

# Chapter 8

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Name \_\_\_\_\_

**Chapter**  
**8**

## **Integers, Number Line, and the Coordinate Plane**

Dear Family,

Have you ever watched the countdown for a space shuttle launch? The time remaining to the launch gets smaller and smaller as the launch approaches, ending in the countdown "3....2....1....Blastoff!" For those working on the mission, time is divided into time before and after the launch. Blastoff is the zero. Time before the launch is negative, and time after the launch is positive.

We use a similar method with temperature—both the Fahrenheit and Celsius scales set a zero that is within the normal range of temperatures for a cold climate. Warmer temperatures are positive, and temperatures colder than zero are negative. A similar method is used to describe elevation, with sea level as the zero and positive and negative elevations on either side. Geographically the equator is set as zero latitude, and other latitudes reference north and south of that zero. For longitude the choice of a natural zero was less apparent, and so the zero was set through the Royal Astronomical Observatory in Greenwich, England. Other longitudes are measured east and west of this zero. Richmond, Virginia, for example, is located at  $37^\circ$  north latitude and  $77^\circ$  west longitude. Its sister city Windhoek, in Namibia, is found at  $22^\circ$  south latitude and  $17^\circ$  east longitude.

You can explore the idea of plotting with integers using a globe. First find the point that is  $0^\circ$  latitude and  $0^\circ$  longitude. How would you describe the location of a favorite spot, such as your home or a favorite vacation destination? What is on the opposite side of the globe from that place?

Happy hunting!

Lesson	Learning Target	Success Criteria
8.1 Integers	Understand the concept of negative numbers and that they are used along with positive numbers to describe quantities.	<ul style="list-style-type: none"> <li>I can write integers to represent quantities in real life.</li> <li>I can graph integers on a number line.</li> <li>I can find the opposite of an integer.</li> <li>I can apply integers to model real-life problems.</li> </ul>
8.2 Comparing and Ordering Integers	Compare and order integers.	<ul style="list-style-type: none"> <li>I can explain how to determine which of two integers is greater.</li> <li>I can order a set of integers from least to greatest.</li> <li>I can interpret statements about order in real-life problems.</li> </ul>
8.3 Rational Numbers	Compare and order rational numbers.	<ul style="list-style-type: none"> <li>I can explain the meaning of a rational number.</li> <li>I can graph rational numbers on a number line.</li> <li>I can determine which of two rational numbers is greater.</li> <li>I can order a set of rational numbers from least to greatest.</li> </ul>
8.4 Absolute Value	Understand the concept of absolute value.	<ul style="list-style-type: none"> <li>I can find the absolute value of a number.</li> <li>I can make comparisons that involve absolute values of numbers.</li> <li>I can apply absolute value in real-life problems.</li> </ul>
8.5 The Coordinate Plane	Plot and reflect ordered pairs in all four quadrants of a coordinate plane.	<ul style="list-style-type: none"> <li>I can identify ordered pairs in a coordinate plane.</li> <li>I can plot ordered pairs in a coordinate plane and describe their locations.</li> <li>I can reflect points in the <math>x</math>-axis, the <math>y</math>-axis, or both axes.</li> <li>I can apply plotting points in all four quadrants to solve real-life problems.</li> </ul>
8.6 Polygons in the Coordinate Plane	Draw polygons in the coordinate plane and find distances between points in the coordinate plane.	<ul style="list-style-type: none"> <li>I can draw polygons in the coordinate plane.</li> <li>I can find distances between points in the coordinate plane with the same <math>x</math>-coordinates or the same <math>y</math>-coordinates.</li> <li>I can find horizontal and vertical side lengths of polygons in the coordinate plane.</li> <li>I can draw polygons in the coordinate plane to solve real-life problems.</li> </ul>
8.7 Writing and Graphing Inequalities	Write inequalities and represent solutions of inequalities on number lines.	<ul style="list-style-type: none"> <li>I can write word sentences as inequalities.</li> <li>I can determine whether a value is a solution of an inequality.</li> <li>I can graph the solutions of inequalities.</li> </ul>
8.8 Solving Inequalities	Write and solve inequalities.	<ul style="list-style-type: none"> <li>I can apply the properties of inequality to generate equivalent inequalities.</li> <li>I can solve inequalities using addition or subtraction.</li> <li>I can solve inequalities using multiplication or division.</li> <li>I can write and solve inequalities that represent real-life problems.</li> </ul>

**Capítulo**  
**8****Enteros, rectas numéricas y plano de coordenadas**

Querida familia:

¿Alguna vez observaron la cuenta regresiva del lanzamiento de una nave espacial? El tiempo que queda para el lanzamiento se va haciendo cada vez más pequeño a medida de que el momento se acerca, y termina en la cuenta regresiva "3... 2... 1... ¡Despegue!". Para quienes trabajan en la misión, el tiempo se divide en antes y después del lanzamiento. El despegue es el cero. El tiempo previo al lanzamiento es negativo, y el tiempo posterior es positivo.

Usamos un método similar con la temperatura, tanto la escala Fahrenheit como la Celsius ubican el cero dentro de la escala normal de temperaturas para el clima frío. Las temperaturas más cálidas son positivas, las temperaturas más frías que cero son negativas. Un método similar se usa para describir la elevación: el nivel del mar es cero y las elevaciones positivas o negativas se ubican a cada lado. Geográficamente, el ecuador está en latitud cero, y se hace referencia a las demás latitudes al norte y al sur de ese cero. En el caso de la longitud, la elección del cero natural fue menos visible, y por eso el cero se estableció a través del Real Observatorio Astronómico de Greenwich, en Inglaterra. Las demás longitudes se miden al este y al oeste de ese cero. Por ejemplo, Richmond, en Virginia, se ubica a  $37^\circ$  latitud norte y  $77^\circ$  longitud oeste. Su ciudad hermana, Windhoek, en Namibia, se encuentra a  $22^\circ$  latitud sud y  $17^\circ$  longitud este.

Pueden analizar la idea de representar con enteros usando un globo terráqueo. Halle en primer lugar el punto de latitud  $0^\circ$  y de longitud  $0^\circ$ . ¿Cómo describirían la ubicación de un lugar preferido, como su hogar o un destino de vacaciones? ¿Qué hay en el lado opuesto a ese lugar en el globo terráqueo?

¡A divertirse con la búsqueda!

Lección	Objetivo de aprendizaje	Criterios de éxito
8.1 Números enteros	Comprender el concepto de números negativos y que se usan junto con los números positivos para describir cantidades.	<ul style="list-style-type: none"> <li>• Sé escribir números enteros para representar cantidades de la vida real y aplicarlos para representar problemas de la vida real.</li> <li>• Sé graficar números enteros en una recta numérica.</li> <li>• Sé hallar el opuesto de un número entero.</li> </ul>
8.2 Comparar y ordenar números enteros	Comparar y ordenar números enteros.	<ul style="list-style-type: none"> <li>• Sé explicar cómo determinar cuál de dos números enteros es más grande y ordenar un conjunto de números enteros de menor a mayor.</li> <li>• Sé interpretar enunciados relacionados con el orden en problemas de la vida real.</li> </ul>
8.3 Números racionales	Comparar y ordenar números racionales.	<ul style="list-style-type: none"> <li>• Sé explicar el significado de un número racional y graficarlo en una recta numérica.</li> <li>• Sé determinar cuál de dos números racionales es más grande y ordenar un conjunto de números racionales de menor a mayor.</li> </ul>
8.4 Valor absoluto	Comprender el concepto de valor absoluto.	<ul style="list-style-type: none"> <li>• Sé hallar el valor absoluto de un número.</li> <li>• Sé hacer comparaciones de valores absolutos de dos números y aplicar el valor absoluto a problemas de la vida real.</li> </ul>
8.5 Plano de coordenadas	Representar y reflejar pares ordenados en los cuatro cuadrantes de un plano de coordenadas.	<ul style="list-style-type: none"> <li>• Sé identificar pares ordenados en un plano de coordenadas, representarlos y describir sus ubicaciones.</li> <li>• Sé reflejar puntos en el eje de <math>x</math>, el eje de <math>y</math> o ambos ejes.</li> <li>• Sé aplicar puntos de representación en los cuatro cuadrantes para resolver problemas de la vida real.</li> </ul>
8.6 Polígonos en el plano de coordenadas	Dibujar polígonos en el plano de coordenadas y hallar las distancias entre los puntos de ese plano.	<ul style="list-style-type: none"> <li>• Sé dibujar polígonos en el plano de coordenadas.</li> <li>• Sé hallar las distancias entre puntos del plano de coordenadas con igual coordenada de <math>x</math> o de <math>y</math>.</li> <li>• Sé hallar la longitud de los lados verticales u horizontales de polígonos en el plano de coordenadas.</li> <li>• Sé dibujar polígonos en un plano de coordenadas para resolver problemas de la vida real.</li> </ul>
8.7 Escribir y graficar desigualdades	Escribir desigualdades y representar soluciones de desigualdades en rectas numéricas.	<ul style="list-style-type: none"> <li>• Sé escribir enunciados como desigualdades.</li> <li>• Sé determinar si un valor es la solución de una desigualdad.</li> <li>• Sé graficar la solución de desigualdades.</li> </ul>
8.8 Resolver desigualdades	Escribir y resolver desigualdades.	<ul style="list-style-type: none"> <li>• Sé aplicar las propiedades de la desigualdad para generar desigualdades equivalentes.</li> <li>• Sé resolver desigualdades con la suma y la resta, la multiplicación y la división.</li> <li>• Sé escribir y resolver desigualdades que representan problemas de la vida real.</li> </ul>

**Lesson**  
**8.1**

## Cumulative Practice

For use before Lesson 8.1

1. Write the word sentence as an equation.

16 less than a number  $a$  equals 9.

