### **Compare Fractions and Decimals**

**Essential Question** How can you compare decimals, fractions, and mixed numbers on a number line?

### Unlock the Problem



The Tech Club compared the weights of three cell phones. Estéban's phone weighed 4.7 ounces. Jill's phone weighed 43ounces. Mona's phone weighed 4.35 ounces. Who has the phone with the lightest weight?

You can use a number line to compare fractions and decimals.

**Remember:** Greater values on a number line lie farther to the right.

How can you identify the number with the least value?

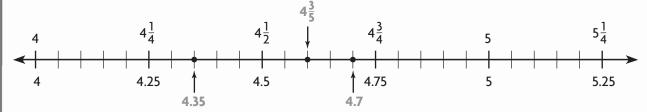
Possible answer: left on the number line has the least value.



Compare the values on a number line.

STEP 1 Locate some benchmarks.

- Benchmark decimals: 4, 4.25, 4.5, 4.75, 5...
- Benchmark mixed numbers: 4,  $4\frac{1}{4}$ ,  $4\frac{1}{2}$ ,  $4\frac{3}{4}$ , 5...



**STEP 2** Mark the weight of each cell phone on the number line.

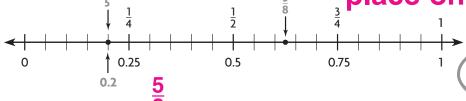
• Find the location of 4.7,  $4\frac{3}{5}$ , and 4.35.

Since  $4.35 < 4\frac{3}{5} < 4.7$ , Mona's phone is lightest.

### **Try This!** Compare $\frac{1}{5}$ , $\frac{5}{8}$ , and 0.2. Which number has the greatest value?







The greatest number is <u>8</u>. **Explain** how you decided.

Of the three numbers,  $\frac{5}{8}$  is farthest to the right.



**Mathematical Practices** 

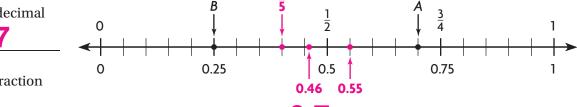
Explain how you can tell that  $\frac{1}{5}$  and 0.2 are equal.



For 1-2, identify the points on the number line.

Then write the greater number.

**1.** point *A* as a decimal



**2.** point B as a fraction

**1**/**4** 

Locate each number on a number line.

Then complete the sentence.

3. 0.55,  $\frac{2}{5}$ , 0.46 Check students' number lines.

The number with the greatest value is 0.55.

#### On Your Own

Locate each number on a number line. Then complete the sentence.

4. 0.4, \(\frac{3}{4}\), 0.15 Check students' number lines.

The number with the greatest value is  $\frac{3}{4}$ .

**5.**  $2\frac{2}{3}$ , 2.45,  $2\frac{2}{5}$ 

The number with the least value is  $\frac{2\frac{2}{5}}{5}$ 

6 3.95,  $3\frac{5}{6}$ ,  $3\frac{4}{5}$ 

The number with the greatest value is 3.95.

# Problem Solving (Real world)

7. Hannah made 0.7 of her free throws in a basketball game. Abra made  $\frac{9}{10}$  of her free throws. Dena made  $\frac{3}{4}$  of her free throws. Who was the best shooter? **Explain.** 

Abra; Possible explanation: On a number line,  $\frac{9}{10}$  is farther right than the other two numbers, so Abra made more of her free throws than the other players.

#### **Order Fractions and Decimals**

**Essential Question** How can you order decimals, fractions, and mixed numbers on a number line?

### Unlock the Problem



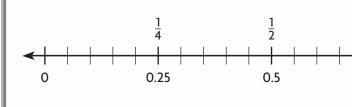
In tennis, Jocelyn's serve takes 0.97 of a second to reach her opponent. Dave's serve takes  $\frac{4}{5}$  of a second. Monica's serve takes 0.85 of a second. Order the three serves from shortest to longest time.



Order the fractions and decimals on the number line.

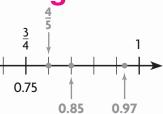
STEP 1 Locate the benchmarks on the number line.

- Benchmark decimals: 0, 0.25, 0.5, 0.75, 1.
- Benchmark fractions:  $0, \frac{1}{4}, \frac{1}{2}, \frac{3}{4}, 1$ .



 You want to order the times from shortest to longest. Should you read the numbers on the number line left to right or right to left?

Possible answer:
Read left to right
because the values
increase from left to
right.



**STEP 2** Locate 0.97,  $\frac{4}{5}$ , and 0.85 on the number line.

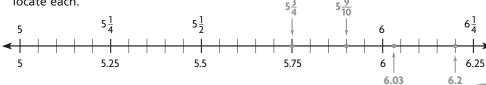
**STEP 3** Order the fractions and decimals.

**Remember:** The point farthest to the left is the least value.

So, the times in order from shortest to longest are:  $\frac{4}{5}$  0.85 0.97

#### **Try This!** Order 6.03, $5\frac{9}{10}$ , $5\frac{3}{4}$ , and 6.2 from greatest to least.

Locate each fraction and decimal on the number line. Use benchmarks to help you locate each.



From the greatest to least: 6.2, 6.03,  $5\frac{9}{10}$ ,  $5\frac{3}{4}$ 

Numbers to the right are greater than numbers to the left. So, I order the numbers from right to left.

#### Math Talk

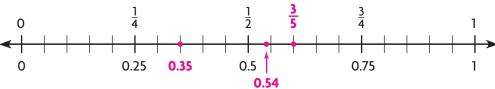
**Mathematical Practices** 

How does the number line help you order numbers from greatest to least?



Locate each number on the number line.

Then write the numbers in order from least to greatest.



1. 
$$\frac{3}{5}$$
, 0.54, 0.35

$$0.35, 0.54, \frac{3}{5}$$

For 2-3, locate each set of numbers on a number line. Then write the numbers in order from greatest to least.

**2.** 1.16, 
$$1\frac{1}{4}$$
, 1.37,  $1\frac{1}{10}$ 

1.37, 
$$1\frac{1}{4}$$
, 1.16,  $1\frac{1}{10}$ 

### Check students' number lines.

3. 
$$\frac{5}{8}$$
, 0.5,  $\frac{2}{5}$ , 0.78

$$0.78, \frac{5}{8}, 0.5, \frac{2}{5}$$

#### On Your Own

For 4-5, locate each number on a number line.

Then write the numbers in order from least to greatest.

**4.** 0.6, 
$$\frac{1}{2}$$
,  $\frac{2}{3}$ , 0.39

$$0.39, \frac{1}{2}, 0.6, \frac{2}{3}$$

Check students' number lines.

5. 
$$7\frac{1}{4}$$
, 7.4,  $7\frac{3}{4}$ , 7.77

$$7\frac{1}{4}$$
, 7.4,  $7\frac{3}{4}$ , 7.77

For 6-7, locate each number on a number line. Then write the numbers in order from greatest to least.

**6.** 
$$\frac{3}{10}$$
, 0.222,  $\frac{3}{5}$ , 0.53

$$\frac{3}{5}$$
, 0.53,  $\frac{3}{10}$ , 0.222

Check students' number lines.

**7.** 2.96, 
$$3\frac{1}{5}$$
, 3.48,  $3\frac{1}{4}$ 

$$3.48, 3\frac{1}{4}, 3\frac{1}{5}, 2.96$$

### Problem Solving



- **8.** Judges in a skateboarding competition gave scores of 8.2,  $8\frac{1}{5}$ ,  $8\frac{4}{5}$ , 8.44, and  $8\frac{1}{5}$ . Which two scores were closest to one another? Explain.
- 8.2 and  $8\frac{1}{5}$  are equal, so they are closest. Possible explanation: I saw on the number line that the two values were in the same place, so they were closest.

#### **Factor Trees**

**Essential Question** How can you factor numbers using a factor tree?

### Unlock the Problem



Mr. Shu gives this puzzle to his math students.

"Write 24 as a product of factors that are prime. Remember that a prime number must be greater than 1 and can have only 1 and itself as factors."

You can use a diagram called a **factor tree** to find the factors of a number.

 Give an example of a number greater than 1 that has only 1 and itself as factors.

Possible answers: 2, 3, 5

Use

Use a factor tree to find the prime number factors that have a product of 24.

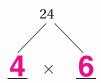
#### STEP 1

Write the number to be factored at the top of the factor tree.

#### STEP 2

Write it as a product of any two factors.

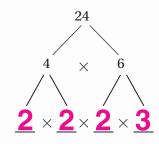
Think: 
$$4 \times 6 = 24$$



#### STEP 3

Write each factor as the product of two factors.

Think: 
$$2 \times 2 = 4$$
 and  $2 \times 3 = 6$ 



#### STEP 4

Continue until each factor is a prime number.

Think: 
$$2 \times 1 = 2$$
 and  $3 \times 1 = 3$ 

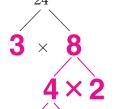
Write the factors that are prime numbers from least to greatest.

So,  $24 = 2 \times 2 \times 2 \times 3$ 

Try This! Make a different factor tree for 24. Possible answer is given.

• Is the product of factors the same as in the Example? **Explain.** 

See Planning Guide, pg. 81.



Math Talk

**Mathematical Practices** 

**Explain** how you can use factored numbers to find common factors.

You can see what factors are the same for the two numbers; these would be Getting Ready for Grade 6 P227



- **1.** Use a factor tree to find the prime number factors that have a product of 210.
  - Write 210 as a product of any two factors.

• Write each factor as the product of factors.

$$10 = 2 \times 5$$

Now each factor has only \_\_\_\_ and itself as factors.

So, 
$$210 = 2 \times 3 \times 5 \times 7$$
.

 $\begin{array}{c}
\mathbf{210} \\
\mathbf{10} \times \mathbf{21} \\
\mathbf{2} \times \mathbf{5} \times \mathbf{3} \times \mathbf{7}
\end{array}$ ERROR Alert

Remember to continue to factor a number if it has factors other than 1 and itself.

Use a factor tree to find the prime number factors.

Check students' factor trees.

2.



$$2 \times 2 \times 2$$

3.

$$3 \times 3 \times 5$$

4.

 $2 \times 5 \times 5 \times 7$ 

### On Your Own

Use a factor tree to find the prime number factors.

Check students' factor trees.

5.



$$2 \times 2 \times 3 \times 3$$

6.

$$\frac{2\times2\times2}{\times3\times3}$$

7.

 $\frac{2\times2\times3}{\times3\times3\times5}$ 

## Problem Solving (World)

Mr. Shu gave these problems to his math students. Solve.

**8.** Write 500 as a product of prime number factors. Each factor must be greater than 1 and can have only 1 and itself as factors.



**9.** Find a number that has four identical even factors. Each factor must be greater than 1 and can have only 1 and itself as factors.

 $2 \times 2 \times 2 \times 2 = 16$ 

#### **Model Percent**

**Essential Question** How can you express real world quantities as percents and use them to solve problems?

### Unlock the Problem



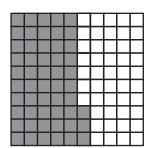
**Percent** means "per hundred" or "out of 100." So, when you find percent you are finding a part of 100. Sixty percent, for example, means 60 out of 100. You can write percents using the percent symbol, %. So, 60 percent is written as 60%.

What number is always compared in a percent?

100

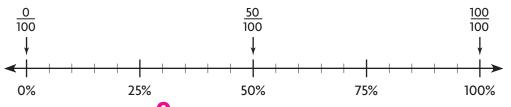
### Example 1 Name the percent that is shaded.

- 5 columns:  $5 \times 10 = 50$ .
- 3 squares:  $3 \times 1 = 3$
- Total: 50 + 3 = 53 out of 100, or 53 percent is shaded.



- Example 2 Name the percent that is not shaded.
- 4 columns:  $4 \times 10 = 40$ .
- 7 squares:  $7 \times 1 = 7$
- Total: 40 + 7 = 47 out of 100, or 47 percent is not shaded.

## **Try This!** Use the number line. Tell what these percents mean: 0 percent, 50 percent, 100 percent.



- **A.** 0 percent means \_\_\_\_\_ out of 100, or none of the total.
- **B.** 50 percent means <u>50</u> out of 100, or half of the total.
- C. 100 percent means 100 out of 100, or all of the total.

50%; Possible explanation: On a number line 33% is closer to 50% than 0%.



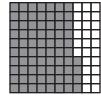
**Mathematical Practices** 

Which benchmark is 33% closest to? **Explain** how you know.



Use the diagram to write the percent.

**1.** How many whole columns and single squares are shaded?



7 columns, 4 single squares

**2.** What percent is shaded?

**74%** 

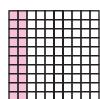
3. What percent is unshaded?

26%

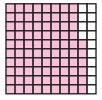
Shade the grid to show the percent.

### Possible shading shown.

**4.** 20 percent



5. 86 percent



#### On Your Own

Use the diagram to write the percent.

