or $\frac{3}{18}$.

The recipe calls for 4 cups of strawberries to 6 cups of cantaloupe.

For 2 cups of strawberries, 3 cups of cantaloupe are needed.

Todd should use 3 cups of cantaloupe for 2 cups of strawberries.

Independent Practice

In **7** through **16**, give two other ratios that are equal to each ratio.

7. $\frac{3}{4}$ **8.** 5 to 8 **9.** 12:16 **10.** 10:25 **11.** $\frac{5}{1}$

12. 6:9 **13.** $\frac{4}{5}$ **14.** 16 to 6 **15.** $\frac{15}{27}$ **16.** 3:12

Problem Solving

In **17** and **18**, use the survey results at the right.

17. What is the ratio of people who prefer the fresh mint flavor to those who took the survey? Write another ratio equal to that ratio.

18. The report stated that two out of five people preferred the tasty cinnamon flavor. Is that correct? Explain.

Which flavor of toothpaste do you prefer?	
Flavor	Number of people
Tasty cinnamon	40
Arctic ice	22
Fresh mint	38

19. In a bowl of mixed nuts, there are 96 peanuts, 34 cashews, 28 almonds, and 35 walnuts. What is the ratio of almonds to walnuts in that bowl of mixed nuts? Write another ratio equal to that ratio.

20. Ms. Graham gathered maps for a geography lesson. She had 8 maps of California, 6 maps of Texas, and 5 maps of Illinois. What is the ratio of maps of Texas to maps of California?

A $\frac{5}{8}$ **B** $\frac{3}{4}$ **C** $\frac{4}{3}$ **D** $\frac{8}{6}$

21. Geometry What is the ratio of the number of sides of a quadrilateral to the number of sides of a pentagon?

22. Number Sense Are the ratios 6 to 20 and 7 to 20 equal? Explain.

NS 1.2 Interpret percents as a part of a hundred; find decimal and percent equivalents for common fractions and explain why they represent the same value; compute a given percent of a whole number.

Understanding Percent

What does percent mean?

The floor plan for a discount store is shown at the right. It is divided into 100 equal parts.

Write the amount of space each department occupies as a ratio and as a percent.
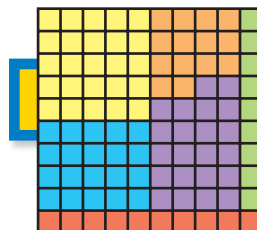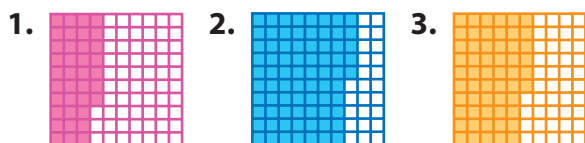
■ Checkout   ■ Men's Clothing
■ CDs & DVDs   ■ Children's Clothing
■ Women's Clothing   ■ Toys

Guided Practice*

Do you know **HOW**?

In **1** through **3**, write the ratio and the percent that is represented by the shaded part of each 100-grid.

1.   **2.**   **3.**

Do you **UNDERSTAND**?

4. Number Sense If all 100 squares in a 10-by-10 grid are shaded, what percent represents the shaded part?

5. Could the floor space in the store be divided this way: Women's clothing 25%, Children's clothing 25%, Men's clothing 25%, Toys 14%, CDs and DVDs 9%, and checkout counter 10%? Explain your answer.

Independent Practice

In **6** through **10**, write the ratio and the percent that is represented by the shaded part of each 100-grid.

6.   **7.**   **8.**   **9.**   **10.**
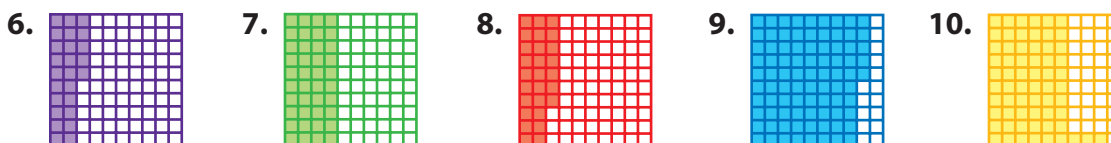
In **11** through **15**, write each ratio as a percent.