An equation is \_\_\_\_\_.

2. Write the word sentence as an equation.

9 less than a number  $p$  equals 18.

An equation is \_\_\_\_\_.

**Lesson**  
**8.1**

## Vocabulary Practice

For use before Lesson 8.1

1. Write what you know about this word.

**Preview: opposites**

**Lesson**  
**8.1**

## Prerequisite Skills Practice

For use before Lesson 8.1

**Graph the number on a number line**

1. 2

2. 5

**Lesson**  
**8.1**
**Extra Practice**

Write a positive or negative integer that represents the situation.

- You lose a \$5 bill while walking home from school.
- You download 7 songs to your MP3 player.
- The wind chill is 35 degrees below zero.
- A parachutist descends 50 feet.
- A baker discards 12 loaves of bread.
- A football team advances 10 yards.
- You earn \$15 for mowing the neighbor's lawn.

Graph the integer and its opposite.

8. 5

9. -2

10. 13

11. 20

12. -18

13. -25

14. Your friend describes the opposite of 7. Is your friend correct? Explain your reasoning.

The opposite of 7 is  $\frac{1}{7}$ .

Identify the integer represented by the point on the number line.

15. A

16. B

17. C

18. D

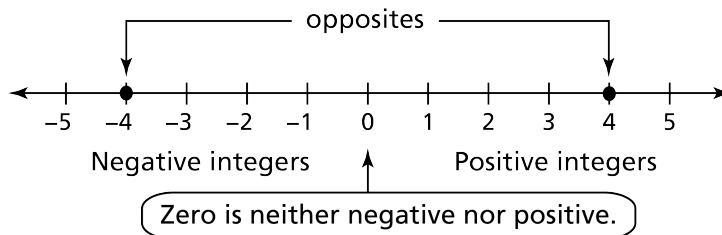


19. To ride an amusement park ride, your height must be at or above the line on the sign. For each set of information, write an integer that represents a person's height relative to the line on the sign and write *yes* or *no* as to whether they can ride the ride.
- Height is 2 inches above the line on the sign.
  - Height is 5 inches below the line on the sign.
  - Height is 1 inch below the line on the sign.



**Lesson**  
**8.1**
**Reteach**
**Key Idea**
**Integers**

**Words** Integers are the set of whole numbers and their opposites.

**Graph**


Words like *increase*, *gain*, *above*, *earns*, and *up* indicate a positive integer.

Words like *decrease*, *lose*, *below*, *debt*, and *down* indicate a negative integer.

**EXAMPLE** Writing Positive and Negative Integers

**Write a positive or negative integer that represents each situation.**

- a.** You deposit \$45 in your savings account.

*Deposit* indicates a number greater than 0.

You are adding an amount.

So, use a positive integer.

► +45, or 45

- b.** You lose 300 points in a video game.

*Lose* indicates a number less than 0.

Points are taken away.

So, use a negative integer.

► -300

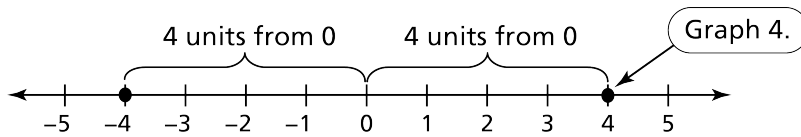
**Lesson**  
**8.1**
**Reteach (continued)**

To graph an integer and its opposite, first graph the given integer. Then, graph the integer on the opposite side of 0 that is the same distance from 0 as the given integer.

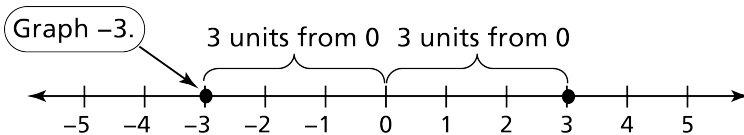
**EXAMPLE Graphing Integers**

Graph each integer and its opposite.

a. 4



b. -3



Write a positive or negative integer that represents the situation.

1. You earn 15 points of extra credit on your quiz.
2. The temperature yesterday was 8 degrees below zero.
3. Your friend hikes 350 feet down to a river.
4. An elevator goes up 28 feet.

Graph the integer and its opposite.

5. -1

6. 5

7. 2

**Lesson**  
**8.1****Enrichment and Extension****Letter Values**

Each letter of the alphabet has been assigned an integer value. Use the values to answer the questions.

**Use your knowledge of integers to answer the questions.**

1. Find two pairs of letters that are assigned opposite values of one another. What is the sum of each pair?
2. Which integer is neither positive nor negative? Which letter has been assigned this value?
3. What is the total combined value of the letters MATH?
4. Write your first name.
  - a. Which letters in your first name are assigned values that are positive integers? Which letters are assigned values that are negative integers?
  - b. What is the combined total value of the letters in your first name?
  - c. What is the opposite of the value in part (b)?
5. Find the combined total value of the letters used to spell your last name.
  - a. What is the opposite of the value?
  - b. Graph the value and its opposite on a number line. How far are the two values from one another on the number line?
6. Graph the letters used to spell your last name on a number line according to their values. Do the letters still spell your last name once they are graphed on the number line?
7. Write a word using only letters that have been assigned values that are negative integers.
8. Write a word using letters whose total combined value is 5 or  $-5$ .

A = 13

B = 12

C = 11

D = 10

E = 9

F = 8

G = 7

H = 6

I = 5

J = 4

K = 3

L = 2

M = 1

N = 0

O =  $-1$

P =  $-2$

Q =  $-3$

R =  $-4$

S =  $-5$

T =  $-6$

U =  $-7$

V =  $-8$

W =  $-9$

X =  $-10$

Y =  $-11$

Z =  $-12$



## Puzzle Time

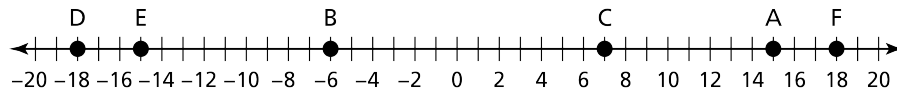
### What Do You Get When You Cross An Electrical Eel With A Sponge?

Write the letter of each answer in the box containing the exercise number.

Write a positive or negative integer that represents the situation.

1. Lisa puts 14 dollars into her piggy bank.
2. You are playing a game and must go back 4 spaces.
3. Claire loses 5 points on a spelling test.
4. The football team scores 21 points in the game.
5. Your dad gains 5 pounds.
6. Addison gets 4 bonus points on the science test.
7. The temperature drops 14 degrees.
8. You take 21 dollars out of your bank account.

Identify the location of the point on the number line.



- |       |       |
|-------|-------|
| 9. A  | 10. B |
| 11. C | 12. D |
| 13. E | 14. F |

**Answers**

O. 21  
 A. -18  
 R. -4  
 K. -14  
 B. -6  
 S. 7  
 B. 18  
 H. -5  
 O. 4  
 S. 14  
 C. -15  
 R. -21  
 S. 5  
 E. 15

11	3	6	13	7		12	10	1	4	8	14	9	2	5
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**Lesson**  
**8.2**

## Cumulative Practice

For use before Lesson 8.2

1. 5% of what number is 36?

5% of \_\_\_\_\_ is 36.

2. 125% of what number is 30?

125% of \_\_\_\_\_ is 30.

**Lesson**  
**8.2**

## Vocabulary Practice

For use before Lesson 8.2

1. Write what you know about this phrase.

**Review: negative numbers**

**Lesson**  
**8.2**

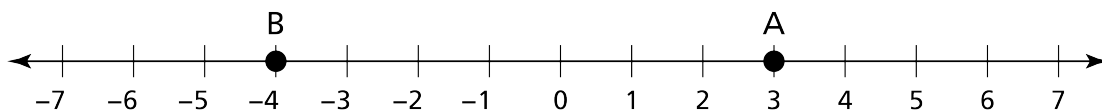
## Prerequisite Skills Practice

For use before Lesson 8.2

Identify the location of the point on the number line.

1. A

2. B



**Lesson  
8.2****Extra Practice**

Copy and complete the statement using  $<$  or  $>$ .