6. light shading

30%

7. dark shading

**52%** 

8. not shaded

18%

9. not shaded

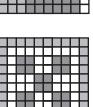
44%

10. dark shading

20%

**11.** light shading

36%



Write the closest benchmark for the percent.

**12.** 48%

**13.** 94%

**14.** 4%

50%

100%

0%

Problem Solving (Real World)

**15.** In an election between Warren and Jorge, Warren declared victory because he received 58 percent of the vote. Is he correct? **Explain**.

Yes; Possible explanation: He is correct because 58% is greater than half, or 50% of the vote.

#### **Relate Decimals and Percents**

**Essential Question** How can you express decimals as percents and percents as decimals?

### **Unlock the Problem**



Decimals and percents are two ways of expressing the same number. You can write a percent as a decimal. You can also write a decimal as a percent.

• In percent, the "whole" is 100. What is the "whole" in decimal form?

1.0, or 1.00

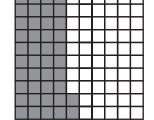


#### **Example 1** Model 0.42. Write 0.42 as a percent.

**STEP 1** Write the decimal as a ratio.

0.42 = 42 hundredths = 42 out of 100.

**STEP 2** Make a model that shows 42 out of 100.



**STEP 3** Use the model to write a percent.

42 shaded squares =  $\frac{42}{9}$  percent, or  $\frac{42}{9}$ %



### **Example 2** Model 19 percent. Write 19% as a decimal.

**STEP 1** Write the percent as a fraction.

 $19\% = \frac{19}{100}$ 

**STEP 2** Make a model that shows 19 out of 100.

**STEP 3** Use the model to write a decimal.

19 shaded squares out of 100 squares =  $\frac{0.19}{}$ 

Possible answer: The sale prices are half of the original prices.



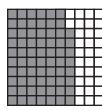
**Mathematical Practices** 

Suppose a store is having a 50% off sale. What does this mean?



Use the model. Complete each statement.

**1a.** 
$$0.68 = 68$$
 out of 100



- **1b.** How many squares are shaded?
- **1c.** What percent is shaded?

68

68%

Write the percents as decimals.

**2.** 47 percent

**3.** 11 percent

0.47

0.11

### On Your Own

Write the decimals as percents.

**4.** 0.20

**5.** 0.39

200/

**6.** 0.44

**7.** 0.93

20%

39%

44%

93%

**8.** 0.07

7%

**9.** 0.7

70%

**10.** 0.06

6%

**11.** 0.6

60%

Write the percents as decimals.

**12.** 12 percent

**13.** 31%

0.31

**14.** 99 percent

0.99

**15.** 13 percent

0.13

**16.** 4 percent

0.04

**17.** 14 percent

0.14

**18.** 90 percent

0.90, or 0.9

**19.** 9%

0.09

### **Problem Solving**



**20.** In basketball, Linda made 0.56 of her shots. What percent of her shots did Linda miss?

44 percent

#### Fractions, Decimals, and Percents

**Essential Question** How can you convert between fractions, decimals, and percents?

### PUnlock the Problem



Every percent and decimal number can also be written as a fraction. All fractions can be written as decimals and percents. For example,  $\frac{2}{5}$  of the songs in Bonnie's music collection are country songs. What percent of her song collection is country?



Write the percent that is equivalent to  $\frac{2}{5}$ .

**STEP 1** Set up the equivalent fraction with a denominator of 100.

$$\frac{2\times?}{5\times?} = \frac{100}{100}$$

**STEP 2** Ask: By what factor can you multiply the denominator to get 100?

**STEP 3** Multiply the numerator by the same factor, 20.

$$\frac{2\times20}{5\times20}=\frac{40}{100}$$

**STEP 4** Write the fraction as a percent.

$$\frac{40}{100} = \underline{40}$$
 percent

So,  $\frac{2}{5}$  equals  $\underline{40}$  percent.

### **More Examples**

A. Write  $\frac{8}{25}$  as a decimal.

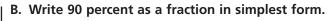
**STEP 1** Write an equivalent fraction with a denominator of 100.

$$\frac{8 \times 4}{25 \times 4} = \frac{32}{100}$$
 multiply denominator and numerator by 4

**STEP 2** Write the fraction as a decimal.

$$\frac{32}{100} = 0.32$$

Possible answer: Alike: Both have the same digits. Different: They have different values and 9% has a 0 in the tenths place.



**STEP 1** Write 90% as a fraction.

$$90\% = \frac{90}{100}$$

STEP 2 Simplify.

$$90\% = \frac{90 \div 10}{100 \div 10} = \frac{9}{10}$$



**Mathematical Practices** 

How are 9% and 90% alike when written as decimals? How are they different?



Complete the steps to write  $\frac{7}{20}$  as a percent.

1. By what factor should you multiply the denominator and numerator? \_

$$\frac{7\times?}{20\times?} = \frac{?}{100}$$

**2.** For  $\frac{7}{20}$ , what is an equivalent fraction with a denominator of 100?

**3.** What percent is equivalent to  $\frac{7}{20}$ ?

35%

Write a decimal, a percent, or a simplified fraction.

**4.**  $\frac{1}{4}$  as a decimal

**5.**  $\frac{3}{10}$  as a percent

**6.** 80% as a fraction

0.25

30%

#### On Your Own

Write a decimal, a percent, or a simplified fraction.

- 7.  $\frac{1}{2}$  as a percent
- **8.**  $\frac{9}{10}$  as a decimal
- 9.  $\frac{11}{20}$  as a percent
- **10.** 75% as a fraction

50%\_\_\_

0.9, or 0.90

**55%** 

- 11.  $\frac{3}{5}$  as a percent
- **12.**  $\frac{9}{25}$  as a decimal **13.**  $\frac{29}{50}$  as a percent
- **14.**  $\frac{1}{20}$  as a percent

60%

0.36

**58%** 

5%

- 15. 4% as fraction

- **16.**  $\frac{4}{5}$  as a percent **17.**  $\frac{24}{25}$  as a decimal **18.**  $\frac{41}{50}$  as a percent

80%

0.96

### Problem Solving



- **19.** Whitney has finished  $\frac{9}{20}$  of her book. What percent of the book does Whitney still need to read?
- **20.** Roger has completed  $\frac{4}{25}$  of his math homework. What percent of his math homework does he still need to do?

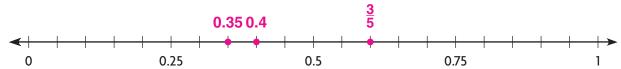
**55%** 



### **Concepts and Skills**

Locate each number on the number line. Then complete the sentence.

**1.** 0.4,  $\frac{3}{5}$ , 0.35



The number with the least value is **0.35** 

Write the numbers in order from least to greatest.

2. 
$$0.4, \frac{3}{5}, 0.55, \frac{1}{4}$$
  
 $\frac{1}{4}$ , 0.4, 0.55,  $\frac{3}{5}$ 

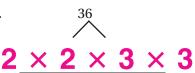
3. 
$$\frac{3}{4}$$
, 0.7,  $\frac{1}{2}$ , 0.1 0.7,  $\frac{3}{4}$ 

Use a factor tree to find the prime number factors.

4.



5.



6.

$$\overset{\stackrel{42}{\sim}}{2\times3\times7}$$

Write a decimal, a percent, or a simplified fraction.

- **7.** 0.08 as a percent
- 8.  $\frac{3}{5}$  as a decimal
- 9. 80% as a fraction
- **10.**  $\frac{13}{20}$  as a percent

- 8%
- 0.6, or 0.60
- <u>4</u> 5

65%

### **Problem Solving**



For 11–12, use the data in the table.

**11.** What percent of the apes in the Wild Country Zoo are orangutans?

**22%** 

**12.** One species makes up 40% of the apes in the zoo. Which species is it?

chimpanzees

| Apes in the Wild Country Zoo |        |
|------------------------------|--------|
| Species                      | Number |
| Bonobo                       | 4      |
| Chimpanzee                   | 20     |
| Gorilla                      | 15     |
| Orangutan                    | 11     |
| Total                        | 50     |

#### Fill in the bubble or grid completely to show your answer.

**13.** Entries for the Lake Manatee Bass Fishing Contest are shown. First place is awarded to the contestant with the heaviest fish.

| Lake Manatee<br>Bass Contest |                       |  |
|------------------------------|-----------------------|--|
| Contestant                   | Weight of fish caught |  |
| George                       | 6.25 pounds           |  |
| Mia                          | $6\frac{2}{5}$ pounds |  |
| Harvey                       | $6\frac{1}{3}$ pounds |  |

What is the correct order from first place to third place?

- A First: George, Second: Mia, Third: Harvey
- **B** First: Mia, Second: George, Third: Harvey
- First: Mia, Second: Harvey, Third: George
- D First: Harvey, Second: Mia, Third: George
- **14.** Ric used a factor tree to write 180 as a product of factors that are prime numbers. How many factors were in Ric's product?
  - **A** 2
  - **B** 3
  - **C** 4
  - **9** 5
- **15.** On Monday, 6% of the students at Riverside School were absent. Written as a decimal, what portion of Riverside's students attended school that day?
  - **(A)** 0.06
  - **B** 0.6
  - 0.94
  - **D** 9
- **16.** The Hastings family drove  $\frac{12}{25}$  of the distance to Yellowstone National Park on the first day of their vacation. What percent of the distance to the park remained for them to drive?
  - **A** 12%
- **C** 48%
- **B** 13%
- 52%

#### **Divide Fractions by a Whole Number**

**Essential Question** How do you divide a fraction by a whole number?

### Unlock the Problem



Four friends share  $\frac{2}{3}$  of a quart of ice cream equally. What fraction of a quart of ice cream does each friend get?

What operation will you use to solve the problem?





Divide.  $\frac{2}{3} \div 4$ 

#### STEP 1

Let the rectangle represent 1 quart of ice cream. Divide it into thirds by drawing vertical lines. Shade 2 of the thirds.



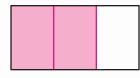
Divide the rectangle into fourths by drawing horizontal lines. Shade  $\frac{1}{4}$  of the  $\frac{2}{3}$  already shaded.



The rectangle is now divided into  $\frac{12}{}$  equal parts.

Each part is 12 of the rectangle. Of the 12 equal parts, 2 parts are shaded twice. So,

 $\frac{2}{12}$ , or  $\frac{1}{6}$  of the rectangle is shaded twice.





Math

Mathematical Practices

So, each friend gets  $\frac{2}{12}$ , or  $\frac{1}{6}$  of a quart of ice cream.

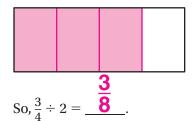
**Explain** why you divided the rectangle into fourths in Step 2.

Possible expanation: The  $\frac{2}{3}$  quart rectangle into form is being shared equally among 4 friends.

**Try This!** Divide.  $\frac{3}{4} \div 2$ 

#### STEP 1

Divide the rectangle into fourths. Shade 3 of the fourths.



#### STEP 2

Divide the rectangle into halves. Shade  $\frac{1}{2}$  of the  $\frac{3}{4}$  already shaded.



#### CTED Z

Of the 8 equal parts,  $\frac{3}{2}$  parts are shaded twice. So,  $\frac{8}{2}$  of the rectangle is shaded twice.



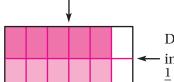


Complete the model to find the quotient. Write the quotient in simplest form.

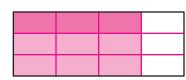
1. 
$$\frac{5}{6} \div 2 = \frac{5}{12}$$

**2.**  $\frac{3}{4} \div 3 = \underline{\qquad \qquad 4}$ 

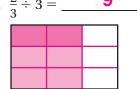
Divide the rectangle into sixths. Shade 5 of the sixths.



Divide the rectangle into halves. Shade  $\frac{1}{2}$  of  $\frac{5}{6}$ .



3.  $\frac{2}{3} \div 3 = \frac{9}{9}$ 



**4.**  $\frac{3}{5} \div 2 = \frac{10}{10}$ 

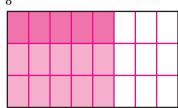
### On Your Own

Complete the model to find the quotient. Write the quotient in simplest form.

5. 
$$\frac{2}{5} \div 2 = \frac{1}{5}$$



**6.**  $\frac{5}{8} \div 3 =$  **24** 



Draw a model to find the quotient. Write the quotient in simplest form. Check students' models. 7.  $\frac{4}{9} \div 2 = \frac{2}{9}$  8.  $\frac{4}{5} \div 3 = \frac{4}{15}$ 

7. 
$$\frac{4}{9} \div 2 = \frac{2}{9}$$

**8.** 
$$\frac{4}{5} \div 3 = \underline{15}$$

## Problem Solving



**9.** Heather, Jocelyn, and Dane are each swimming one leg of a  $\frac{9}{10}$  mile race. They will divide the distance equally. How far will each team member swim?

#### **Ratios**

**Essential Question** How can you express real world quantities as ratios?

### Unlock the Problem



Max sells bouquets of roses. There are 3 yellow roses and 2 red roses. What is the ratio of yellow to red roses?