11. 47 out of 100

12. $\frac{50}{100}$

13. 76 to 100

14. $\frac{9}{100}$

15. 35:100

16. Writing to Explain Is 75% the same as the ratio 3 to 4? Why or why not?

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A percent is a ratio in which the first term is compared to 100.

Percent means *per hundred*.

The percent symbol is %.

Toys occupy 14 out of 100 parts, or 14%.

14% is read "fourteen percent."

Written as a ratio, 14% is 14 to 100, or 14:100, or $\frac{14}{100}$.

Floor space occupied by the departments

Women's clothing:	25 out of 100 or 25%
Men's clothing:	20 out of 100 or 20%
Children's clothing:	22 out of 100 or 22%
Toys:	14 out of 100 or 14%
CDs and DVDs:	9 out of 100 or 9%
Checkout counter:	10 out of 100 or 10%

Problem Solving

17. In a group of 100 people, 37 people wear glasses. What percent of the people in the group wear glasses?

18. Both triangles below have 50% of their area shaded. Why are the shaded areas not the same amount?
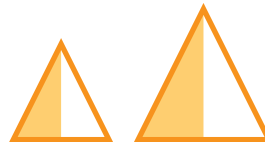

19. A florist is preparing 10 vases of flowers. Each vase will contain 3 roses and 8 carnations. How many of each type of flower will be needed?

20. The Glenview orchestra contains 100 members. The conductor shaded the grid shown below to represent the members in each section. What percent of the members are in each section?

  a strings

  b woodwinds

  c brass

  d percussion

  e keyboards

21. Algebra What is the value of *n* in the equation $12n = 180$?

  A 12   **C** 20

  B 15   **D** 9

22. Estimation Some zoo employees gathered data one day and found that 153 people entered the zoo in 10 minutes. Based on that data, estimate the number of people who would enter the zoo in 1 hour.

23. Ashley spent $5.75 for camera film and $17.49 for a CD. She also bought lunch. She started the day with $30. If she had $2.35 left, how much did she spend for lunch?

Percents, Fractions, and Decimals

How are percents related to fractions and decimals?

Many states charge sales tax on items you buy. Sales tax is often named as a percent. It compares an amount to the 100 cents in a dollar.

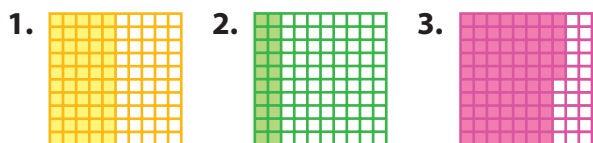How is Indiana's sales tax expressed as a fraction and a decimal?

Indiana sales tax 6%

Guided Practice*

Do you know HOW?

In **1** through **3**, write the percent, decimal, and fraction in simplest form represented by the shaded part of each 100-grid.

1. **2.** **3.**

Do you UNDERSTAND?

4. **Writing to Explain** If $\frac{2}{8} = \frac{1}{4} = 25\%$, then how can you find what $\frac{1}{8}$ is as a percent?

5. The sales tax in Chicago is 9%. Write that percent as a decimal and fraction in simplest form.

Independent Practice

In **6** through **10**, write the percent, decimal, and fraction in simplest form represented by the shaded part of each 100-grid.
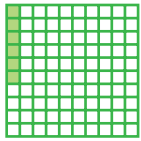
6. **7.** **8.** **9.** **10.**

In **11** through **20**, write each percent as a decimal and a fraction in simplest form.

11. 65%   **12.** 5%   **13.** 23%   **14.** 72%   **15.** 1%

16. 2%   **17.** 45%   **18.** 100%   **19.** 125%   **20.** 200%

*For another example, see Set C on page 399.

Percent means *per hundred.*

So, 6% means 6 out of 100.

The ratio 6 out of 100 can be written as the fraction $\frac{6}{100}$.