1.  $-4$  ?  $0$

2.  $7$  ?  $0$

3.  $3$  ?  $-3$

4.  $-6$  ?  $2$

5.  $5$  ?  $9$

6.  $-8$  ?  $-2$

7. Your friend compares the two integers.  
Is your friend correct?  
Explain your reasoning.

$2 < 5$ . So, $2 < -5$ .
--------------------------

Order the integers from least to greatest.

8.  $0, -2, 2, 3, -3$

9.  $1, -3, 4, -4, 2$

10.  $3, -4, 4, 5, -5$

11.  $6, -3, 1, 4, -5$

12. A water pipe is 3 feet below the ground. A gas pipe is 8 feet below the ground. Which pipe is higher? Explain your answer.
13. A number is between  $-1$  and  $-5$ . What is the least possible integer value of its opposite?

Tell whether the statement is *always*, *sometimes*, or *never* true. Explain.

14. A negative integer is greater than its opposite.
15. An integer is more than its opposite and less than 0.
16. An integer is less than its opposite.
17. Nine students choose integers. Seven of them are  
 $-16, 12, -13, -6, -5, 6,$  and  $1$ .
- a. Order the numbers from least to greatest.
- b. When all nine integers are ordered from least to greatest, the middle integer is  $-6$ . Describe the other two integers.

**Lesson**  
**8.2** **Reteach**

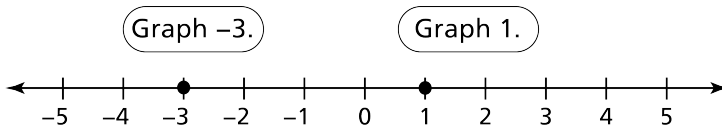
On a horizontal number line, numbers to the left are less than numbers to the right. Numbers to the right are greater than numbers to the left.

On a vertical number line, numbers below are less than numbers above. Numbers above are greater than numbers below.

**EXAMPLE** Comparing Integers

**a. Compare 1 and -3.**

Graph each number on a horizontal number line.

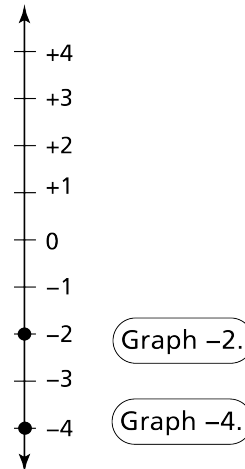


▶ 1 is to the right of -3. So  $1 > -3$ .

**b. Compare -4 and -2.**

Graph each number on a vertical number line.

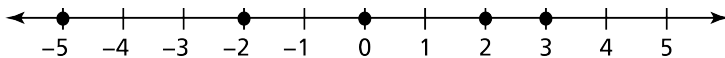
▶ -4 is below -2. So,  $-4 < -2$ .



**EXAMPLE** Ordering Integers

**Order -5, 0, 2, -2, 3 from least to greatest.**

Graph each integer on a number line.



Write the numbers as they appear on the number line from left to right.

▶ So, the order from least to greatest is -5, -2, 0, 2, 3.

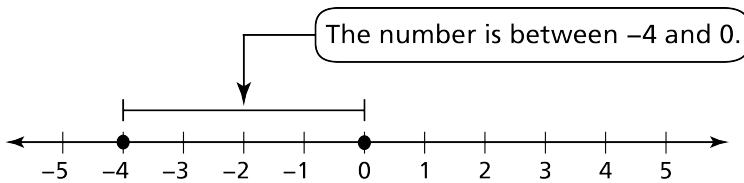
**Lesson**  
**8.2**
**Reteach** (continued)

**EXAMPLE** Reasoning with Integers

A number is greater than  $-4$  and less than  $0$ . What is the greatest possible integer value of this number?

- A.  $-5$                       B.  $-2$                       C.  $-1$                       D.  $3$

The number must be to the right of  $-4$  and to the left of  $0$  on a horizontal number line.



The greatest possible integer value between  $-4$  and  $0$  is the integer farthest to the right of these values on the number line, which is  $-1$ .

► So, the correct answer is C.

Copy and complete the statement using  $<$  or  $>$ .

1.  $-7$  ?  $7$                       2.  $3$  ?  $-1$                       3.  $-2$  ?  $-4$   
 4.  $-5$  ?  $0$                       5.  $-8$  ?  $-7$                       6.  $-4$  ?  $-3$

Order the integers from least to greatest.

7.  $3, -6, 6, 9, -9$                       8.  $5, -2, -4, -7, 3$   
 9.  $10, -10, 30, 40, -40$                       10.  $8, -12, -22, 25, -28$   
 11. A number is between  $-3$  and  $-12$ .  
 a. What is the least possible integer value of this number?  
 b. What is the greatest possible integer value of this number?

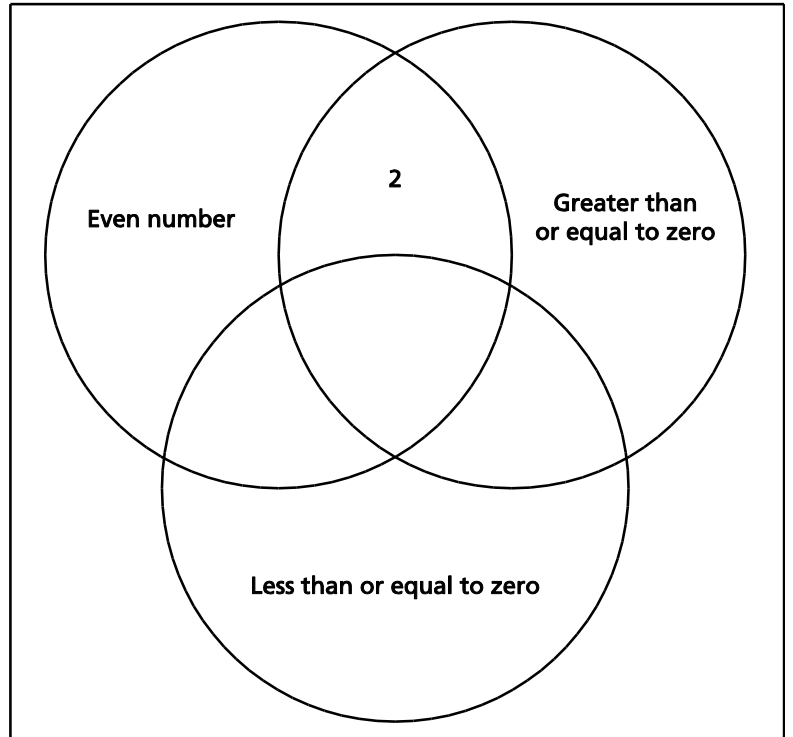


**Lesson**  
**8.2**
**Enrichment and Extension**
**Sorting Integers**

Numbers can be categorized, or sorted, based on their properties. Three properties are listed in the Venn diagram.

**Example: 2**

Two is an even number because it is evenly divisible by two. Two is not odd because it is even. Two is greater than zero because it falls to the right of zero when ordered on a number line. Because two is both even and greater than zero, it should be placed in the part of the Venn diagram where the two properties overlap.



**In Exercises 1–6, use the Venn diagram.**

1. Categorize the list of numbers based on their properties by placing them in the correct location in the Venn diagram.  
 $-3, 12, 15, -4, 0, -5, -11, 17$
2. Consider the set containing only the values less than or equal to zero. What types of numbers are contained in this set?
3. How many values are in the category of the Venn diagram containing both odd values and values less than zero?
4. What is the sum of the values that are located in the part of the Venn diagram containing positive, odd values?
5. Is there any section of the Venn diagram that contains no numbers? Why?
6. What is the only number that belongs to all three categories? That is, which is the only number that was placed in the section of the Venn diagram where all three circles overlap?



**Lesson**  
**8.3**

## Cumulative Practice

For use before Lesson 8.3

Write the percent as a decimal.

1.  $6\% =$  \_\_\_\_\_

2.  $17\% =$  \_\_\_\_\_

**Lesson**  
**8.3**

## Vocabulary Practice

For use before Lesson 8.3

1. Write what you know about this phrase.

**Preview: rational number**

**Lesson**  
**8.3**

## Prerequisite Skills Practice

For use before Lesson 8.3

Find an integer that is between the two numbers.

1. 1 and 3

2. -1 and 5

**Lesson  
8.3****Extra Practice**

Graph the number and its opposite.

1.  $-\frac{3}{4}$

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

3.  $-2.6$

4.  $3.75$

Copy and complete the statement using  $<$  or  $>$ .

5.  $-\frac{10}{3}$  ?  $-\frac{7}{4}$

6.  $\frac{4}{5}$  ?  $-1\frac{7}{8}$

7.  $-\frac{7}{6}$  ?  $-\frac{6}{7}$

8.  $-2\frac{3}{4}$  ?  $-2\frac{2}{3}$

9.  $2.1$  ?  $-2.1$

10.  $-0.08$  ?  $-0.8$

11.  $-3.08$  ?  $-4.16$

12.  $-4.82$  ?  $-4.89$

Order the numbers from least to greatest.