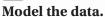
A ratio is a comparison of two numbers.

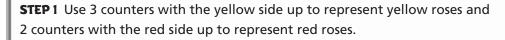
 A ratio is expressed by comparing one part to another, such as 4 feet to 20 toes, or 3 yellow roses to

2 red roses



#### **Activity** Materials ■ two-color counters







**STEP 2** Write the ratio of yellow to red roses.

• Ratios can be written in different ways.

3 to 2 or 3:2 or  $\frac{3}{2}$  (as a fraction)

So, the ratio of yellow roses to red roses is 3 to 2, 3:2, or

In the example above, you compared a part to a part. You can also use a ratio to compare a part to a whole or a whole to a part.

**Try This!** Show a ratio of red counters to total counters.

**STEP 1** Count to find the number of red counters. **5** 





5 to 7, 5:7,  $\frac{5}{7}$ . **STEP 3** Write the ratio.



The numbers would be reversed. The ratio would be 7 to 5, 7:5, or

How would the ratio change if you found the ratio of total counters to red counters?



Find the ratio of red counters to yellow counters.

**1a.** How many red counters are there?

**1b.** How many yellow counters are there?

**1c.** What is the ratio of red to yellow counters?

4 to 3, 4:3, or  $\frac{4}{3}$ 

#### Write the ratio.

### Students may write ratios in a different form. 3. total squares to dark squares

- 2. squares to circles



#### On Your Own

Students may write ratios in a different form.

For 4-6, use the drawing to write the ratio.

4. dark to light

5 to 3

5. light to dark

3 to 5

6. light to total

3 to 8



For 7-9, use the drawing to write the ratio.

**7.** triangles to circles

8. dark to light

**9.** total shapes to circles

to 4



For 10-12, write the ratio.

5 to 4

10. weekdays to weekend days

5 to

11. weekend days to days in a week

4 to 5

**12.** days in a week to days in January

7 to 31

### Problem Solving



13. The ratio of length to width in Gus's driveway is 13 yards to 4 yards. What is this ratio in feet? (Hint: 3 ft = 1 yd)

39 feet to 12 feet

## Unlock the Problem



To make brass, you can mix 2 parts zinc to 3 parts copper, a ratio of 2 to 3. If you have 12 bars of copper and use them all, how many bars of zinc do you need to make brass?

Since ratios can be written as fractions, 2 to 3 can be written as  $\frac{2}{3}$ . Use what you know about equivalent fractions to find equivalent ratios.



Use a diagram to find an equivalent ratio.

**STEP 1** Draw bars to represent a 2 to 3 ratio of zinc to copper.

**STEP 2** Add groups until you have 12 bars of copper.









copper

You know that each group of zinc to copper bars needed to make brass has a ratio of 2 to 3. How can you use this group to find an equivalent ratio?

Possible answer: Add equivalent



copper

groups. Since each group has the same ratio of 2 zinc

bars to 3 copper bars, the sum will also have a 2 to 3 ratio.

**STEP 3** Count the zinc bars. Write an equivalent ratio.

There are 8 zinc bars. So, 2 to 3 is equivalent to the ratio 8 to 12.

**Try This!** Use equivalent ratios to find out if 6:8 is equivalent to 18:24.

**STEP 1** Write the ratios as fractions.

$$6:8 = \frac{6}{8} \qquad \qquad 18:24 = \frac{18}{24}$$

**STEP 2** Write the fractions in simplest form. Then compare.

$$\frac{6 \div 2}{8 \div 2} = \frac{3}{4}$$

$$\frac{18 \div 6}{24 \div 6} = \frac{3}{4}$$

Both ratios equal  $\frac{3}{4}$ , so they are equivalent.

Possible answer: Ratios can be written as fractions. So, by writing the fractions in simplest form, I can compare them to see if they are equivalent.



Mathematical Practices

How does knowing how to simplify fractions help you decide whether two ratios are equivalent?



Are the ratios 3:5 and 12:20 equivalent?

**1a.** Write both ratios as fractions.

3. <u>12</u> 5, <u>20</u> **1b.** Are both ratios in simplest form?

no

**1c.** Write both ratios in simplest form.

 $\frac{3}{5}, \frac{3}{5}$ 

**1d.** Are the ratios equivalent?

yes

Write equivalent or not equivalent.

2. 1 to 3 and 2 to 6

equivalent

**3.** 3 to 7 and 12 to 21

not equivalent

### On Your Own

Write the equivalent ratio.

4. 
$$5 \text{ to } 2 = 10 \text{ to } 4$$

5. 
$$3 \text{ to } 6 = 7 \text{ to } \frac{14}{14}$$

7. 
$$14 \text{ to } 21 = \frac{10}{10} \text{ to } 15$$

9. 
$$8 \text{ to } 9 = 40 \text{ to } \frac{45}{}$$

Write equivalent or not equivalent.

**10.** 3:5 and 21:35

equivalent

**11.** 4 to 3 and 36 to 24

not equivalent

**12.** 27:72 and 9:24

equivalent

# Problem Solving (Real World)

**13.** Three of every 5 pizzas that Miggy's Pizza sells are cheese pizzas. Miggy's sold 80 pizzas today. How many of them would you expect were cheese?

48 pizzas

#### Rates

**Essential Question** How can you find rates and unit rates?

# Unlock the Problem



**CONNECT** You know how to write ratios to compare two quantities. A rate is a ratio that compares two quantities that have different units of measure. A unit rate is a rate that has 1 unit as its second term.

Rafael is shopping at a used book and music store. A sign advertises 4 CDs for \$12. What is the unit rate for the cost of 1 CD?



Write the rate in fraction form. Then find the unit rate.

#### STEP 1

Write the rate in fraction form to compare dollars to CDs.

$$\xrightarrow[CDs]{\text{dollars}} \xrightarrow{12}$$

#### STEP 2

Divide to find an equivalent rate so that 1 is the second term.

$$\frac{12}{4} = \frac{12 \div \cancel{4}}{4 \div \cancel{4}} = \frac{\cancel{3}}{\cancel{1}}$$
 unit rate

So, the unit rate for CDs is  $\cancel{\$3}$  for 1 CD

that are being compared?

### dollars and CDs

What are the units of the quantities

What operations can you use to write equivalent ratios?

multiplication and division

No; Possible explanation: The unit rate is  $\frac{1}{3}$ CD for \$1; you cannot buy part of a CD.

Math

**Mathematical Practices** 

Would it make sense to compare CDs to dollars to find a unit rate? Explain.

• What if the regular price of CDs is 5 for \$20? What is the unit rate for CDs at the regular price? Explain how you found your answer.

\$4 for 1 CD; Possible explanation: The rate is  $\frac{20}{5}$ . I divided the numerator and denominator by 5 to find the unit rate.



1. Find the unit rate of speed for 120 miles in 2 hours.

$$\frac{\text{miles}}{\text{hours}} = \frac{120}{2} = \frac{120 \div 2}{2^{\div}} = \frac{60}{1}$$

The unit rate of speed is 60 miles per 1 hour

#### Find the unit rate.

**2.** \$5.00 for 2 T-shirts

\$2.50 per T-shirt 3. 200 words in 4 min

50 words per min

**4.** 150 mi on 10 gal of gas

15 mi per gal

### On Your Own

Write the rate in fraction form.

**5.** 90 words in 2 min

<u>90</u> 2 **6.** \$1.20 for 6 goldfish

1.20 6 **7.** \$0.05 per page

0.05

#### Find the unit rate.

**8.** \$208 for 4 tires

\$52 per tire

**9.** 300 mi per 15 gal

20 mi per gal

**10.** 240 people per 2 sq mi

120 people per sq mi

### Problem Solving



**11.** An ice skating rink charges \$1.50 to rent ice skates for 30 minutes. What is the unit rate per hour for renting ice skates?

**\$3.00 per hour** 

### Distance, Rate, and Time

**Essential Question** How can you solve problems involving distance, rate, and time?

### Unlock the Problem



You can use the formula  $d = r \times t$  to solve problems involving distance, rate, and time. In the formula, d represents distance, r represents rate, and t represents time. The rate is usually a unit rate comparing distance to time, such as miles per hour.

• What are the given values?

What word is used in place of rate?

• What is the unknown value?

## **Example 1**

The winner of an automobile race drove 500 miles at an average speed of 150 miles per hour. How long did it take the winner to finish the race?

STEP 1

Write the formula.

 $d = r \times t$ 

STEP 2

Replace d with 500 and r with 150.

$$d = r \times t$$

$$00 = 150 \times t$$

STEP 3

Use what you know about inverse operations to find t.

$$500 \div \boxed{150} = t$$
$$3\frac{1}{3} = t$$

So, it takes the winner complete the race.

\_hours **20** 

Example 2

Possible answer: In Example 1, the missing value is a factor, so the inverse operation, division, must be used to find its value. In Example 2, the missing

A race car driver traveled at an average speed of 120 miles per hour to finish a race in 2 hours. What was the length of the race?

value is the product, which can be found using multiplication.

STEP 1

Write the formula.

 $d = r \times t$ 

STEP 2

Replace *r* with 120 and *t* with 2.

$$d = r \times t$$

STEP 3

Multiply to solve for d.

$$d = 120 \times 2$$

$$d = 240$$

Math Talk

**Mathematical Practices** 

Why were different operations used in Step 3 of Examples 1 and 2?

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So, the race was **240** miles long.



**1.** A cyclist travels 45 miles in 3 hours. What is the cyclist's speed?

Write the formula:  $d = r \times t$ Replace d with 45.

Replace t with 3.

The rate is 15 miles per hour.

#### Use the formula $d = r \times t$ to solve. Include the units in your answer.

**2.** A train travels at an average speed of 80 miles per hour for 5 hours. How far does the train travel?

400 miles

**3.** A horse travels at an average speed of 12 miles per hour. How long does it take the horse to travel 60 miles?

5 hours

### On Your Own

#### Use the formula $d = r \times t$ to solve. Include the unit in your answer.

**4.** A hiker travels at a speed of 3 miles per hour for 3 hours. How far does the hiker travel in that time?

9 miles

**5.** A snail travels at a speed of 2 centimeters per minute. How long does the snail take to travel 30 centimeters?

15 minutes

**6.** A boat travels 6 miles in 24 minutes. What is the average speed of the boat?

 $\frac{1}{4}$  mile per minute

7. d = 320 cm

 $r = \frac{40 \text{ cm per}}{\text{SeC}}$   $t = 8 \sec$ 

8. d = 300 km

r = 50 km per hr

 $t = 6 \,\mathrm{hr}$ 

**9.** d = 150 ft

t = 20 ft per min  $t = \frac{7\frac{1}{2} \text{ min or}}{7.5 \text{ min}}$ 

### **Problem Solving**



**10.** In an experiment, Ava found that it took a ball 5 seconds to roll down an 80-foot ramp. What is the average speed of the ball?

### 16 feet per second

**11.** Jason's family is driving 1,375 miles to Grand Canyon National Park. They plan to drive at an average speed of 55 miles per hour. How long will they be driving to reach the park?

### 25 hours



### **Concepts and Skills**

Draw a model to find the quotient. Write the quotient in simplest form.

**1.** 
$$\frac{3}{4} \div 3$$

**2.** 
$$\frac{2}{3} \div 5$$

### Check students' drawings.

3. 
$$\frac{3}{7} \div 2$$

For 4—6, use the drawing to write the ratio.

**4.** squares to triangles

3 to 3

**5.** total to dark 6 to 3 **6.** triangles to total

3 to 6



Write the equivalent ratio.

7. 
$$8 \text{ to } 3 = \frac{32}{100} \text{ to } 12$$

8. 
$$2 \text{ to } 6 = 4 \text{ to } \frac{12}{12}$$

**9.** 
$$11:4 = 44:16$$

Find the unit rate. (pp. P243-P244)

**10.** 45 visitors with 5 tour guides

9 visitors per guide

**11.** 450 mi on 15 gal of gas

30 mi per gal

**12.** \$56 in 8 hr

\$7 per hr

Use the formula  $d = r \times t$  to solve the problem. Include the units in your answer.

13. 
$$d = 120 \text{ km}$$

r = 40 km per hr

 $t = 3 \, \mathrm{hr}$ 

**14.** 
$$d = 90 \text{ ft}$$

r = 10 ft per sec

 $t = 9 \sec$ 

**15.** 
$$d = 300 \,\mathrm{mi}$$

 $_{r}$  75 mi per hr

 $t = 4 \, \mathrm{hr}$ 

### Problem Solving



Use the table for 16-17.

**16.** Fuel efficiency can be written as a rate comparing the distance driven to the gallons of gas used. What is the fuel efficiency of Car A written as a unit rate?