In simplest form, $\frac{6}{100}$ can be written as $\frac{3}{50}$.

$$6\% = \frac{6}{100} = \frac{3}{50}$$

The ratio 6 out of 100 can be written as the decimal in hundredths.

$$6\% = \frac{6}{100} = 0.06$$

Tip *Remember to write zeros in a decimal when needed.*

Indiana Sales Tax

As a percent: 6%

As a fraction:

$$\frac{6}{100} = \frac{3}{50}$$

As a decimal: 0.06

For every dollar a person spends, an additional $0.06 is paid for sales tax.

Problem Solving

21. Fill in the missing equivalent values.

percent	■	■	33%	■
fraction	■	$\frac{19}{20}$	■	$1\frac{1}{2}$
decimal	0.3	■	■	■

22. **Think About the Process** What would you do first to order the following numbers from least to greatest?

$25\%, \frac{1}{3}, 0.64, \frac{7}{8}, 0.8$

A Convert the decimals to percents.

B Order the decimals.

C Convert all numbers to decimals or fractions.

D Order the fractions.

23. If there are 4 juice boxes in 50% of a package, how many boxes are in a whole package?

24. About 16% of the total U.S. land area is in Alaska. Write 16% as a decimal and a fraction in simplest form.

25. Only 15% of the class did a science project on birds. What fraction did not do a project on birds?

26. Sally traveled 550 miles on vacation. She traveled 330 of those miles in Nevada. What percent of the trip did she travel in Nevada? (Hint: Write a fraction and find an equal fraction with a denominator of 100.)

27. Melanie counted and identified birds that came near her home. The circle graph shows her observations. Find the ratio of the number of birds of each type to the total number of birds. Write each ratio as a percent, a decimal, and fraction in simplest form.
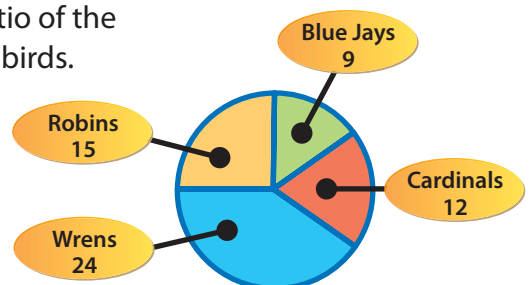
a Robins   **c** Cardinals

b Wrens   **d** Blue Jays

Blue Jays 9

Robins 15

Cardinals 12

Wrens 24

Finding Percent of a Whole Number

How can you find a percent of a given number?

Different stores have included a backpack in their back-to-school sale. What is the amount of the discount at each store?

$25

Store	Discount
#1	50%
#2	10%
#3	35%
#4	20%

Guided Practice*

Do you know HOW?

In **1** through **4**, find the percent of each number.

1. 3% of 200

2. 25% of 48

3. 90% of 85

4. 75% of 44

Do you UNDERSTAND?

5. What is an easy way to find 25% of a number?

6. In the example above, what would the amount of the discount be if the backpack was discounted 40%?

Independent Practice

In **7** through **18**, find the percent of each number.

7. 43% of 350

8. 87% of 210

9. 5% of 46

10. 100% of 37

11. 30% of 66

12. 10% of 230

13. 20% of 400

14. 15% of 90

15. 50% of 75

16. 12% of 100

17. 33% of 300

18. 77% of 10

19. Find 1% of 235. How many decimal places in 235 did the decimal point move to the left in the answer?

20. What is an easy way to find 2% of 660?

21. Writing to Explain What is an easy way to find 11% of a number? Use 11% of 70 to explain.

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For another example, see Set D on page 399.

Find 50% of 25.

50% = 0.5

Multiply 25 by 0.5.

$$\begin{array}{r} 25 \\ \times\ 0.5 \\ \hline 12.5 \end{array}$$

Notice that 50% of 25 is the same as 25 ÷ 2.

The discount at store #1 is $12.50.

Find 10% of 25.

10% = 0.1

Multiply 25 by 0.1.

$$\begin{array}{r} 25 \\ \times\ 0.1 \\ \hline 2.5 \end{array}$$

Notice that the decimal point moved one place to the left.

The discount at store #2 is $2.50.

Find 35% of 25.