13.  $-\frac{7}{10}$ ,  $-\frac{1}{10}$ ,  $-\frac{2}{5}$ ,  $-\frac{3}{10}$ ,  $-\frac{1}{2}$

14.  $1\frac{1}{12}$ ,  $-\frac{3}{12}$ ,  $1\frac{5}{12}$ ,  $\frac{7}{12}$ ,  $-\frac{2}{12}$

15.  $-\frac{2}{3}$ ,  $-2$ ,  $-1\frac{1}{3}$ ,  $-1\frac{2}{3}$ ,  $-2\frac{2}{3}$

16.  $-2.4$ ,  $-2.1$ ,  $-3$ ,  $-2.75$ ,  $-2$

17. The position of a deep sea probe is  $-2\frac{3}{4}$  fathoms relative to sea level. After finishing taking data, it moves to  $-2\frac{5}{8}$  fathoms relative to sea level. Which was deeper, the first mission or the second?

18. An oceanographer takes readings at the following positions relative to sea level:  $-2.48$  kilometers,  $-2.83$  kilometers,  $-2.70$  kilometers, and  $-2.15$  kilometers. Order the positions from farthest from sea level to closest to sea level.

## Lesson 8.3

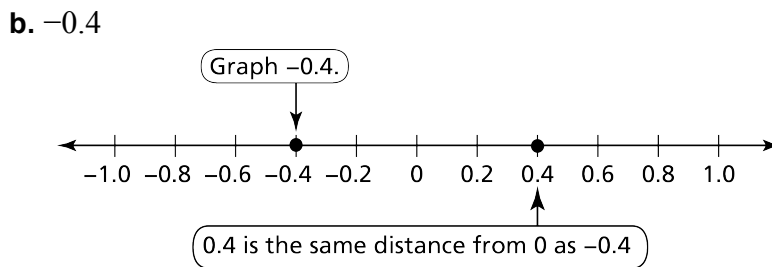
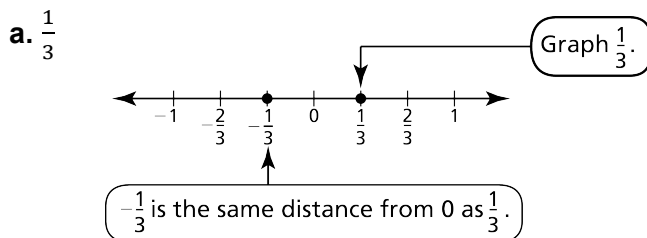
# Reteach

A **rational number** is a number that can be written as  $\frac{a}{b}$ , where  $a$  and  $b$  are integers and  $b \neq 0$ . The set of rational numbers is made up of integers, fractions, and decimals.

To graph a rational number and its opposite, first graph the given rational number. Then, graph the rational number on the opposite side of 0 that is the same distance from 0 as the given rational number.

### EXAMPLE Graphing Rational Numbers

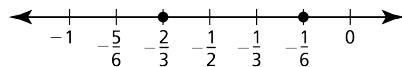
Graph each number and its opposite.



### EXAMPLE Comparing Fractions and Mixed Numbers

a. Compare  $-\frac{1}{6}$  and  $-\frac{2}{3}$ .

Graph  $-\frac{1}{6}$  and  $-\frac{2}{3}$  on a number line.

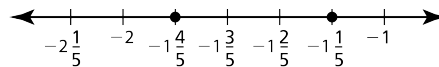


$-\frac{2}{3}$  is to the left of  $-\frac{1}{6}$ .

► So,  $-\frac{2}{3} < -\frac{1}{6}$ .

b. Compare  $-1\frac{1}{5}$  and  $-1\frac{4}{5}$ .

Graph  $-1\frac{1}{5}$  and  $-1\frac{4}{5}$  on a number line.



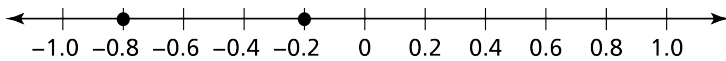
$-1\frac{1}{5}$  is to the right of  $-1\frac{4}{5}$ .

► So,  $-1\frac{1}{5} > -1\frac{4}{5}$ .

**Lesson**  
**8.3**
**Reteach** (continued)

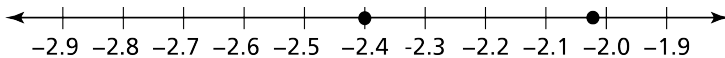
**EXAMPLE** Comparing Decimals

**a. Compare  $-0.8$  and  $-0.2$ .**

 Graph  $-0.8$  and  $-0.2$  on a number line.

 $-0.8$  is to the left of  $-0.2$ .

 ► So,  $-0.8 < -0.2$ .

**b. Compare  $-2.04$  and  $-2.4$ .**

 Graph  $-2.04$  and  $-2.4$  on a number line.

 $-2.4$  is to the left of  $-2.04$ .

 ► So,  $-2.04 > -2.4$ .

**Graph the number and its opposite.**

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

2.  $-1\frac{2}{3}$

3.  $-1.6$

**Copy and complete the statement using  $<$  or  $>$ .**

4.  $-\frac{3}{5}$  ?  $-\frac{7}{10}$

5.  $-\frac{4}{9}$  ?  $-\frac{1}{3}$

6.  $-1\frac{1}{2}$  ?  $-1\frac{3}{4}$

7.  $-3\frac{5}{6}$  ?  $-3\frac{2}{3}$

8.  $-0.25$  ?  $-0.12$

9.  $-6.1$  ?  $-4.7$

10.  $-3.9$  ?  $-3.09$

11.  $-0.22$  ?  $-0.66$

12.  $-4.63$  ?  $-4.36$

**Lesson**  
**8.3****Enrichment and Extension****Fraction Game**

Cut 10 index cards in half. Divide the cut index cards between you and a partner. Follow the rules below to play a game.

- Write a fraction or mixed number on a piece of index card that is between the two decimals given.
- Compare your number with your friend's number. The person with the larger number gets both index cards. If the numbers are equivalent, each player writes a different fraction or mixed number. Repeat until there is not a tie.
- The person with the most index cards after the last set of numbers is the winner.

1.  $-0.5, 1.33$

2.  $0.1, -1.86$

3.  $-1.2, -0.6$

4.  $-1.75, -2.25$

5.  $-4.77, -12.42$

6.  $-6.8, -5.71$

7.  $-4.63, -5.38$

8.  $-10.5, -9.62$

9.  $-20.5, -15.33$

10.  $-62.55, -70.45$



## Puzzle Time

### What Did One Plate Say To The Other Plate?

Write the letter of each answer in the box containing the exercise number.

**Which number is greater?**

- |                                   |                                   |
|-----------------------------------|-----------------------------------|
| 1. $-\frac{1}{2}, \frac{3}{5}$    | 2. $-\frac{2}{3}, -\frac{5}{6}$   |
| 3. $-5\frac{1}{4}, -5\frac{1}{2}$ | 4. $-2\frac{7}{8}, -2\frac{3}{4}$ |
| 5. 4.8, -4.2                      | 6. -21.5, -21.05                  |
| 7. -3.07, -3.14                   |                                   |

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

8. 3.4, -4, -2.7, 0, -2.85
9.  $3, -2\frac{1}{4}, -2\frac{1}{6}, 3\frac{1}{5}, -2\frac{3}{4}$
10. Use a number line to determine which number is between -4.4 and -5.8.  
**A.** -5.68      **B.** -4.14      **C.** -5.92
11. Use a number line to determine which number is between -2.61 and -5.49  
**A.** -2.49      **B.** -5.51      **C.** -3.11

**Answers**

- H.**  $-2\frac{3}{4}, -2\frac{1}{4}, -2\frac{1}{6}, 3, 3\frac{1}{5}$
- O.**  $-\frac{2}{3}$
- M.** -21.05
- N.**  $\frac{3}{5}$
- E.**  $-2\frac{3}{4}$
- N.** -3.07
- U.** A
- S.** 4.8
- L.** -4, -2.85, -2.7, 0, 3.4
- C.**  $-5\frac{1}{4}$
- I.** C

8	10	1	3	9		11	5		2	7		6	4
---	----	---	---	---	--	----	---	--	---	---	--	---	---



**Lesson**  
**8.4**

## Cumulative Practice

For use before Lesson 8.4

1. Use the Distributive Property to simplify the expression  $7(8x + 3)$ .

$$7(8x + 3) = \underline{\hspace{2cm}}$$

2. Use the Distributive Property to simplify the expression  $3(5x - 2)$ .

$$3(5x - 2) = \underline{\hspace{2cm}}$$

**Lesson**  
**8.4**

## Vocabulary Practice

For use before Lesson 8.4

1. Write what you know about this phrase.

**Preview: absolute value of a number**

**Lesson**  
**8.4**

## Prerequisite Skills Practice

For use before Lesson 8.4

**Graph the integer and its opposite.**

1.  $-8$

2.  $4$

**Lesson  
8.4****Extra Practice****Find the absolute value.**

1.  $|-13|$

2.  $|-8|$

3.  $|-4|$

4.  $|-1|$

5.  $|5.2|$

6.  $|-12|$

7.  $\left|2\frac{1}{3}\right|$

8.  $|-51|$

9.  $\left|-\frac{5}{6}\right|$

10.  $|-38|$

11.  $|40|$

12. Your friend finds the absolute value of  $-20$ . Is your friend correct? Explain your reasoning..

$ -20  = -20$
---------------

**Copy and complete the statement using  $<$ ,  $>$ , or  $=$ .**

13.  $|-6|$    ?  $4$

14.  $10$    ?  $|-10|$

15.  $|-4.5|$    ?  $|-5.2|$

16.  $\left|\frac{2}{3}\right|$    ?  $\left|-\frac{1}{6}\right|$

17. In a sailboat race series, a boat's score indicates the number of points it is behind the winning boat. Your boat has score  $-18$  and your friend's boat has score  $-23$ .