22 mi per gallon

17. During the test, Car B was driven at the speed of 48 miles per hour. How long did the test take?

| Fuel Test Results |                     |                 |
|-------------------|---------------------|-----------------|
| Car               | Distance<br>(in mi) | Gas<br>(in gal) |
| A                 | 308                 | 14              |
| В                 | 288                 | 12              |

#### Fill in the bubble completely to show your answer.

- **18.** To make fruit punch for a party, Alison used 3 quarts of pineapple juice and 2 gallons of orange juice. There are 4 quarts in a gallon. What is the ratio of pineapple to orange juice in quarts?
  - **A** 3 to 2
  - **B** 3 to 5
  - 3 to 8
  - **D** 8 to 3
- **19.** Three out of every 10 pairs of skis sold by Snow Sports are cross-country skis. Snow Sports sold 450 pairs of skis during the winter season. How many of the skis were likely to have been cross-country skis?
  - **A** 443
  - 135
  - **C** 45
  - **D** 30
- **20.** At Greentree Elementary School, there are 72 fifth graders in 3 classrooms. What unit rate describes this situation?
  - $\bigcirc$  14 $\frac{2}{5}$  fifth graders per class
  - **B** 18 fifth graders per class
  - 24 fifth graders per class
  - (D) 216 fifth graders per class
- **21.** Eduardo rides his bicycle for 6 hours. What was Eduardo's average speed if he rides a distance of 84 miles? Use the formula  $d = r \times t$ .
  - 🛕 504 mi per hr
  - **B** 90 mi per hr
  - © 78 mi per hr
  - 14 mi per hr

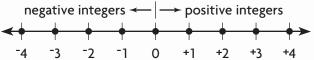
#### **Understand Integers**

**Essential Question** How can you use positive and negative numbers to represent real world quantities?

### Unlock the Problem



**Connect** You have used a number line to show 0 and whole numbers. You can extend the number line to the left of 0 to show the **opposites** of the whole numbers. For example, the opposite of <sup>+</sup>3 is <sup>-</sup>3. Any whole number or the opposite of a whole number is called an **integer**.



integers are written with or without a positive sign, <sup>+</sup>.

-4 -3 -2 -1 0 +1 +2 +3 +4

Negative integers are written with a negative sign, -. Positive

 How can you tell whether a number is an integer or not?

Possible answer:
It is an integer if it is a whole number or the opposite of a whole number.

## 🚹 Example 1

The temperature in Fairbanks, Alaska, was 37 degrees below zero. Write an integer to represent the situation.

**STEP 1** Decide whether the integer is positive or negative.

The word below tells me that the integer is negative

So, the temperature in Fairbanks was \_\_\_\_\_\_ degrees.

## **Example 2**

The Koala Bears gained 11 yards on a football play. Write an integer to represent the situation. Then, tell what 0 represents in that situation.

**STEP 1** Decide what positive integers and negative integers represent.

Positive integers represent yards

Negative integers represent yards

I ost

**STEP 2** Decide what 0 represents.

So, 0 means yards were neither **gained** 

nor **lost** 

Possible answers: below, less than, lost, before, under



**Mathematical Practices** 

**Identify** some words that might tell you that an integer is negative.



Write an integer to represent the situation.

1. a loss of \$25

The word *loss* represents an integer that is

The integer that represents the situation is  $\underline{\phantom{a}}$ .

**2.** 73 degrees above zero **73** 

**4.** a profit of \$76 + **76** 

Write an integer to represent the situation. Then, tell what 0 represents.

| Situation   | Integer         | What Does 0 Represent?            |
|---|-----------------|-----------------------------------|
| <b>5.</b> The passenger jet flew at an altitude of 34,000 feet. | +34,000         | sea level                         |
| <b>6.</b> Zack lost 45 points on his first turn.                | <sup>-</sup> 45 | neither gaining nor losing points |
| <b>7.</b> Craig was 20 minutes early for his appointment.       | <sup>-</sup> 20 | on time for the appointment       |

#### On Your Own

Write an integer to represent the situation.

- **10.** an increase of 37 students +37
- 11. 15 seconds before rocket liftoff

Write an integer to represent the situation. Then, tell what 0 represents.

| Situation   | Integer        | What Does 0 Represent?           |
|---|----------------|----------------------------------|
| <b>12.</b> Amelia earned \$1,200 in one week.       | +1,200         | neither earning nor losing money |
| <b>13.</b> The coal was 2 miles below ground level. | <sup>-</sup> 2 | ground level                     |
| <b>14.</b> The alarm clock rang 5 minutes early.    | <sup>-</sup> 5 | the alarm ringing on time        |

# Problem Solving (Real World)

- **15.** Gina withdrew \$600 from her checking account to pay for her new guitar. What integer can you write to represent the withdrawal? What does 0 represent?
  - 600; neither withdrawing nor depositing money in her checking acount

### **ALGEBRA** Lesson 13

### **Write and Evaluate Expressions**

**Essential Question** How can you write and evaluate expressions?

### **Unlock the Problem**



Montel hires Shea to buy some tools for him at the hardware store. Montel will pay Shea \$5 more than the cost of the tools she buys.

- **A.** How can you represent this payment as an expression?
- **B.** How can you use the expression to calculate what Montel will pay Shea?
- Write an expression for what Montel will pay.
- **STEP 1** Choose a variable and explain what it stands for.

Let *c* equal the cost of the tools.

**STEP 2** Write a word expression.

\$5 more than the cost.

**STEP 3** Replace the word expression with an addition expression using c.

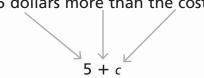
5 + c

So, an expression that tells how much Montel owes Shea is

• The problem states that Montel will pay \$5 more than cost. What operation do the words more than suggest?

addition

5 dollars more than the cost



Try This! If the tools cost a total of \$18, how much will Montel pay Shea? Evaluate the expression 5 + c for c = 18.

**STEP 1** Write the expression.

**STEP 2** Replace *c* with

**STEP 3** Add to evaluate.

5 + 18 = **23** 

Possible answers: more than, plus, greater than, in all, total, altogether



**Mathematical Practices** 

What key words might tell you that you need to use addition in a word problem?



Write an expression.

Tallahassee's temperature is 15 degrees less than the temperature in Miami.

**1a.** What operation does the phrase *less than* suggest?

subtraction

1c. Write an expression for Tallahassee's temperature. Let m stand for the temperature in Miami.

m - 15

1**b.** Write a word expression:

Possible answer: 15° less than the Miami temperature

1**d.** Evaluate the expression for Tallahassee's temperature for m = 90.

**75** 

Evaluate each expression for the value given.

**2.** b - 45 for b = 70

**3.** 13 + a for a = 40

**53** 

### On Your Own

Write an expression.

**4.** Zeke has some tropical fish, f. Dean gave Zeke 5 new fish. How many fish does Zeke have now?

f + 5

**5.** Myra had some candles, c. She used up 12 of them. How many candles does Myra have now?

Evaluate each expression for the value given.

**6.** s - 18 for s = 80

**9.**  $60 \div n$  for n = 20

**7.** 49 + k for k = 31

**10.**  $t \times 12$  for t = 8

**8.**  $w \times 6$  for w = 13

**11.** r - 25 for r = 110

## Problem Solving



**12.** Keith is 2 inches shorter than his sister. If *s* represents his sister's height, what expression can you write that represents Keith's height?

Possible answer: s-2

#### **Understand Inequalities**

**Essential Question** How can you use inequalities to solve problems?

### Unlock the Problem



Every morning, Bobbi's Hot Bagels makes a special claim. All bagels Bobbi's sells will be warm and less than 9 minutes old. What **inequality** can you write to represent in whole minutes how old Bobbi's bagels are?

An inequality is a number sentence that compares two unequal quantities and uses the symbols <, >,  $\le$ , or  $\ge$ .

 What clue words tell you that this problem involves an inequality?

# Possible answer: the words less than

Write an inequality using a variable.

**STEP 1** Write the inequality in words.

time  $\longrightarrow$  is less than  $\longrightarrow$  9

**STEP 2** Replace *time* with the variable *t*.

 $t \longrightarrow less than \longrightarrow 9$ 

**STEP 3** Replace the words *less than* with a *less than* (<) symbol.

*t* < 9

**Try This!** Graph the solutions on the number line. Of 3, 6, 9, and 12, which numbers are solutions for t < 9?

**STEP 1** In t < 9, replace t with 3. Repeat the process for t = 6, 9, 12.

t < 9

3 < **9 ←** true

**STEP 2** Identify the values that make t < 9 true.

6 < 9 ← true

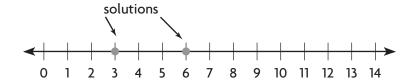
True values are solutions: t = 3, 6.

9 < 9 ← false

False values are not solutions: t = 3, 6.

 $12 < 9 \leftarrow false$ 

**STEP 3** Graph the solutions on a number line. Graph true values with filled circles.



Possible answer: 9 would also be a solution for the inequality.



**Mathematical Practices** 

How does the answer for the problem change if the inequality is "t is less than or equal to 9"?



Of 2, 5, and 8, which numbers are solutions for the inequality  $x \ge 5$ ? Graph the solutions on the number line.

**1a.** Replace *x* with 2. True or false?

2 ≥ 5. false



1**b.** Replace x with 5. True or false?

**5** ≥ **5**. true

1c. Replace x with 8. True or false?

**8** ≥ **5**, true

Show two solutions for the inequality on a number line.

**2.** a < 6

# Sample answers are shown. Any value less than 6 is correct.

On Your Own

Of 7, 10, and 13, which numbers are solutions for the inequality?

3. m > 8

10, 13

**4.**  $b \le 10$ 

7, 10

**7, 10, 13** 

Of 0, 4, 6, and 11, which numbers are solutions for the inequality?

**6.**  $d \ge 8$ 

**7.** r < 1

8. s > 4

6, 11

Show two solutions for the inequality on a number line.

**9.**  $n \le 6$ 



**10.** x > 2



# Problem Solving

Possible answers are shown. Check students' number lines.

11. For her birthday party, Dina wants to invite at least 8 guests but not more than 12 guests. How many guests might she have? Name all of the possibilities.

Dina can have 8, 9, 10, 11, or 12 guests.



### **Concepts and Skills**

Write an integer to represent the situation.

- 1. a shark 125 feet below sea level 125
- 2. a bank deposit of 300 dollars

+300

Write an integer to represent the situation. Then, tell what 0 represents.

| Situation                                       | Integer         | What Does 0 Represent?           |
|---|-----------------|----------------------------------|
| <b>3.</b> a gain of 13 yards by a football team | +13             | neither gaining nor losing yards |
| 4. a temperature of 25 degrees below zero       | <sup>-</sup> 25 | a temperature of zero degrees    |

Write an expression. Then evaluate the expression for the value given.

**5.** Miki has n dollars. Dora has 3 more dollars than Miki. How many dollars does Dora have? Evaluate for n = 14.

n + 3; \$17

**6.** Chip has *s* shells. Gina has 4 times as many shells as Chip. How many shells does Gina have? Evaluate for *s* = 6.

 $4 \times s$ ; 24 shells

Of 1, 3, 4, and 8, which numbers are solutions for the inequality?

**7.** a < 7

1, 3, 4

**8.** *b* ≥ 3

3, 4, 8

**9.** c > 4

8

**10.**  $d \le 8$ 

1, 3, 4, 8

### Problem Solving



Filters are set up to sort pennies, dimes, and nickels. A penny is 19 mm wide, a dime is 17.9 mm wide, and a nickel is 21 mm wide. Coins less than 20 mm wide will pass through the first level, and coins less than 18.5 mm wide will pass through the second level.

- drop coins

  Level 1 20 mm
- **11.** If you drop a large number of all 3 coins from above, which coins will be caught at Level 1? Which coins will pass through?

nickels; Dimes and pennies pass.

12. Which coins will be caught at Level 2? Which coins will pass through? **Pennies; Dimes pass.** 

- **13.** The lowest temperature ever recorded in North Dakota was 60 degrees below zero Fahrenheit. Which integer represents the temperature?
  - $\bigcirc$  0
  - **B** 60
  - <sup>-60</sup>
  - $(\mathbf{D})^{-0}$
- **14.** In football, a team receives 3 points for each field goal it makes. Which expression shows the number of points a team will receive for making *f* field goals?

  - $\bigcirc$  3×f
  - **©** f 3
  - $\bigcirc$   $f \div 3$
- **15.** The elevation of Central City is 84 feet above sea level. Which integer is the opposite of 84?
  - **(A)** 48
  - **B** +84
  - $(C)^{-48}$
  - <sup>-</sup>84
- **16.** Uncle Louie is at least 1 inch shorter than Miriam, and at least 2 inches taller than Jeffrey. Jeffrey's height is 64 inches. Miriam is not more than 5 inches taller than than Jeffrey. Which answer choice could be Uncle Louie's height?
  - (A) 65 inches
  - 67 inches
  - (C) 69 inches
  - (D) 70 inches

### **Polygons on a Coordinate Grid**

**Essential Question** How can you plot polygons on a coordinate grid?

**Connect** You have learned to plot points on a coordinate grid. You can use that skill to plot polygons on a coordinate grid.