35% = 0.35

Multiply 25 by 0.35.

$$\begin{array}{r} 25 \\ \times\ 0.35 \\ \hline 8.75 \end{array}$$

The discount at store #3 is $8.75.

Find 20% of 25.

20% = 0.2

Multiply 25 by 0.2.

$$\begin{array}{r} 25 \\ \times\ 0.2 \\ \hline 5.0 \end{array}$$

The discount at store #4 is $5.00.

Problem Solving

22. About 12% of the U.S. population lives in California. If the U.S. population is about 300,000,000 people, about how many people live in California?

23. Marcia had dinner at a restaurant and wants to leave a 20% tip. Explain how she could calculate the tip using mental math.

Use the information from the chart to answer **24** through **26**.

Meat	Ounces	Cost
Ham	14	$5.74
Turkey	11	$4.07
Pastrami	5	$4.85
Roast Beef	8	$6.56

24. What is the cost of 2 ounces of turkey?

25. Which costs more per ounce, roast beef or pastrami?

26. What is the total cost of 14 ounces of ham and 5 ounces of pastrami?

27. Algebra Jordan bought a $35 jacket and a $40 pair of shoes at a 25% discount. Write an equation to find the total amount of discount on the items. Solve the equation.

28. Reasoning Write these numbers in order from least to greatest.

60%, $\frac{1}{4}$, 0.75, 28%, $\frac{1}{2}$, 0.55

29. The price of a computer is $1,450, and a monitor costs $350. The sales tax is 6%. What is the total amount of sales tax on both items?

30. Of the 20 tallest buildings in the world, 20% are located in the United States. How many of the world's 20 tallest buildings are in the U.S.?

31. Critical Thinking The price of a new bike is $90. The store is advertising a 30% discount and the sales tax is 7%. Explain how to find the cost of the bike.

Problem Solving

Make a Table and Look for a Pattern

Kiesha and Sheryl play on the school basketball team. The statistics from the last game are shown at the right.

If they continue at the same rate, what percent of their shots would each player make?

Game Statistics

Player	Shots Attempted	Baskets Made
Kiesha	|||| |||| |||| ||||	|||| ||
Sheryl	|||| |||| |||| ||||	|||| ||||

Guided Practice*

Do you know HOW?

Find the percent by completing the table.

1. 4 free throws out of 16 were made

Free throws made	4	▪	▪	▪
Free throws attempted	16	8	4	▪

Do you UNDERSTAND?

2. How can a table help you to find a percent?

3. **Write a Problem** Write a real-world problem that you can solve using a table to find a percent.

Independent Practice

In **4** through **7**, find each percent by completing each table.

4. 8 completions out of 20 attempts

Pass completions	8	▪	▪	▪	▪
Pass attempts	20	40	60	80	100

5. 6 out of 30 days were cloudy

Cloudy days	6	▪	▪	▪
Total days	30	10	50	100

Stuck? Try this....

- What do I know?
- What am I asked to find?
- What diagram can I use to help understand the problem?
- Can I use addition, subtraction, multiplication, or division?
- Is all of my work correct?
- Did I answer the right question?
- Is my answer reasonable?

For another example, see Set E on page 399.

Make a table and look for patterns to get a comparison with 100. Begin with the numbers you know and find equal ratios.

Kiesha

Baskets made	5				
Shots attempted	20	40	60	80	100

Sheryl

Baskets made	7			
Shots attempted	25	50	75	100

Complete each table and look for patterns.

Kiesha

Baskets made	5	10	15	20	25
Shots attempted	20	40	60	80	100

Sheryl

Baskets made	7	14	21	28
Shots attempted	25	50	75	100

Kiesha might make 25 out of 100, or 25%, of her shots.
Sheryl might make 28 out of 100, or 28%, of her shots.

6. 30 of the 75 fossils are shells.

Fossil shells	10	■	■	■
Total fossils	25	50	75	■

7. 54 of the 75 votes were for Fred.