- Find the absolute value score of each boat.
- Whose boat is farther behind the winning boat?

**Order the values from least to greatest.**

18.  $0, |-3|, 1, -2, |5|$

19.  $|3|, |-1|, -3, |-5|, -5$

**Tell whether the statement is *always*, *sometimes*, or *never* true. Explain.**

- The absolute value of a negative number is its opposite.
- The absolute value of a number is less than the number.
- The absolute value of a negative number is equal to the number.

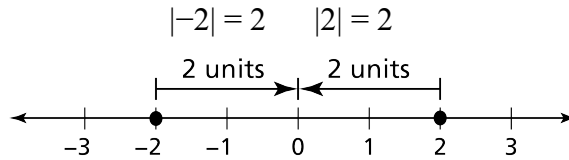
**Lesson**  
**8.4** **Reteach**

**Key Idea**

**Absolute Value**

**Words** The **absolute value** of a number is the distance between the number and 0 on a number line. The absolute value of a number  $a$  is written as  $|a|$ .

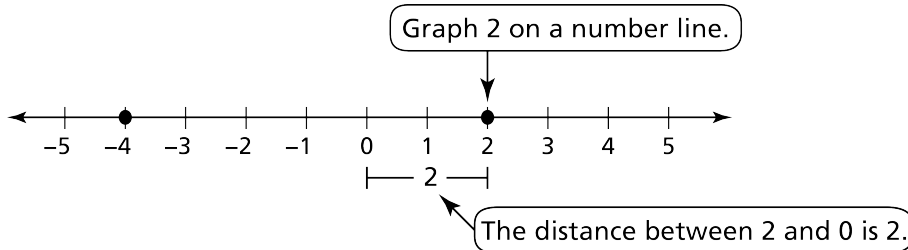
**Numbers**



To find the absolute value, graph the given number on a number line. Then find the distance between the given number and 0.

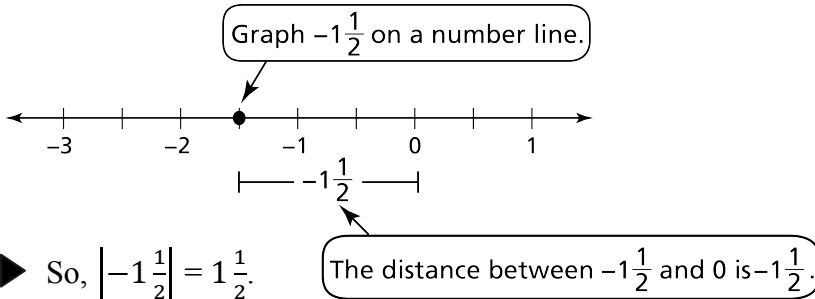
**EXAMPLE** Finding Absolute Value

**a.** Find the absolute value of 2.



► So,  $|2| = 2$ .

**b.** Find the absolute value of  $-1\frac{1}{2}$ .

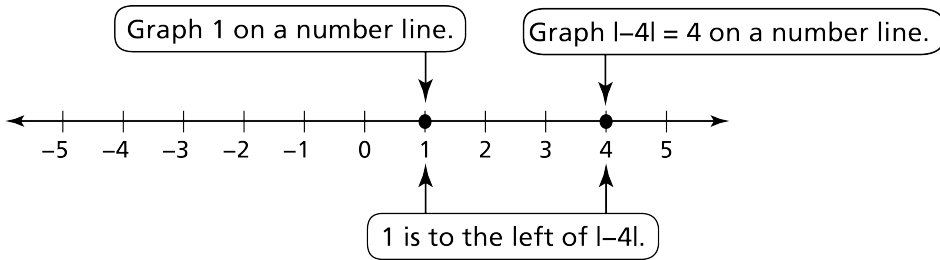


► So,  $|-1\frac{1}{2}| = 1\frac{1}{2}$ .

**Lesson 8.4 Reteach** (continued)

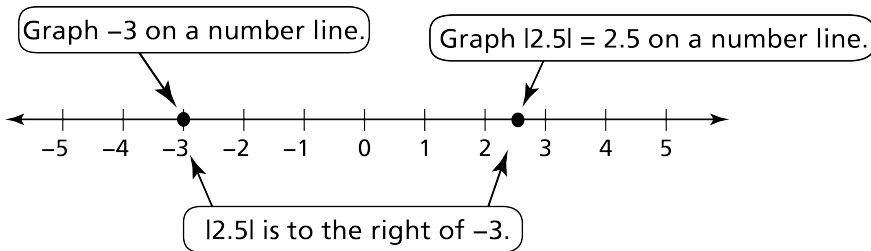
**EXAMPLE Comparing Values**

a. Compare 1 and  $|-4|$ .



► So,  $1 < |-4|$ .

b. Compare  $|2.5|$  and  $-3$ .



► So,  $|2.5| > -3$ .

**Find the absolute value.**

- |              |             |                     |
|--------------|-------------|---------------------|
| 1. $ -8 $    | 2. $ 7.5 $  | 3. $ \frac{2}{3} $  |
| 4. $ -11.4 $ | 5. $ 53 $   | 6. $ 2\frac{3}{5} $ |
| 7. $ 16.7 $  | 8. $ -142 $ | 9. $ 300 $          |

**Copy and complete the statement using  $<$ ,  $>$ , or  $=$ .**

- |  |  |
|--|--|
| 10. $ -6.2 $ $\underline{\quad ? \quad}$ $ 7.9 $                 | 11. $12$ $\underline{\quad ? \quad}$ $ -12 $ |
| 12. $ \frac{-3}{4} $ $\underline{\quad ? \quad}$ $ \frac{5}{8} $ | 13. $ -4 $ $\underline{\quad ? \quad}$ $3$   |

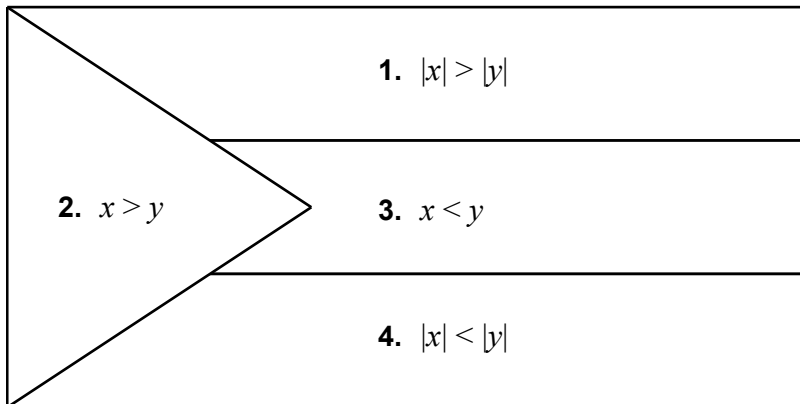
**Lesson**  
**8.4**

**Enrichment and Extension**

**Flags**

Copy the flag shown. Assume  $x > 0$  and  $y < 0$ . Tell whether the statement is *always*, *sometimes*, or *never* true. Use the table to color the portion of your flag that contains the exercise.

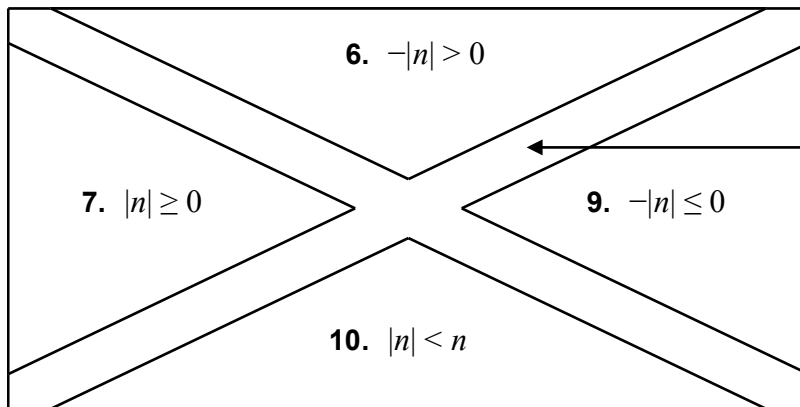
Answer	Color
Always	Black
Sometimes	Aqua
Never	Yellow



5. Which country does the flag represent?

Copy the flag shown. Tell whether the possible values of  $n$  are *all integers*, *all positive integers*, *all negative integers*, or *no integers*. Use the table to color the portion of your flag that contains the exercise.