### Tunlock the Problem



Camille is designing an indoor greenhouse on a coordinate grid. The floor of the greenhouse is a polygon. The vertices of the polygon can be graphed using the coordinates shown in the table. Plot and describe the floor of the greenhouse.

| X  | у  |
|----|----|
| 10 | 1  |
| 2  | 6  |
| 2  | 1  |
| 6  | 10 |
| 10 | 6  |

What do x and y represent in the table? Each (x, y) pair represents the x- and v-coordinates of a point.



Plot the polygon on a coordinate grid.

**STEP 1** Write ordered pairs.

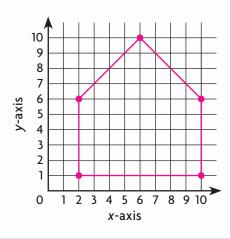
Use each row of the table to write an ordered pair.

**STEP 2** Graph a point for each pair on the coordinate grid.

**STEP 3** Connect the points.

pentagon So, the floor of the greenhouse is a \_\_\_

• What if the greenhouse floor had only four of the five vertices given in the table and did not include (6, 10). What would the shape of the floor be? a rectangle



• A parallelogram on a coordinate grid has vertices at (3, 4), (6, 1), and (8, 4). What are the coordinates of the fourth vertex? Explain how you found the answer.

(1, 1), (5, 7), or (11, 1); Possible answer: I plotted the three points on a coordinate grid and joined them to make three sides of a parallelogram. I used the shape to find the fourth vertex.

Possible answer: The number of sides equal the number of vertices.

Math Talk

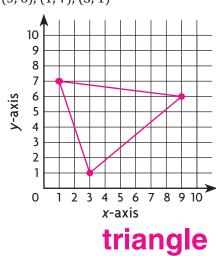
**Mathematical Practices** 

Suppose you know the vertices of a polygon. How can you identify what type of polygon it is without plotting the vertices on a coordinate grid?

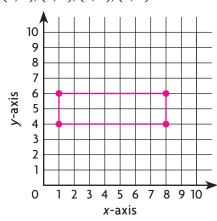


Plot the polygon with the given vertices on a coordinate grid. Identify the polygon.

**1.** (9, 6), (1, 7), (3, 1)



**2.** (1, 6), (8, 4), (1, 4), (8, 6)

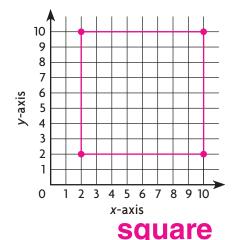


rectangle

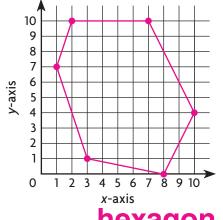
### On Your Own

Plot the polygon with the given vertices on a coordinate grid. Identify the polygon.

**3.** (2, 10), (10, 2), (10, 10), (2, 2)



**4.** (10, 4), (2, 10), (3, 1), (8, 0), (7, 10), (1, 7)



hexagon

### Problem Solving (R



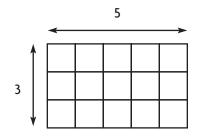
**5.** A football field is a rectangle measuring 300 ft by 160 ft. Each unit on a coordinate grid represents 1 foot. (0, 0) and (0, 160) are two of the coordinates of a football field drawn on the grid. What are the coordinates of the other two vertices?

(300, 0) and (300, 160)

#### Area of a Parallelogram

**Essential Question** How can you find the area of a parallelogram?

**Connect** You have learned that the area of a rectangle with base b and height h is  $A = b \times h$ . The rectangle shown has a base of 5 units and a height of 3 units. So, its area is  $A = 5 \times 3 = 15$  square units. You can use what you have learned about the area of a rectangle to find the area of a parallelogram.



### Unlock the Problem



The souvenir stand at Mighty Grasshopper basketball games sells parallelogram-shaped pennants. Each pennant has a base of 12 inches and a height of 5 inches.



Find the area of the parallelogram.

Materials ■ grid paper ■ scissors

**STEP 1** Draw the parallelogram on grid paper and cut it out.

**STEP 2** Cut along the dashed line to remove a right triangle.

**STEP 3** Move the right triangle to the right side of the parallelogram to form a rectangle.

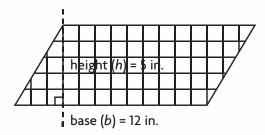
The height of the rectangle measures  $\underline{\phantom{0}}$  inches.

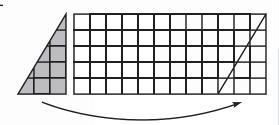
The area of the rectangle is

 $12 \times \underline{5} = \underline{60}$  square inches.

• **Explain** why the area of the parallelogram must equal the area of the rectangle.

Possible explanation: Both figures are made from the same amount of paper.





Possible explanation: Multiply the base times the height.

So, the area of a pennant is

$$12 \times 5 = 60 \text{ square inches.}$$



**Mathematical Practices** 

**Explain** how to find the area of a parallelogram if you know the base and the height of the figure.

### **Share and Show**

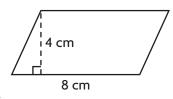


Find the area of the parallelogram.

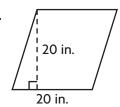
1.  $A = b \times h$ 

$$A = 8 \times 4$$

$$A =$$
 sq cm

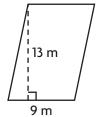


2.



$$A =$$
 **400** sq in.

3.



$$A = \underline{\hspace{1cm}} \mathbf{117} \qquad \operatorname{sq} \mathbf{m}$$

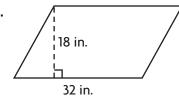


$$A =$$
 35 sa vd

### On Your Own

Find the area of the parallelogram.

5.



•



$$A =$$
 **28.25** sq cm

**7.** base = 0.6 cm

$$height = 0.15 cm$$

$$A = 0.09 \, \text{sg cm}$$

**8.** base = 1.8 m

$$height = 2.9 m$$

$$A = \frac{5.22}{\text{sq m}}$$

**9.** base =  $\frac{1}{2}$ ft

height = 
$$\frac{3}{8}$$
ft

$$A = \frac{3}{16} \text{ sq ft}$$

**10.** base =  $4\frac{1}{4}$ in.

$$height = 20 in.$$

$$A = 85 \text{ sq in.}$$

### Problem Solving



**11.** Carla made a border for her garden using parallelogram-shaped tiles. Each piece had a base of 4 in. and a height of  $2\frac{1}{2}$  in. She used 85 tiles. What was the total area of the border?

850 sq in.

How can you find the median if there

Divide the sum

of the two middle

is an even number of data items?

items by 2.

#### **Median and Mode**

**Essential Question** How can you describe a set of data using median and mode?

The **median** of a set of data is the middle value when the data are written in order. For example, a baseball team scored 6, 2, 6, 0, and 3 runs in five games. The median is 3 runs: 0, 2, 3, 6, 6.

If there is an even number of data items, the median is the sum of the two middle items divided by 2.

The **mode** of a data set is the data value or values that occur most often. A data set may have no mode, one mode, or several modes. The mode of the data set of baseball runs is 6.

### Unlock the Problem



For the Science Fair, Ronni grew 9 sweet pea plants under different conditions. Here are the plants' heights, in centimeters: 11, 13, 6, 9, 15, 7, 9, 17, 12.

What are the median and mode of the data?

- Find the median and mode.
- **STEP 1** Order the heights from <u>least</u> to greatest.

6, 7, **9 9 11 12 13 15 17** 

STEP 2 Circle the middle value.

So, the median is \_\_\_\_\_\_ centimeters.

**STEP 3** Identify the data value that occurs most often. 9 occurs two times.

So, the mode is \_\_\_\_\_ centimeters.

#### Math Talk

Mathematical Practices

Try This! Find the median and mode of the numbers: 8, 11, 13, 6, 4, 3.

**STEP 1** Order the numbers from least to greatest.

3 4 6 8 11 13

STEP 2 There is an even number of data items, so divide the sum of the two middle items by 2.  $\frac{6+8}{2} = \frac{14}{2} = \frac{7}{2}$ 

Possible answer: 5, 6, 6, 6, 7, 8, 8, 8

Give an example of a data set

with two modes.

So, the median is =  $\frac{7}{}$ 

**STEP 3** No data value appears more than once.

So, the data set has **no** mode.

#### **Share and Show**



#### Find the median and the mode of the data.

- 25, 21, 22, 18, 23, 24, 25
  median: \_\_\_\_\_\_\_ students
  mode: \_\_\_\_\_\_ students

**2.** numbers of students in math classes:

- 3. numbers of 3-point baskets made:
  2, 0, 5, 4, 5, 2, 5, 2
  median:
  3 3-point baskets
  mode:
  3 3-point baskets

### On Your Own

#### Find the median and the mode of the data.

5. ages of first 10 U.S. presidents when inaugurated:
57, 61, 57, 57, 58, 57, 61, 54, 68, 51
median: 57 years
mode: 57 years

- 6. weights of rock samples (pounds): 39, 28, 21, 47, 40, 33 median: \_\_\_\_\_\_ pounds mode: \_\_\_\_\_ pounds
- 7. lengths of humpback whale songs (minutes): 25, 29, 31, 22, 33, 31, 26, 22 median: 27.5 minutes mode: 22, 31 minutes
- 8. Sascha's test scores:
  90, 88, 79, 97, 100, 97, 92, 88, 85, 92
  median:
  91
  mode: 88, 92, 97

## Problem Solving (Real world)

**9.** Adrian recorded the daily high temperatures the first two weeks of July. What were the median and mode of her data?

| median: | 99.5 | 0]   |
|---------|------|------|
| mode:   | 98   | _ •F |

| Daily High Temperatures (°F) |    |    |     |     |     |     |  |  |  |
|------------------------------|----|----|-----|-----|-----|-----|--|--|--|
| 101                          | 99 | 98 | 96  | 102 | 101 | 98  |  |  |  |
| 101                          | 98 | 95 | 100 | 102 | 98  | 102 |  |  |  |

### Finding the Average

**Essential Question** How can you find the average of a set of values?

An average of a set of data can be found by finding the sum of the group of numbers from the data and then dividing by the number of addends.

For example, if Anne scores 21 points, 22 points, and 17 points in 3 different basketball games, she scores an average of 20 points per game. This is because 21+22+17=60, and  $60\div 3$ , the total number of points divided by the number of games, is 20.

### Unlock the Problem



Jonathon and Pilar are practicing to be a juggling team. The table shows the number of seconds they were able to keep 4 balls in the air without making a mistake. What was the average number of seconds they were able to juggle?

| Trial | Seconds |
|-------|---------|
| a     | 32      |
| b     | 8       |
| С     | 62      |
| d     | 55      |
| е     | 13      |

How many trials did they record?

5



Find the average of the times.

**STEP 1** Find the sum of the seconds.

$$32 + 8 + 62 + 55 + 13 = 170$$

**STEP 2** How many numbers did you add?

5 numbers

**STEP 3** Divide the sum by the number of addends.

So, the average time that Jonathon and Pilar kept 4 balls in the air was seconds per trial.

**Try This!** Find the average of 61, 99, 106, 3, 44, and 89.

**STEP 1** Find the sum.

$$61 + 99 + 106 + 3 + 44 + 89 = 402$$

**STEP 2** Divide the sum by the number of addends.

$$402 \div 6 = 67$$

So, the average of 61, 99, 106, 3, 44, and 89 is **67** 

Possible answer: They might juggle for about 34 seconds before they make a mistake.



**Mathematical Practices** 

Use the jugglers' average time per trial. What might you expect of them in their next trial?

### **Share and Show**



Tommy's basketball scoring record is shown for this month. What was the average number of points that Tommy scored per game?

**1a.** Find the sum of the points Tommy scored.

| 1   |     | 2   |
|-----|-----|-----|
| 136 | poi | nts |

| Game   | 1  | 2  | 3  | 4  | 5 | 6  | 7  | 8 |
|--------|----|----|----|----|---|----|----|---|
| Points | 24 | 11 | 31 | 14 | 9 | 21 | 18 | 8 |

**1b.** How many numbers did you add to find the sum in Exercise 1?

8

**1c.** Divide the sum by the number of games. What is the average number of points per game?

17 points

Find the average of the set of numbers.

**2.** 6, 9, 14, 4, 12

9

**3.** 44, 55, 33, 22, 40, 40

39

#### On Your Own

Find the average of the set of numbers.

**4.** 4, 8, 12, 14, 15, 19

12

**7.** 17, 91, 49, 73, 115, 27

**62** 

**10.** 2,439; 801; 1,508; 0

1,187

**5.** 28, 20, 31, 17

24

**8.** 5, 8, 13, 4, 22, 6, 0, 5, 9

8

**11.** 13, 12, 11, 13, 15, 13, 19, 22, 13, 19

, 19

15

**6.** 100, 140, 60, 120, 180

120

**9.** 637, 492, 88, 743

490

**12.** 78, 61, 51, 99, 8, 112, 76,

32, 59

64

**13.** Find the average temperature.

52°F

| Day              | 1  | 2  | 3  | 4  | 5  | 6  | 7  |
|------------------|----|----|----|----|----|----|----|
| Temperature (°F) | 48 | 59 | 38 | 53 | 61 | 61 | 44 |

### **Problem Solving**



**14.** In the temperature table above, suppose the temperature for the next 2 days was 70 degrees. By how much would this change the average temperature over the entire period?