Votes for Fred	54	■	■	■
Total votes	75	150	300	■

8. Rodrigo wants to wrap a package with paper. Find the least amount of paper he will need.

9 in.
18 in.
12 in.
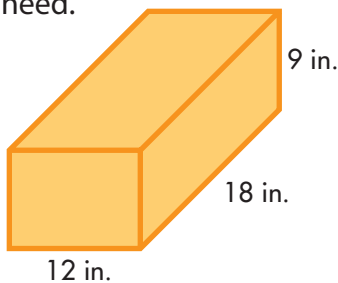
9. Mr. Perez bought 8 souvenir mugs to give as gifts. Mrs. Perez bought 7 souvenir mugs. How much did each person spend? If the tax was 10%, what was their total bill?

$3 each

10. Draw a net to represent the package Rodrigo is wrapping.

11. Luciana made 45 hits out of 150 times at bat. What is that as a percent?

12. Brett plans to walk 16 miles this weekend. On Saturday, he walked 12 miles. What percent of his goal has Brett walked?

13. Tessa used 24 minutes of an 80-minute CD. What percent of the CD has *not* been used? How many minutes is that?

14. Writing to Explain Fran estimated 45% of 87 by finding 50% of 90. Will her estimate be greater than or less than the exact answer? Why?

15. Nicole's digital camera has a 360-picture memory. She has taken 162 pictures. Make a table and find a pattern. What percent of the camera's memory has she used?

1. The table shows the number of animals in an animal shelter. What is the ratio of dogs to total animals in the shelter? (17-1)

Animal Type	Number
Cat	18
Dog	12
Rabbit	3

A 12 : 33

B 12 : 21

C 21 : 12

D 33 : 12

2. What is 61 out of 100 as a percent? (17-2)

A 100%

B 61%

C 39%

D 6.1%

3. Which of the following can be used to find 65% of 80? (17-4)

A Multiply 0.65 by 80.

B Multiply 0.65 by 0.8.

C Multiply 80 by 100.

D Multiply 65 by 80 and 100.

4. Which of the following ratios is equal to 15 to 10? (17-1)

A 10 to 15

B 20 to 15

C 3 to 5

D 3 to 2

5. A football team won 75% of their games. If they played 12 games, how many games did they win? (17-4)

A 7

B 8

C 9

D 10

**6.** Five out of 25 students are absent. What percent of the students are absent? (17-5)

Students Absent	5	■	■	■
Total Students	25	50	75	100

A 5%

B 10%

C 15%

D 20%

7. About 85% of Americans have Rh positive blood. What is the ratio of Americans that are Rh positive to all Americans? (17-2)
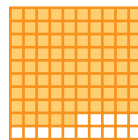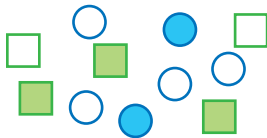
A $\frac{15}{85}$

B $\frac{85}{100}$

C $\frac{100}{85}$

D $\frac{15}{100}$

8. Which of the following represents the shaded area as a percent, a decimal and a fraction? (17-3)
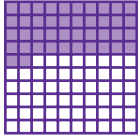
A 21%, 0.21, $\frac{21}{100}$

B 42%, 0.42, $\frac{21}{100}$

C 42%, 0.42, $\frac{21}{50}$

D 21%, 0.21, $\frac{21}{50}$

9. What is the ratio of shaded circles to shaded squares? (17-1)

A 3 : 11

B 2 : 11

C 3 : 2

D 2 : 3

10. Which is equal to 20%? (17-3)

A $\frac{2}{100}$

B 20 : 50

C $\frac{1}{5}$

D 2 out of 100

11. Which is 60% written as a decimal and a fraction? (17-3)

A 0.06, $\frac{60}{100}$

B 0.6, $\frac{60}{100}$

**C** 0.6, $\frac{6}{100}$

D 0.06, $\frac{6}{100}$

12. In a particular hospital during one month, the ratio of the number of girls born to the number of boys born was 24 to 15. Which of the following ratios is equal to 24 to 15? (17-1)

A 5 to 8

B 8 to 5

C 3 to 5

D 19 to 10

13. The United States consumes 27% of all commercially harvested wood in the world. What fraction equals 27%? (17-3)

A $\frac{27}{100}$

B $\frac{73}{100}$

C $\frac{27}{73}$

D $\frac{73}{27}$

14. What percent is represented by the shaded part of the grid? (17-2)
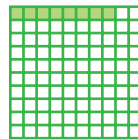
A 0.8%

B 8%

C 18%

D 80%

15. What is 80% of 150? (17-4)

A 80

B 100

C 120

D 130

Set A, pages 386–387

Write the ratio of squares to circles in three ways.