Answer	Color
All integers	Black
All positive integers	Red
All negative integers	Yellow
No integers	Green



11. Which country does the flag represent?



**Lesson**  
**8.5**

## Cumulative Practice

For use before Lesson 8.5

1. Write a unit rate for the situation.
2. Write a unit rate for the situation.

**Situation:** 248 miles in 4 hours

**Situation:** 312 calories in 4 servings

**Unit rate:** \_\_\_\_\_ miles per hours

**Unit rate:** \_\_\_\_\_ calories per serving

**Lesson**  
**8.5**

## Vocabulary Practice

For use before Lesson 8.5

1. Write what you know about this phrase.

**Review: coordinate plane**

**Lesson**  
**8.5**

## Prerequisite Skills Practice

For use before Lesson 8.5

**Order the integers from least to greatest.**

1.  $-4, 3, -5, 1$

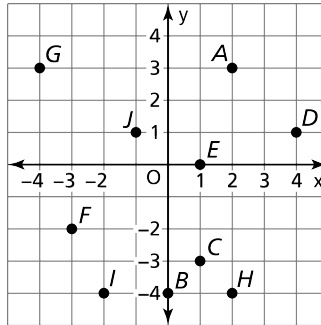
2.  $-6, 7, -9, -5$

**Lesson**  
**8.5**

**Extra Practice**

Write an ordered pair corresponding to the point.

- |                   |                    |
|-------------------|--------------------|
| 1. Point <i>A</i> | 2. Point <i>B</i>  |
| 3. Point <i>C</i> | 4. Point <i>D</i>  |
| 5. Point <i>E</i> | 6. Point <i>F</i>  |
| 7. Point <i>G</i> | 8. Point <i>H</i>  |
| 9. Point <i>I</i> | 10. Point <i>J</i> |



Plot the ordered pair in a coordinate plane. Describe the location of the point.

- |                |                          |                |                    |
|----------------|--------------------------|----------------|--------------------|
| 11. $K(5, 2)$  | 12. $L(-3, 6)$           | 13. $M(-5, 0)$ | 14. $N(-4.5, 2.5)$ |
| 15. $P(7, -4)$ | 16. $Q(1\frac{1}{2}, 3)$ | 17. $R(-2, 4)$ | 18. $S(0, 3)$      |

19. Your friend describes how to plot the point. Is your friend correct? Explain your reasoning.

To plot  $(3, -4)$ , start at  $(0, 0)$  and move 3 units right and 4 units down.

Reflect the point in (a) the *x*-axis and (b) the *y*-axis.

- |              |                |               |
|--------------|----------------|---------------|
| 20. $(4, 1)$ | 21. $(-3, -2)$ | 22. $(-5, 0)$ |
|--------------|----------------|---------------|

Reflect the point in the *x*-axis followed by the *y*-axis.

- |              |               |               |
|--------------|---------------|---------------|
| 23. $(2, 6)$ | 24. $(-4, 2)$ | 25. $(0, -7)$ |
|--------------|---------------|---------------|

26. Your house is located at  $(0, 0)$ .

- To get from your house to school, you walk 2 blocks east and 1 block south. What ordered pair corresponds to the location of your school?
- To get from your house to the mall, you walk 4 blocks west and 3 blocks north. What ordered pair corresponds to the location of the mall?
- Is your school or the mall closer to your home?
- Describe how you would walk from your school to the mall.
- Your friend lives 2 blocks from the mall. Is your friend's house in the same quadrant as the mall? Explain.



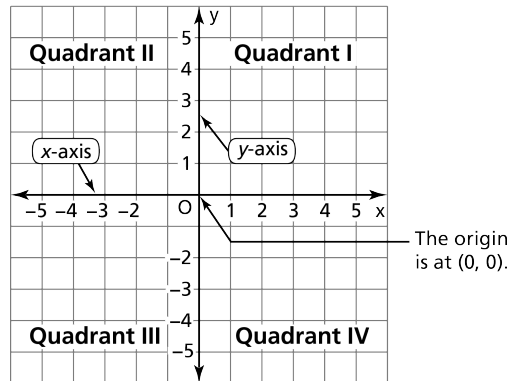
**Lesson**  
**8.5**

**Reteach**

**Key Idea**

**The Coordinate Plane**

A **coordinate plane** is formed by the intersection of a horizontal number line and a vertical number line. The number lines intersect at the **origin** and separate the coordinate plane into four regions called **quadrants**.



An *ordered pair* is used to locate a point in a coordinate plane.

Ordered pair: (4, -2)



Positive *x*-coordinate: move right from the origin

Negative *x*-coordinate: move left from the origin

Positive *y*-coordinate: move up from the origin

Negative *y*-coordinate: move down from the origin

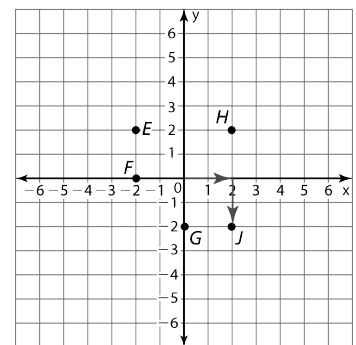
**EXAMPLE Identifying an Ordered Pair**

Which ordered pair corresponds to Point *J*?

- A. (-2, 2)    B. (2, 2)    C. (-2, -2)    D. (2, -2)

Point *J* is 2 units to the right of the origin and 2 units down. So, the *x*-coordinate is 2 and the *y*-coordinate is -2.

- The ordered pair (2, -2) corresponds to Point *J*. The correct answer is **D**.



**Lesson 8.5 Reteach (continued)**

**EXAMPLE Plotting Ordered Pairs**

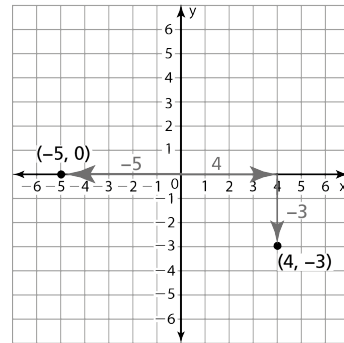
Plot (a)  $(4, -3)$  and (b)  $(-5, 0)$  in a coordinate plane. Describe the location of each point.

a. Start at the origin. Move 4 units right and 3 units down. Then plot the point.

▶ The point  $(4, -3)$  is in Quadrant IV.

b. Start at the origin. Move 5 units left. Then plot the point.

▶ The point is on the  $x$ -axis.



**EXAMPLE Reflecting a Point in Both Axes**

Reflect  $(2, 5)$  in the  $x$ -axis followed by the  $y$ -axis.

Plot  $(2, 5)$ .

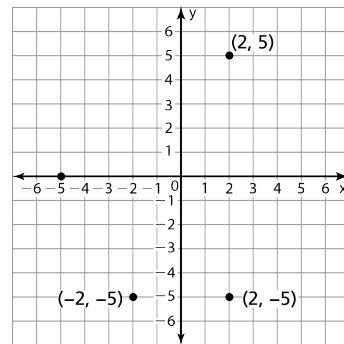
Then reflect the point in the  $x$ -axis. Use the same  $x$ -coordinate, 2, and take the opposite of the  $y$ -coordinate. The opposite of 5 is  $-5$ .

The reflection of  $(2, 5)$  in the  $x$ -axis is  $(2, -5)$ . Use the same  $y$ -coordinate,  $-5$ , and take the opposite of the  $x$ -coordinate.

The opposite of 2 is  $-2$ .

Now reflect  $(2, -5)$  in the  $y$ -axis. The reflection of  $(2, -5)$  in the  $y$ -axis is  $(-2, -5)$ .

▶ So, the reflection of  $(2, 5)$  in the  $x$ -axis followed by the  $y$ -axis is  $(-2, -5)$ .



Write an ordered pair corresponding to the point.

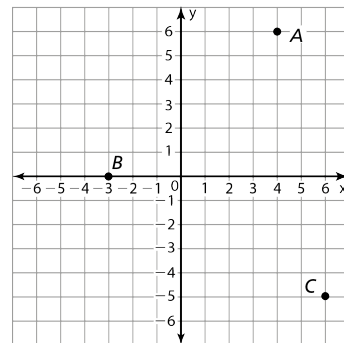
1. Point A                      2. Point B                      3. Point C

Plot the ordered pair in a coordinate plane. Describe the location of the point.

4.  $X(4, -2)$                       5.  $Y(-3, 1)$                       6.  $Z(0, -4)$

Reflect the point in the  $x$ -axis followed by the  $y$ -axis.