4 degrees

**Essential Question** How can you use a histogram to organize data?

### **Unlock the Problem**



**Activity** The table below shows the ages of the members of a bicycle club. Make a histogram of the data. A histogram is a bar graph that shows how often data occur in intervals.

|   | Ages of Members in a Bicycle Club |    |    |    |    |    |    |    |    |    |    |    |    |    |
|---|-----------------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 3 | 34                                | 38 | 29 | 41 | 40 | 35 | 50 | 20 | 47 | 22 | 19 | 21 | 18 | 17 |
| 2 | 26                                | 30 | 41 | 43 | 52 | 45 | 28 | 25 | 39 | 24 | 23 | 25 | 50 | 59 |

Math Idea

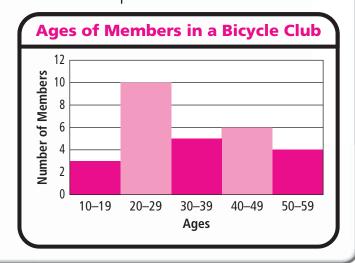
In a histogram, the bars touch because they represent continuous intervals.

**STEP 1** Make a frequency table with intervals of 10. Fill in the frequencies.

**STEP 2** Choose an appropriate scale and interval for the vertical axis, and list the intervals on the horizontal axis. Label each axis.

**STEP 3** Draw a bar for each interval. Give the histogram a title.

| Ages  | Tally | Frequency |
|-------|-------|-----------|
| 10–19 | Ш     | 3         |
| 20–29 | ШШ    | 10        |
| 30–39 | Ш     | 5         |
| 40–49 | ШІ    | 6         |
| 50–59 |       | 4         |



What if you changed the histogram to show four age groups with 12-year intervals?

How would the histogram change?

Possible answer: There would only be 4 bars but the frequencies would still add up to the same number. Each interval would include more ages. Possible explanation: In a bar graph with categories,

there are spaces between the bars. A histogram shows

Math **Mathematical Practices** Talk

> Explain how a histogram and a bar graph with categories are different.

P265

#### Share and Show



#### For 1-3, use the data below.

The number of vacation days that each employee of a company took last summer is given below.

2, 5, 6, 11, 3, 5, 7, 8, 10, 1, 4, 6, 10, 5, 12, 15, 6, 8, 7, 14

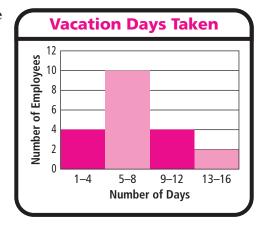
1. Start at 1 day and use 4 days for each interval. List the intervals.

1-4, 5-8, 9-12, 13-16

**2.** Complete the frequency table.

| Number of Days | Tally | Frequency |
|----------------|-------|-----------|
| 1-4            | Ш     | 4         |
| 5-8            | ШШ    | 10        |
| 9-12           |       | 4         |
| 13-16          |       | 2         |

**3.** Complete the histogram.



#### On Your Own

#### For 4-6, use the data below.

The number of minutes that each student in Mrs. Green's class spent on homework last night is given below.

45, 30, 55, 35, 50, 48, 60, 38, 47, 56, 40, 39, 55, 65, 49, 34, 35

4. Start at 30 and use 10-minute intervals for the data. List the intervals.

30-39, 40-49, 50-59, 60-69

**5.** Make a frequency table of the data.

Check students' frequency tables.

**6.** Make a histogram of the data.

Check students' histograms.

### Problem Solving Real World

**7.** The number of words per minute that one class of students typed is given below.

30, 45, 28, 35, 48, 37, 41, 44, 34, 29, 25, 32, 40, 45, 39, 49

What are reasonable intervals for the data?

Possible answer:

<u>25–29, 30–34, 35–39, 40–44, 45–49</u>

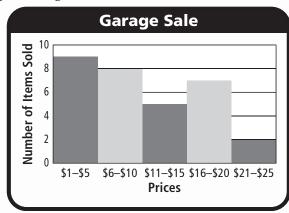
### **Analyze Histograms**

**Essential Question** How can you analyze data in a histogram?

### Unlock the Problem



The histogram shows the number of items sold at a garage sale within each price range.



#### **ERROR Alert**

Remember to read the intervals. For some questions, you may need to combine data from two or more intervals in order to answer the question.

- How many of the items sold cost \$6 to \$10?
- Find the interval labeled \$6-\$10.
- Find the frequency.
- The bar for \$6–\$10 shows that items were sold.
- of the items sold cost \$6 to \$10.
- How many of the items sold cost \$16 to \$25?
- Find the frequencies for the intervals labeled \$16-\$20 and \$21-\$25.
- The bar for \$16–\$20 shows that items were sold. The bar for \$21-\$25 shows that items were sold.
- Add the frequencies.

of the items sold cost \$16 to \$25.



**Mathematical Practices** 

Possible explanation: You do not know how many of each item sold at a certain price.

Explain why you cannot tell from the histogram the total amount of money that was made during the garage sale.

### Share and Show



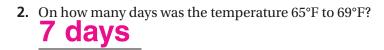
For 1-3, use the histogram at the right.

- 1. The histogram shows the number of days in one month whose temperatures were within each temperature range. On how many days was the temperature at or above 70°F?
  - List the bars that represent temperatures at or above 70°F.

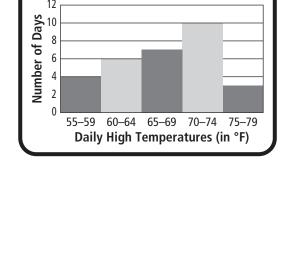
70-74 and 75-79

- The frequency for interval 70–74 is \_ frequency for interval 75-79 is \_
- Add the frequencies.

The daily high temperature was at or above 70°F on



**3.** On how many days was the temperature less than 65°F?



**Daily High Temperatures** 

12

#### On Your Own

For 4-5, use the histogram at the right.

- **4.** Which interval has the greatest frequency?
- 5. How many days did Maxine ride the stationary bike for 30 or more minutes?

## Problem Solving

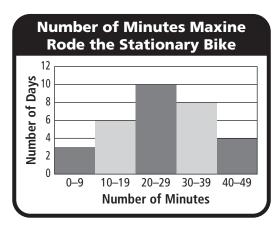
For 6-7, use the histogram at the right.

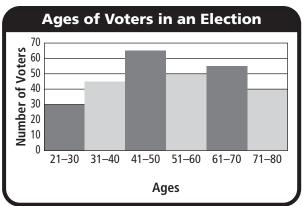
**6.** How many people voted in the election?

285 people

7. How many more voters were there from ages 41-50 than from ages 21-30?

35 more voters





### **Concepts and Skills**

**1.** Plot and identify the polygon with vertices at (4, 0), (8, 7), (4, 7), and (8, 0).

### rectangle

2. A parallelogram has a base of 8.5 cm and a height of 6 cm. What is the area of the parallelogram?

### 51 sq cm

**3.** Find the median and mode of Erin's math sores: 93, 88, 85, 93, 100, 94, 85, 89,

median

\_\_\_<sub>mode</sub> <u>85</u> and 93

**4.** Find the average of the following temperatures: 59°F, 66°F, 59°F, 67°F, 54°F, 64°F, 72°F.

average



The math test scores for Miss Jackson's class are given below.

88, 94, 86, 78, 65, 83, 71, 74, 92, 73, 95, 71, 100, 98, 68, 85, 81, 93, 89, 84

- **5.** Make a histogram for the data using intervals of 10.
- **6.** Which interval has the greatest frequency?

### Possible interval: 81-

**7.** How many students received grades greater than 80?

### Check students' graphs.

10

8

7 6

4

3

0

2 3 6

x-axis

### Problem Solving



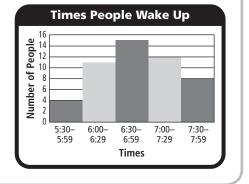
For 8-9, use the histogram. The histogram shows the times that people wake up in the morning.

**8.** How many people were surveyed?

50 people

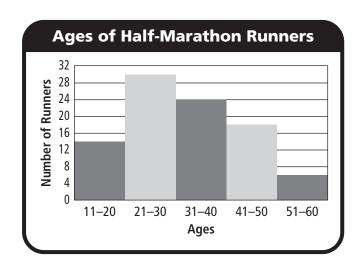
9. How many more people surveyed wake up between 6:30 and 6:59 than between 7:30 and 7:59?

more people



#### Fill in the bubble completely to show your answer.

- **10.** On a map of the town of Barton, City Hall Park has three of its four vertices at (15, 0), (5, 0), and (15, 9). City Hall Park is a rectangle. What are the coordinates of the park's fourth vertex?
  - (5,9)
  - **(B)** (9, 5)
  - **(**5, 15)
  - **(**9, 15)
- **11.** A window at an art gallery is shaped like a parallelogram. The base measures 1.2 meters and the height measures 0.8 meters. What is the area of the window?
  - (A) 0.48 sq m
  - 0.96 sq m
  - (C) 1.92 sq m
  - **(D)** 2.0 sq m
- **12.** The ages of the members of the Chess Club are given below. What is the median age?
  - 13, 9, 10, 9, 14, 13, 8, 9
  - **(A)** 9
  - 9.5
  - **(C)** 10
  - **(D)** 10.5
- **13.** The histogram shows the ages of runners in a half-marathon. How many runners are between the ages of 21 and 40?
  - **(A)** 24
  - **(B)** 30
  - **(C)** 42
  - 54



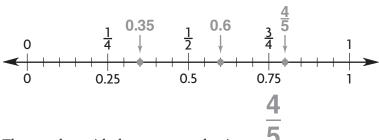
#### Lesson 1

### **Compare Fractions and Decimals**

Locate each number on a number line. Then complete the sentence.

Check students' number lines.

1.  $0.6, \frac{4}{5}, 0.35$ 



The number with the greatest value is \_\_\_\_\_\_

- 2.  $3\frac{1}{4}$ , 3.45,  $3\frac{1}{3}$ The number with the greatest value is **3.45**.
- 3.  $2\frac{4}{5}$ , 2.65,  $2\frac{3}{4}$ The number with the least value is **2.65**.
- **4.**  $4\frac{1}{2}$ ,  $4\frac{1}{6}$ , 4.85

  The number with the greatest value is **4.85**.

### Problem Solving (Re

- **6.** Leonardo correctly answered 0.8 of the questions on his math exam. Liam correctly answered  $\frac{9}{10}$  of the questions. Keira correctly answered  $\frac{3}{4}$  of the questions. Who correctly answered the greatest number of questions?
  - Liam

7. Lana bought 1.25 pounds of ground beef at the market. Jada bought  $1\frac{2}{5}$  pounds of ground beef. Willow bought 1.8 pounds of ground beef. Which person bought the least amount of ground beef?

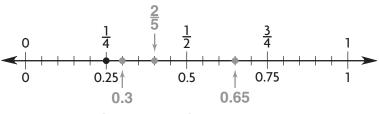
### Lana

#### **Order Fractions and Decimals**

For 1-2, locate each number on a number line. Then write the numbers in order from least to greatest.

# Check students' number lines.

**1.** 0.3, 
$$\frac{1}{4}$$
,  $\frac{2}{5}$ , 0.65



$$\frac{1}{4}$$
, 0.3,  $\frac{2}{5}$ , 0.65

$$8\frac{1}{5}$$
, 8.44, 8.5,  $8\frac{4}{5}$ 

For 3–6, locate each number on a number line. Then write the numbers in order from greatest to least.

**3.** 
$$\frac{7}{10}$$
, 0.888,  $\frac{3}{5}$ , 0.27

$$0.888, \frac{7}{10}, \frac{3}{5}, 0.27$$

**4.** 
$$7\frac{9}{10}$$
, 8.04,  $7\frac{1}{6}$ , 7.85

**2.**  $8\frac{1}{5}$ , 8.5,  $8\frac{4}{5}$ , 8.44

8.04, 
$$7\frac{9}{10}$$
, 7.85,  $7\frac{1}{6}$ 

**5.** 4.33, 
$$5\frac{2}{5}$$
, 5.8,  $4\frac{1}{4}$ 

5.8, 
$$5\frac{2}{5}$$
, 4.33,  $4\frac{1}{4}$ 

**6.** 
$$\frac{5}{8}$$
, 0.67, 1.2,  $\frac{3}{5}$ 

1.2, 0.67, 
$$\frac{5}{8}$$
,  $\frac{3}{5}$ 

### **Problem Solving**



**7.** Judges in a diving competition gave scores of 9.3,  $9\frac{1}{2}$ ,  $9\frac{4}{5}$ , 9.95, and  $9\frac{1}{4}$ . Which two scores were closest to one another? Explain.