The ratio can be written as

4 to 5, 4:5, or $\frac{4}{5}$.

Write two ratios equal to 4:12.

Multiply or divide both terms by the same number.

$\frac{4 \times 2}{12 \times 2} = \frac{8}{24}$　　$\frac{4 \div 2}{12 \div 2} = \frac{2}{6}$

4:12 = 8:24 = 2:6

Remember that the order of the terms is important.
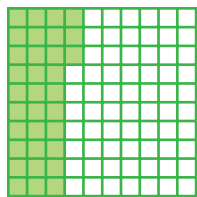
Use the shapes at the left. Write each ratio.

1. triangles to circles

2. all shapes to triangles

3. circles to all shapes

Write two other ratios equal to each ratio.

4. $\frac{9}{12}$　　　　　**5.** 6 to 7

6. 14:28　　　　**7.** 27:9

8. 15 to 12　　　**9.** $\frac{35}{40}$

10. 5 to 3　　　　**11.** 18:24

12. $\frac{21}{49}$　　　　**13.** $\frac{15}{21}$

Set B, pages 388–389

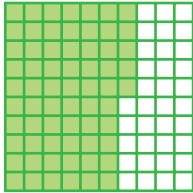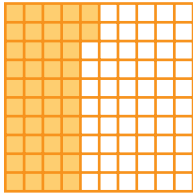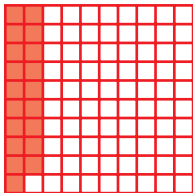Write the ratio that compares the shaded squares to all the squares.

The ratio can be written as

33 to 100, 33:100, or $\frac{33}{100}$.

Write that ratio as a percent.

$\frac{33}{100} = 33\%$

Remember that a percent is a ratio in which a number is compared to 100.
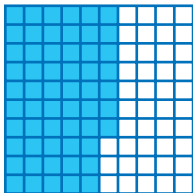
Write the ratio that compares the shaded squares to all the squares for each grid. Write each ratio as a percent.

1. 　　**2.**

3. 　　**4.**

Set C, pages 390–391

Write 24% as a decimal and as a fraction in simplest form.

24% means 24 out of 100.

To write a decimal: Write the ratio as a decimal in hundredths.

24% = 0.24

To write a fraction: Write as a ratio with 100 as second term and find simplest form.

$$\frac{24}{100} = \frac{24 \div 4}{100 \div 4} = \frac{6}{25}$$

Remember to write zeros when more decimal places are needed.

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

1. 50%	**2.** 40%
3. 25%	**4.** 5%
5. 36%	**6.** 70%
7. 94%	**8.** 100%

Set D, pages 392–393

Find 40% of 80.

Change 40% to a decimal.   40% = 0.40 or 0.4

Multiply 80 by 0.4.
$$\begin{array}{r} 80 \\ \times\ 0.4 \\ \hline 32.0 \end{array}$$

40% of 80 is 32.

Remember to find the percent of a number, multiply the number by the decimal form of the percent.

Find the percent of each number.

1. 75% of 56	**2.** 10% of 32
3. 50% of 36	**4.** 90% of 60
5. 35% of 40	**6.** 20% of 90

Set E, pages 394–395

A hockey player attempted 15 shots on goal and made 9 goals. What percent of the shots did she make?

Write the ratio in a table. Find equal ratios to get the second term to be 100. Write the percent.

ratio		÷3	×4	×5
Goals made	9	3	12	60
Shots attempted	15	5	20	100

The hockey player made goals on 60% of her shots.

Remember that to find a ratio equal to another ratio, both terms of the ratio must be multiplied or divided by the same number.

1. A baseball player was up to bat 40 times and got 14 hits. What percent of the times at bat did he get a hit?

2. The weather report stated that rain fell on 9 of the 30 days last month. On what percent of the days last month did it rain?