7.  $(1, -3)$                       8.  $(-5, 2)$                       9.  $(2, 6)$

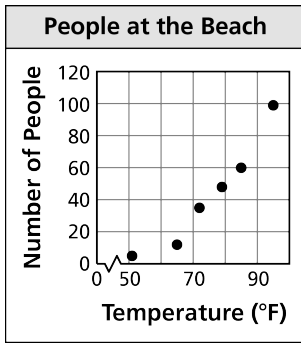


**Lesson  
8.5**

**Enrichment and Extension**

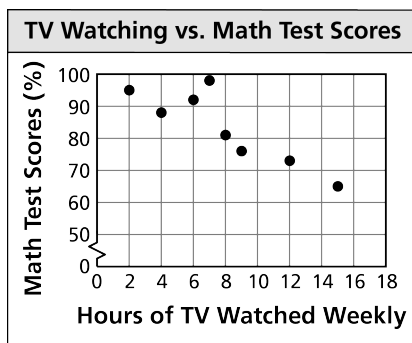
**Scatter Plots and Correlation**

A **scatter plot** is used to show relationships between two sets of numerical data with plotted points on a graph. Scatter plots also help you to see **correlations** in data.

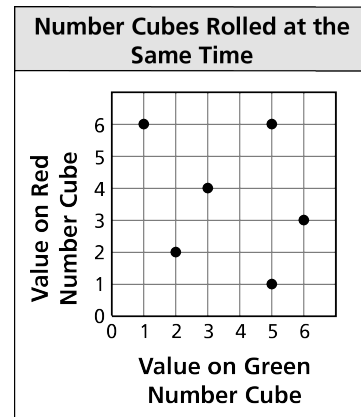


<b>Number of people</b>	60	48	35	5	99	12
<b>Temperature (°F)</b>	85	79	72	51	95	65

This scatter plot shows a **positive correlation**: as the temperature *increases*, there are *more* people at the beach.



This scatter plot shows a **negative correlation**: students who watch *more* TV, get *lower* scores on their math tests.



This scatter plot shows **no correlation**: there is no relationship between the values on two number cubes.

**Predict whether the following will have a positive correlation, negative correlation, or no correlation.**

1. Money spent on car repairs vs. mileage on the odometer
2. Years of education vs. number of convicted crimes
3. Number of letters in a state's name vs. number of parks in the state
4. Age of a computer vs. value of the computer
5. After making your prediction for the following data, create a scatter plot to test your prediction.

<b>Baby's age (months)</b>	2	10	5	0	4	6	12	9	8	1
<b>Baby's weight (pounds)</b>	10	22.5	16.5	7	15	17	24	21	20	8

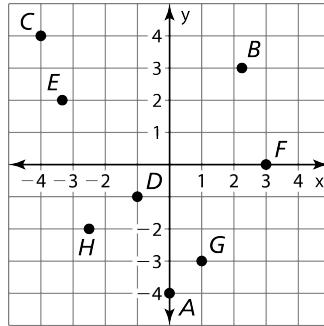
# 8.5 Puzzle Time

## What Has Stars and Stripes?

Write the letter of each answer in the box containing the exercise number.

Write an ordered pair corresponding to the point.

- 1. Point *A*
- 2. Point *B*
- 3. Point *C*
- 4. Point *D*
- 5. Point *E*
- 6. Point *F*
- 7. Point *G*
- 8. Point *H*



Plot the ordered pair in a coordinate plane. Describe the location of the point.

- 9.  $(6, -2)$
- 10.  $(2\frac{1}{8}, 6)$
- 11.  $(-1, 2)$
- 12.  $(-4.8, -6.1)$

Reflect the point in the *x*-axis followed by the *y*-axis.

- 13.  $(3, 2)$
- 14.  $(-2, 3)$
- 15.  $(3, -2)$
- 16.  $(-3, -2)$
- 17.  $(2, -3)$

### Answers for 1–8

- O.  $(2.25, 3)$
- E.  $(-3\frac{1}{3}, 2)$
- A.  $(0, -4)$
- E.  $(-4, 4)$
- A.  $(3, 0)$
- I.  $(-2\frac{1}{2}, -2)$
- O.  $(-1, -1)$
- U.  $(1, -3)$

### Answers for 9–12

- A. Quadrant I
- T. Quadrant II
- R. Quadrant III
- A. Quadrant IV

### Answers for 13–17

- B.  $(-3, 2)$
- Z.  $(-2, 3)$
- B.  $(-3, -2)$
- V.  $(2, -3)$
- M.  $(3, 2)$

9		16	4	14	8	3		10	13	2	7	11		6		17	5	15	12	1
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**Lesson**  
**8.6**

## Cumulative Practice

For use before Lesson 8.6

1. The tape diagram represents the ratio of your monthly allowance to your friend's monthly allowance. The monthly allowances total \$56. How much is each allowance?

You 

--	--	--	--

Friend 

--	--	--

Your allowance is \$\_\_\_\_\_, and your friend's allowance is \$\_\_\_\_\_.

2. The tape diagram represents the ratio of your monthly allowance to your friend's monthly allowance. The monthly allowances total \$72. How much is each allowance?

You 

--	--	--	--	--	--	--

Friend 

--	--	--	--	--

Your allowance is \$\_\_\_\_\_, and your friend's allowance is \$\_\_\_\_\_.

**Lesson**  
**8.6**

## Vocabulary Practice

For use before Lesson 8.6

1. Write what you know about this word.

**Review: origin**

**Lesson**  
**8.6**

## Prerequisite Skills Practice

For use before Lesson 8.6

**Plot and label each point in the same coordinate plane.**

1.  $A(1, 3)$

2.  $B(5, 3)$

**Lesson**  
**8.6**

**Extra Practice**

**Draw the polygon with the given vertices in a coordinate plane.**

- 1.  $A(2, 5), B(3, 2), C(0, 0)$
- 2.  $D(3, 1), E(6, 2), F(2, \frac{1}{2})$
- 3.  $G(4, 1), H(4, 3), J(9, 3), K(9, 1)$
- 4.  $L(4, 2\frac{1}{2}), M(4, 6), N(7, 2\frac{1}{2}), P(7, 6)$

- 5. Your friend finds the distance between  $(-2, 4)$  and  $(3, 4)$ . Is your friend correct? Explain your reasoning.

$$|-2| + |3| = 2 + 3 = 5$$

The distance between  $(-2, 4)$  and  $(3, 4)$  is 5.

**Find the distance between the points.**

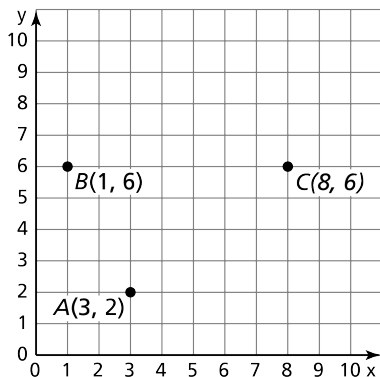
- 6.  $F(1, 0), G(6, 0)$
- 7.  $J(3, 1), K(3, 3)$
- 8.  $W(5, 2), X(7, 2)$

**Find the perimeter and the area of the polygon with the given vertices.**

- 9.  $E(0, 0), F(7, 0), G(7, 2), H(0, 2)$
- 10.  $P(4, 5), Q(4, 9), R(8, 9), S(8, 5)$
- 11. You design a courtyard using a coordinate plane. You plot the vertices of the courtyard at  $F(1, 0), G(5, 8),$  and  $H(1, 8)$ . The coordinates are measured in yards.
  - a. What is the shape of the courtyard?
  - b. What is the area of the courtyard?

**Draw a polygon with the given conditions in a coordinate plane.**

- 12. a rectangle with a perimeter of 20 units
- 13. a square with a perimeter of 16 units
- 14. a square with an area of 25 square units
- 15. a triangle with an area of 6 square units
- 16. The coordinate plane shows three vertices of a parallelogram. Find two possible points that could represent the fourth vertex.



**Lesson**  
**8.6**

**Reteach**

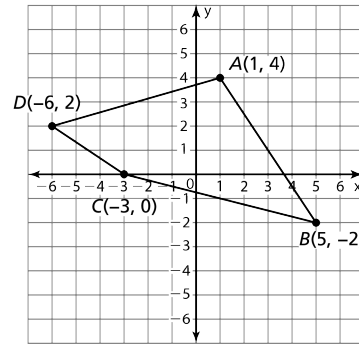
**EXAMPLE** Drawing a Polygon in a Coordinate Plane

The vertices of a quadrilateral are  $A(1, 4)$ ,  $B(5, -2)$ ,  $C(-3, 0)$ , and  $D(-6, 2)$ .  
Draw the quadrilateral in a coordinate plane.

Plot and label the vertices.

Draw line segments to connect the points in the given order.

The line segments form the quadrilateral.

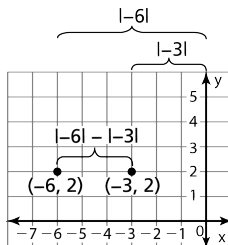


**Key Idea**

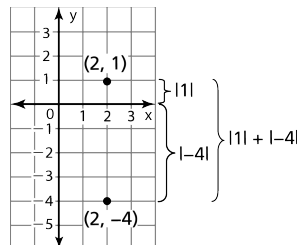
**Finding Distances between Points in a Coordinate Plane**

You can find distances between points in a coordinate plane with the same  $x$ -coordinates or the same  $y$ -coordinates using the absolute values of the coordinates that are different.