9.3 and  $9\frac{1}{4}$  are closest. Possible explanation: On a number line, these two values are closest to each other.

**8.** In gym class, you run one mile. You finish in  $8\frac{9}{10}$  minutes. Ina finishes in 8.45 minutes. Davis finishes in  $8\frac{1}{3}$  minutes. Order the finishing times from shortest to longest time.

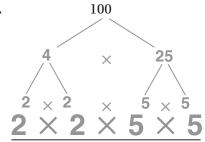
$$8\frac{1}{3}$$
, 8.45,  $8\frac{9}{10}$ 

#### **Factor Trees**

Use a factor tree to find prime factors.

### Check students' factor trees.

1.



2.



3.



 $2 \times 3 \times 7$ 

| 2 | X   | 3 | X   | 3 | X   | 3 |
|---|-----|---|-----|---|-----|---|
|   | • • |   | • • |   | • • |   |

4.



5.



6.



 $2 \times 2 \times 2 \times 7$ 



$$2 \times 3 \times 3 \times 5$$

**7**.



8.



9.



 $\frac{2\times2\times2\times}{3\times5}$ 

$$5 \times 5 \times 7$$

$$\frac{2\times2\times3\times}{5\times5}$$

### **Problem Solving**



- 10. What is the least number that has 4 odd factors that are all the same? Each factor is greater than 1, and can have only 1 and itself as factors. Explain how you found the number.
  - 81; Possible explanation: 3 is the least odd number greater than 1. Since the only factors of 3 are 1 and itself, find  $3 \times 3 \times 3 \times 3$ .

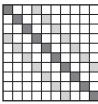
#### **Model Percent**

Use the diagram to write the percent.

10%

30%

- 1. dark shading
- 2. light shading
- 3. not shaded



14%

20%

.

76%

50%



**4.** not shaded

5. dark shading

**6.** light shading



Write the closest benchmark for the percent.

**7.** 8%

**8.** 52%

**9.** 99 percent

0%

50%

100%

**10.** 87%

**11.** 12 percent

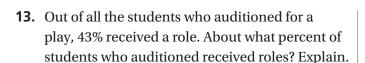
**12.** 45%

100%

0%

**50%** 

### Problem Solving (Real World



E00/ Descible explanation, 420/ is

50%. Possible explanation: 43% is closest to 50%.

**14.** The school cafeteria is holding an election for students to vote on which items they would like to see on the lunch menu. The choices for entrees are grilled chicken and veggie pizza. 36% of students vote for veggie pizza. Which item will be on the lunch menu?

Grilled chicken. Possible

explanation: 36% is less than half,

so more than half of the students must have voted for grilled chicken.

#### **Relate Decimals and Percents**

Write the decimals as percents.

Write the percents as decimals.

**Problem Solving** 



**25.** In baseball, Anthony hit 0.63 of the pitches thrown at him. What percent of the pitches did Anthony miss?

**37%** 

**26.** In a theater, 0.85 of the seats are filled. What percent of the seats are empty?

15%

#### Fractions, Decimals, and Percents

Write a decimal, a percent, or a simplified fraction.

**1.** 
$$\frac{1}{4}$$
 as a percent

**2.** 
$$\frac{7}{10}$$
 as a decimal

3. 
$$\frac{13}{20}$$
 as a percent

5. 
$$\frac{2}{5}$$
 as a percent

**6.** 
$$\frac{9}{20}$$
 as a decimal

**7.** 
$$\frac{21}{50}$$
 as a percent **8.**  $\frac{1}{25}$  as a percent

**8.** 
$$\frac{1}{25}$$
 as a percen

10. 
$$\frac{3}{5}$$
 as a percent

**10.** 
$$\frac{3}{5}$$
 as a percent **11.**  $\frac{12}{25}$  as a decimal **12.**  $\frac{3}{10}$  as a percent

**12.** 
$$\frac{3}{10}$$
 as a percent

**13.** 
$$\frac{3}{4}$$
 as a percent

**15.** 
$$\frac{1}{5}$$
 as a percent

**16.** 
$$\frac{9}{10}$$
 as a percent

### Problem Solving



**17.** Ashlee has finished  $\frac{7}{25}$  of her homework. What percent of the homework does Ashlee still need to finish?

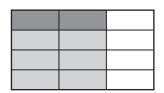
18. Luz catches 83% of the balls in the outfield. What fraction of the balls does she not catch?

| _ | 17 | 7 |
|---|----|---|
| 1 | 0  | 0 |

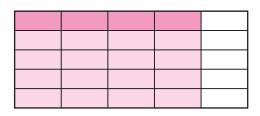
### **Divide Fractions by a Whole Number**

Complete the model to find the quotient. Write the quotient in simplest form.

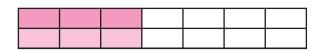
1. 
$$\frac{2}{3} \div 4 = \frac{1}{6}$$



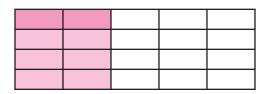
2. 
$$\frac{4}{5} \div 5 = 25$$



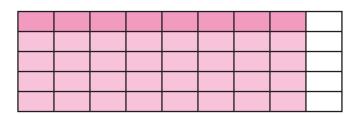
3. 
$$\frac{3}{7} \div 2 = \frac{3}{14}$$



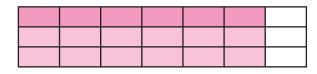
4. 
$$\frac{2}{5} \div 4 = \frac{10}{10}$$



5. 
$$\frac{8}{9} \div 5 = \frac{8}{45}$$



**6.** 
$$\frac{6}{7} \div 3 = \frac{2}{7}$$



## Problem Solving (Re



7. Annie, Zane, Erin, and Kenny are each running one leg of  $a_2^1$ -mile relay race. They will divide the distance equally. How far will each person run?

#### **Ratios**

For 1-3, use the drawing to write the ratio.

**1.** dark squares to light squares

7 dark squares 3 light squares

7 to 3

2. light squares to total squares

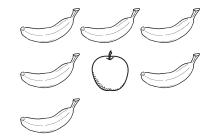
3. light squares to dark squares



3 to 10 3 to 7

For 4-6, use the drawing to write the ratio.

- 4. total fruit to bananas
- 5. apples to bananas
- 6. apples to total fruit



7 to 6

to 6

1 to <u>7</u>

For 7-12, write the ratio.

- **7.** weekend days to weekdays
- 8. months in a year to months that start with a vowel
- **9.** months that start with F to months in a year

2 to 5

12 to 3

to 12

- **10.** vowels to consonants in **RATIO**
- **11.** vowels to letters in **MATHEMATICS**
- **12.** letters to consonants in **NUMBERS**

3 to 2

4 to 11

7 to 5

### **Problem Solving**



13. Amanda has 15 coins in her pocket. Of these, 8 are quarters. What is the ratio of quarters to coins in Amanda's pocket?

8 to 15

14. Michael has \$0.50 in dimes in his pocket. He also has \$0.20 in nickels in his pocket. What is the ratio of the number of dimes to nickels in Michael's pocket?

5 to 4

### **Equivalent Ratios**

Write the equivalent ratio.

1. 
$$8 \text{ to } 20 = 4 \text{ to } 10$$

3. 
$$2 \text{ to } 3 = 20 \text{ to } \boxed{30}$$

$$\frac{8 \div 2}{20 \div 2} = \frac{4}{10}$$

5. 
$$6 \text{ to } 9 = \frac{18}{1000} \text{ to } 27$$

7. 
$$11 \text{ to } 12 = 33 \text{ to }$$

Write equivalent or not equivalent.

**10.** 15:10 and 3:2

- **11.** 24 to 16 and 8 to 4
- **12.** 6:9 and 24:45

### equivalent

### not equivalent

not equivalent

**13.** 6:24 and 9:45

- **14.** 15 to 20 and 3 to 4
- **15.** 2:3 and 8:12

### not equivalent

### equivalent

### equivalent

### Problem Solving (R



**16.** Are the ratios of free throws made to free throws attempted by the Rockets and by the Turbos equivalent?

#### no

**17.** In another game, the Rockets attempted only 12 free throws. If the ratio of free throws made to free throws attempted stays the same, how many free throws would you expect the team to make?

|   | Basketball Game Stats |                     |                          |  |  |  |  |  |
|---|-----------------------|---------------------|--------------------------|--|--|--|--|--|
|   | Team                  | Free Throws<br>Made | Free Throws<br>Attempted |  |  |  |  |  |
| ĺ | Rockets               | 8                   | 24                       |  |  |  |  |  |
|   | Turbos                | 16                  | 36                       |  |  |  |  |  |

#### Rates

Write the rate in fraction form.

1. 80 cars in 20 minutes

**4.** \$12 for 6 boxes

2. 20 feet in 4 seconds

**5.** \$96 for 8 DVDs

3. 250 words per 15 minutes

**6.** 800 miles in 16 hours

Find the unit rate.

**7.** \$4.80 for 4 markers

- **10.** 276 mi on 12 gal of gas
- **8.** 60 oz for 10 servings

# 6 oz per serving

**11.** \$45 for 5 tickets

**9.** 27 songs on 3 CDs

### 9 songs per CD

**12.** 160 mi in 4 hr

### 23 mi per gal

### \$9 per ticket

40 mi per hr

**13.** 42 tbsp in 7 batches

6 tbsp per batch **14.** 18 exercises in 6 min

3 exercises per min

**15.** \$72 for 9 hr

\$8 per hr

### **Problem Solving**



For 16-18, use the advertisement for the toy store.

**16.** Find the unit rate for the board games.

### <u>\$12 per game</u>

**17.** Tyler has \$20. Is this enough to buy one radio-controlled car? Use a unit rate to explain your answer.

Yes; the unit rate is \$16 per car.

**18.** Building block sets are usually priced at \$18 per set. How much can you save by buying one set at the sale price?

<u>\$4</u>

#### This Week's Specials

Radio-Controlled Cars \$80 for 5

> Board Games \$36 for 3 games

Miniature Building Blocks \$28 for 2 sets

#### Distance, Rate, and Time

Use the formula  $d=r\times t$  to solve. Include the unit in your answer.

1. A truck continuously travels at an average speed of 60 miles per hour. How long does it take the truck to travel 240 miles?

**3.** A cyclist travels 7 hours at a speed of 11 miles per hour. How far does the cyclist travel?

 $d = r \times t$   $240 = 60 \times t$   $240 \div 60 = t$  4 = t 4 hr

### 300 m per min

77 mi

**4.** d = 300 cm

r = 2 cm per min

<sub>t=</sub> 150 min

7. *d* = 1,200 mi

r = 120 mi per hr

 $t = 10 \,\mathrm{hr}$ 

5. d = **270 mi** 

r = 45 mi per hr

 $t = 6 \, \mathrm{hr}$ 

**8.**  $d = 700 \, \text{ft}$ 

 $_{r}$  14 ft per min

 $t = 50 \, \mathrm{min}$ 

**6.**  $d = 400 \, \text{yd}$ 

 $_{r}$  20 yd per min

 $t = 20 \min$ 

**9.** d = 1,200 mi

r = 600 mi per hr

**2** hr

### Problem Solving Real World

Use the road signs and the formula.  $d = r \times t$ 

**10.** How long will it take a car traveling the speed limit to reach Crestview?

3 hr

**11.** A car travels the speed limit. Can it reach Oceanside in 4 hours? Explain.

Yes; Possible explanation:
The car can travel 260 miles
in 4 hours, and 230 < 260.



#### **Understand Integers**

Write an integer to represent the situation.

- **1.** 5 degrees below zero \_\_\_\_**5**

- **2.** a profit of \$37 \_\_\_\_\_

Write an integer to represent the situation. Then, tell what 0 represents.

| Situation  | Integer            | What Does 0 Represent?           |  |  |
|--|--------------------|----------------------------------|--|--|
| 7. Trisha earned \$18 babysitting.                     | +18                | neither earning nor losing money |  |  |
| 8. Luis read 5 more books.                             | +5                 | read the same number of books    |  |  |
| <b>9.</b> The submarine is 2,500 feet below sea level. | <sup>-</sup> 2,500 | sea level                        |  |  |
| <b>10.</b> Lexi lost \$10.                             | <sup>-</sup> 10    | neither losing nor gaining money |  |  |

## Problem Solving (Real world)

**11.** Zachary deposited \$125 into his savings account. What integer can you write to represent the deposit? What does 0 represent?

<sup>+</sup>125; neither depositing nor withdrawing any money

**12.** Hannah dives 25 feet below sea level. What integer can you write to represent how far she dives? What does 0 represent?

<sup>25</sup>; sea level

### **Write and Evaluate Expressions**

#### Write an expression.

**1.** Rosie has some charms, *c*, for her charm bracelet. Ray gives Rosie 3 new charms. How many charms does Rosie have now?

c + 3

**3.** Margo has 60 party favors that she wants to share equally with her guests, *g*. How many party favors will each guest get?

 $60 \div g$ 

**2.** Grayson has some model cars, *m*. He loses 2 of them. How many model cars does Grayson have now?

m-2

**4.** Phillip earns \$10 each hour he works, *h*. How much does Phillip earn?

 $10 \times h$ 

#### Evaluate each expression for the value given.

5. t - 14 for t = 27

13

**8.**  $w \times 8$  for w = 18

144

**11.**  $c \times 9$  for c = 13

117

**6.** 32 + m for m = 17

49

**9.**  $125 \div n$  for n = 25

5

**12.**  $d \div 12$  for d = 72

6

**7.**  $y \times 7$  for y = 14

98

**10.** b - 35 for b = 93

**58** 

**13.** f + 0 for f = 17

17

### Problem Solving



**14.** Kacey is 2 years younger than her sister. If *y* represents her sister's age, what expression can you write that represents Kacey's age? How old is Kasey if her sister is 14 years old?

y - 2; 12 years old

**15.** Greenville gets 3 more inches of snow than Charlotte gets. If *s* represents the number of inches of snow that Charlotte gets, what expression can you write that represents the amount of snow Greenville gets? How much snow does Greenville get if Charlotte gets 5 inches?

s + 3; 8 inches

#### **Understand Inequalities**

Of 2, 10, and 18, which numbers are solutions for the inequality?

**1.** *b* < 15

**2.**  $d \ge 8$ 

3.  $r \le 18$ 

2, 10

10, 18

2, 10, 18

Of 1, 3, 5, and 11, which numbers are solutions for the inequality?

**4.** *t* < 2

**5.** z > 0

**6.**  $g \ge 4$ 

1

1, 3, 5, 11

5, 11

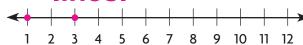
Show two solutions for the inequality on a number line.

**7.** c > 10

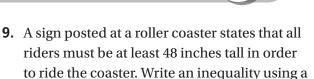


are shown. Check s. f≤3 students' number lines.

Possible answers



### Problem Solving (Re



**10.** Ansley wants to drink at least 64 ounces of water per day, but not more than 72 ounces. How many ounces of water per day might she drink? Name all of the whole number possibilities.

Possible answer:

h ≥ 48, where h

represents height

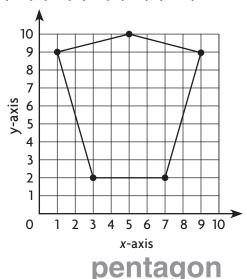
variable that represents this situation.

Ansley might drink 64, 65, 66, 67, 68, 69, 70, 71, or 72 ounces of water per day.

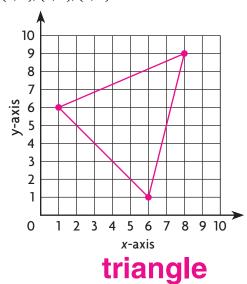
### **Polygons on a Coordinate Grid**

Plot the polygon with the given vertices on a coordinate grid. Identify the polygon.

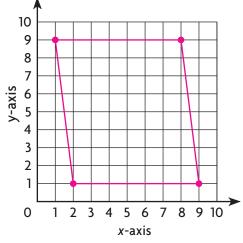
**1.** (1, 9), (3, 2), (7, 2), (9, 9), (5, 10)

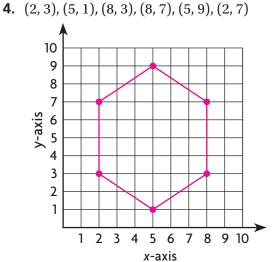


**2.** (1, 6), (6, 1), (8, 9)



**3.** (1, 9), (2, 1), (9, 1), (8, 9)





parallelogram

hexagon

## Problem Solving (Real World)

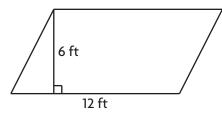
**5.** A square tile measures 12 inches by 12 inches. Each unit on a coordinate grid represents 1 inch. (1, 1) and (1, 13) are two of the coordinates of the tile drawn on the grid. What are the coordinates of the other two vertices?

(13, 1), (13, 13)

### Area of a Parallelogram

Find the area of the parallelogram.

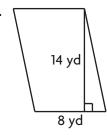
1.



$$A = b \times h$$

$$= 12 \times 6$$

$$= 72 \text{ sq ft}$$



3. base = 
$$0.4 \text{ cm}$$

**4.** base = 
$$2.4 \text{ m}$$

**5.** base 
$$=\frac{1}{4}$$
 ft

**4.** base = 
$$2.4 \text{ m}$$
 **5.** base =  $\frac{1}{4} \text{ ft}$  **6.** base =  $3\frac{1}{3} \text{ in.}$ 

$$height = 0.20 cm$$

$$height = 1.7 \text{ m}$$

height 
$$=\frac{2}{3}$$
 ft

$$height = 9 in.$$

Area = 
$$\frac{0.08}{\text{sq cm}}$$

$$Area = \frac{4.08}{9} sq m$$

$$\begin{aligned} &\text{height} = 0.20 \text{ cm} & \text{height} = 1.7 \text{ m} & \text{height} = \frac{2}{3} \text{ ft} & \text{height} = 9 \text{ in.} \\ &\text{Area} = \underline{\frac{0.08}{5}} \text{sq cm} & \text{Area} = \underline{\frac{4.08}{5}} \text{sq m} & \text{Area} = \underline{\frac{1}{6}} \text{sq ft} & \text{Area} = \underline{\frac{30}{5}} \text{sq in.} \end{aligned}$$

$$Area = \underline{30} sq in$$

7. base = 
$$0.5 \, \text{cm}$$

**8.** base = 
$$7.3 \, \text{m}$$

**9.** base 
$$=\frac{3}{5}$$
 ft

**7.** base = 0.5 cm **8.** base = 7.3 m **9.** base = 
$$\frac{3}{5}$$
 ft **10.** base =  $2\frac{3}{4}$  in.

$$height = 0.08 cm$$

$$.08 \text{ cm} \qquad \qquad \text{height} = 2.71$$

height 
$$=\frac{1}{4}$$
 ft

$$height = 6 in.$$

$$Area = \underbrace{\textbf{0.04}}_{sq cm}$$

$$Area = \frac{19.71}{\text{sq m}}$$

Area = 
$$\frac{20}{20}$$
 sq ft

$$\begin{array}{lll} \text{height} = 0.08 \text{ cm} & \text{height} = 2.7 \text{ m} & \text{height} = \frac{1}{4} \text{ ft} & \text{height} = 6 \text{ in.} \\ \text{Area} = \underbrace{\begin{array}{c} \textbf{0.04} \\ \text{sq cm} \end{array}}_{\text{sq m}} & \text{Area} = \underbrace{\begin{array}{c} \textbf{3} \\ \textbf{20} \end{array}}_{\text{sq ft}} & \text{Area} = \underbrace{\begin{array}{c} \textbf{16} \\ \textbf{1} \\ \textbf{2} \end{array}}_{\text{sq in.}} \end{array}$$

### Problem Solving

11. The windows of a certain building are in the shape of a parallelogram. The windows have a base of 30 in. and a height of 24 in. The building has a total of 11 windows. What is the total area of all 11 windows?

**7,920 sq in.** 

#### **Median and Mode**

#### Find the median and the mode of the data.

**1.** daily low temperatures the first 7 days of February (°F): 25, 24, 25, 27, 25, 23, 15

median: 25 °F mode: 25 °F

**3.** ages of 9 children at a dentist's office: 9, 10, 10, 8, 7, 9, 5, 12, 10

median: 9 yrs
mode: 10 yrs

**5.** number of exercises on math homework for one week: 12, 25, 15, 18, 13

median: 15 exercises
mode: none

**7.** amount earned per hour for babysitting (\$): 10, 10, 6, 9, 8, 12

median: \$ 9.50 mode: \$ 10

**2.** lengths of 8 songs played on the radio (minutes): 2, 3, 3, 5, 4, 3, 4, 3

median: 3 minutes
mode: 3 minutes

**4.** number of touchdowns scored per game: 1, 0, 3, 4, 2, 2, 3, 4, 1, 3

median: 2.5 touchdowns
mode: 3 touchdowns

**6.** number of tacos eaten per person: 2, 3, 3, 4, 4, 4, 2, 5, 1, 3, 1

median: 3 tacos
mode: 3, 4 tacos

**8.** number of days per month: 31, 28, 31, 30, 31, 30, 31, 30, 31, 30, 31

median: 31 days mode: 31 days

## Problem Solving (Real World)

**9.** Jasmine surveys her classmates and records the number of siblings each person has. What are the median and mode of her data?

median: 2 siblings
mode: 1

Number of Siblings Per Classmate

2-0-2-3-1-4-2-2-5

4-1-0-1-1-2-1-3-1-1

### Finding the Average

Find the average of the set of numbers.

**1.** 1, 3, 9, 7

- **2.** 10, 18, 20, 8, 11, 17
- **3.** 100, 120, 105, 115, 110

$$1 + 3 + 9 + 7 = 20$$
  
 $20 \div 4 = 5$   
5

**14** 

110

- **4.** 18, 28, 50, 92, 116, 74
- **5.** 737, 843, 188, 592
- **6.** 8, 11, 16, 7, 25, 9, 3, 8, 12

63

**590** 

11

- **7.** 2,639; 1,001; 1,708; 200
- **8.** 24, 23, 22, 24, 26, 24, 30, 33, 34, 30
- **9.** 70, 53, 43, 91, 0, 104, 68, 24, 51

1,387

**27** 

**56** 

- **10.** 16, 32, 48, 56, 60, 76
- **11.** 10, 9, 8, 10, 12, 11, 16, 19, 10, 15
- **12.** 278, 261, 251, 299, 208, 312, 276, 232, 259

48

**12** 

264

**13.** Find the average amount of snowfall.

| 1 | 6 | ı | n |  |
|---|---|---|---|--|

| Month                       | 1  | 2  | 3  | 4  | 5 | 6 | 7 |
|-----------------------------|----|----|----|----|---|---|---|
| Amount of<br>Snowfall (in.) | 44 | 28 | 23 | 15 | 2 | 0 | 0 |

### Problem Solving (Red

**14.** In the snowfall table above, suppose the amount of snowfall for each of the next three months was 6 inches. By how much would this change the average amount of snowfall over the entire period?

3 in.

**Time on Bus** 

10-19

**Number of Minutes** 

20 - 29

30-39

Number of Students

0-9

#### **Histograms**

#### For 1-3, use the histogram at the right.

The amount of time, in minutes, that it takes students in Lacey's class to get to school by bus is shown below.

10, 25, 12, 20, 15, 8, 27, 13, 22, 30, 19, 9, 11, 17, 26, 21, 18, 20, 28, 16

**1.** Use 10-minute intervals starting at 0. List the intervals.

2. Make a frequency table of the data.

### Check students' frequency tables.

**3.** Complete the histogram of the data.

### Check students' histograms.

For 4-6, use the data below to make a histogram.

The heights, in inches, of the saplings in the nursery are shown below.

60, 48, 52, 64, 56, 59, 63, 58, 62, 65, 50, 57, 49, 60, 61, 67, 55, 58, 62, 63, 59, 56, 64, 65, 54, 51, 62, 57, 58, 64

**4.** Use 10-inch intervals for the data. List the intervals.

### Possible answer: 40-49, 50-59, 60-69

**5.** Make a frequency table of the data.

### Check students' frequency tables.

**6.** Make a histogram of the data.

### Check students' histograms.

## Problem Solving Real World

7. Use a smaller interval for the heights in Exercises 4-6.
List the intervals.

45-49, 50-54, 55-59, 60-64, 65-69

8. How does the histogram change? Possible answer: The tallest bar is shorter than the tallest bar in the original histogram. There are more bars. Each interval includes a smaller number of heights.

GRP19

### **Analyze Histograms**

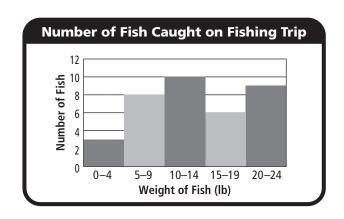
#### For 1-2, use the histogram at the right.

1. Which interval has the greatest frequency?

10-14

**2.** How many fish weighing less than 10 pounds were caught?

11 fish



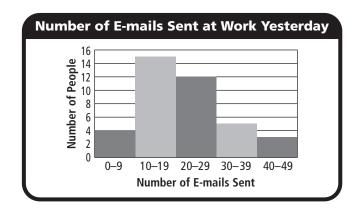
#### For 3-4, use the histogram at the right.

3. Which interval has the least frequency?

40-49

**4.** How many people sent 30 or more e-mails at work yesterday?

8 people



### Problem Solving (



#### For 5–7, use the histogram at the right.

**5.** How many students sold tickets to the talent show?

### 71 students

**6.** How many more students sold 10–19 tickets than sold 30–39 tickets?

### 8 more students

**7.** Can you tell from the histogram how many tickets were sold in all? Explain.

No; Possible answer: You

do not know the exact
number of tickets sold by each student.