**Points in the same quadrant:**



**Points in different quadrants:**



When finding distances between points in the same quadrant, be sure to subtract the lesser absolute value from the greater absolute value.

**Lesson**  
**8.6** **Reteach** (continued)

**EXAMPLE** Finding Distances between Points

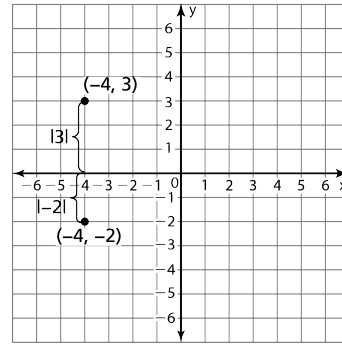
**a. Find the distance between  $(-4, -2)$  and  $(-4, 3)$ .**

Plot the points.

The points are in different quadrants and have the same  $x$ -coordinates. The distance between the points is the sum of the absolute values of the  $y$ -coordinates.

$$|-2| + |3| = 2 + 3 = 5$$

► So, the distance between  $(-4, -2)$  and  $(-4, 3)$  is 5.



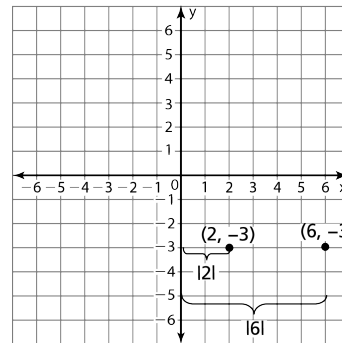
**b. Find the distance between  $(2, -3)$  and  $(6, -3)$ .**

Plot the points.

The points are in the same quadrant and have the same  $y$ -coordinates. The distance between the points is the difference of the absolute values of the  $x$ -coordinates.

$$|6| - |2| = 6 - 2 = 4$$

► So, the distance between  $(2, -3)$  and  $(6, -3)$  is 4.



**Draw the polygon with the given vertices in a coordinate plane.**

1.  $A(1, 3), B(4, 4), C(2, 0)$
2.  $D(3, 5), E(6, 2), F(4, 1), G(0, 3)$
3.  $J(5, 4), K(6, 4), L(6, 1), M(5, 1)$
4.  $N(4, -2), P(4, -6), Q(-3, -6), R(-3, -2)$

**Find the distance between the points.**

5.  $(5, 2), (5, 5)$
6.  $(1, -4), (-6, -4)$
7.  $(-3, 3), (3, 3)$
8.  $(0, 6), (0, -2)$
9.  $(-1, 5), (4, 5)$
10.  $(-2, 4), (-2, 1)$

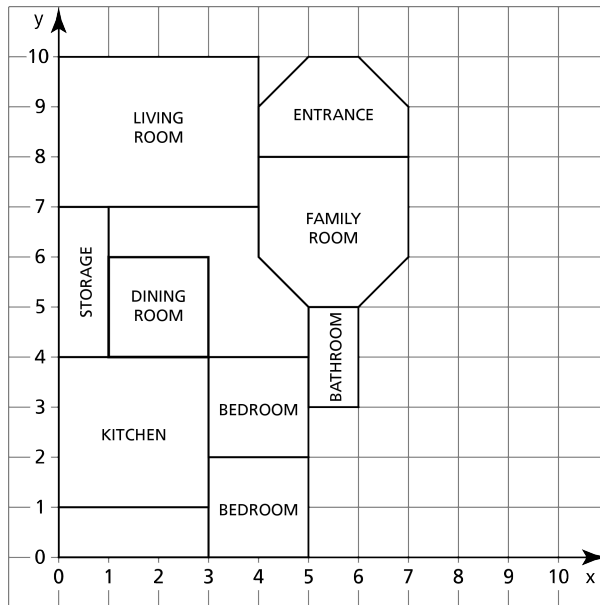


**Lesson**  
**8.6**

**Enrichment and Extension**

**Using a Blueprint**

Blueprints are used when constructing a house. The measurements on a blueprint correspond to the actual measurement the house will be when completed.



Use the blueprint above for Exercises 1–7.

1. Draw a line by connecting points (4, 9) and (7, 9). Do the same for points (4, 6) and (7, 6). Name the shapes the Entrance and Family Room are now broken into.
2. Which labeled rooms are rectangles?
3. Which labeled rooms are squares?
4. Use the lines you drew in Exercise 1 and your knowledge of shapes to help you find the area of the Family Room.
5. What is the total area of the labeled rooms?
6. The builder wants to order wood trim for the living room and dining room. What are the perimeters of these two rooms?
7. Find the area of the space near the center of the house that is not labeled.



## Puzzle Time

### What Do You Call A Bunch Of Toads Stacked On Top Of Each Other?

Circle the letter of each correct answer in the boxes below. The circled letters will spell out the answer to the riddle.

Find the distance between the points.

1.  $A(1, 2), B(9, 2)$
2.  $I(6, 3), J(6, 7)$
3.  $O(4, 5), P(4, 10)$
4.  $C(3, 3), D(6, 3)$
5.  $M(2, 0), N(8\frac{1}{2}, 0)$
6.  $P(10\frac{1}{4}, 1), Q(10\frac{1}{4}, 7)$

Find the perimeter of the polygon with the given vertices.

7.  $A(2, 3), B(8, 3), C(8, 9), D(2, 9)$
8.  $E(4\frac{1}{2}, 1), F(4\frac{1}{2}, 6), G(8\frac{1}{2}, 6), H(8\frac{1}{2}, 1)$

Find the area of the polygon with the given vertices.

9.  $I(2, 2), J(2, 5), K(5, 5), L(5, 2)$
10.  $M(1, 0), N(1, 6), O(7\frac{1}{2}, 6), P(7\frac{1}{2}, 0)$

11. You design a bean-bag toss board using a coordinate plane. You plot the vertices of the board at  $C(3, 2), D(3, 6), E(5, 2),$  and  $F(5, 6)$ . What is the perimeter of the bean-bag toss board?

<b>M</b>	<b>A</b>	<b>B</b>	<b>I</b>	<b>U</b>	<b>T</b>	<b>W</b>	<b>L</b>	<b>O</b>	<b>G</b>	<b>P</b>	<b>A</b>	<b>F</b>	<b>D</b>	<b>Z</b>	<b>D</b>	<b>Y</b>	<b>E</b>	<b>K</b>
44	24	52	1	60	12	14	61	8	23	20	$6\frac{1}{2}$	16	$4\frac{1}{2}$	62	6	63	18	11
<b>V</b>	<b>J</b>	<b>T</b>	<b>M</b>	<b>S</b>	<b>C</b>	<b>N</b>	<b>P</b>	<b>H</b>	<b>A</b>	<b>Q</b>	<b>O</b>	<b>M</b>	<b>X</b>	<b>L</b>	<b>E</b>	<b>A</b>	<b>E</b>	<b>R</b>
46	53	2	3	54	$3\frac{1}{2}$	45	9	13	10	17	4	$5\frac{1}{2}$	15	39	50	7	5	19

**Lesson**  
**8.7**

## Cumulative Practice

For use before Lesson 8.7

1. Solve  $3a = 21$ .

The solution is  $a = \underline{\hspace{2cm}}$ .

2. Solve  $6x = 42$ .

The solution is  $x = \underline{\hspace{2cm}}$ .

**Lesson**  
**8.7**

## Vocabulary Practice

For use before Lesson 8.7

1. Write what you know about this word.

**Preview: inequality**

**Lesson**  
**8.7**

## Prerequisite Skills Practice

For use before Lesson 8.7

Complete the statement with  $<$ ,  $>$ , or  $=$ .

1.  $-5 \underline{\hspace{0.5cm} ? \hspace{0.5cm}} -2$

2.  $4 \underline{\hspace{0.5cm} ? \hspace{0.5cm}} -6$

**Lesson**  
**8.7**
**Extra Practice**

**Write the word sentence as an inequality.**

1. 2 is more than a number  $v$ .
2. A number  $h$  is at most 15.
3. A number  $p$  is less than  $\frac{1}{2}$ .
4. 12 is fewer than a number  $n$ .
5.  $\frac{3}{5}$  is no less than a number  $a$ .
6. A number  $b$  is no more than 17.
7. 6 plus a number  $x$  is at least 12.
8. A number  $k$  minus 7 is greater than 10.

**Tell whether the given value is a solution of the inequality.**

9.  $y \leq 11$ ;  $y = 8$
10.  $q + 1 \geq 7$ ;  $q = 3$
11.  $4 < u - 9$ ;  $u = 13$
12.  $5m < 72$ ;  $m = 15$
13.  $\frac{7}{8} \leq 2c$ ;  $c = 3$
14.  $10 \geq g + 3$ ;  $g = 7$

**Graph the inequality on a number line.**

15.  $k > 1$
16.  $w \leq 5$
17.  $r < 0$
18.  $t \geq \frac{1}{3}$
19.  $s > 6$
20.  $z \leq -\frac{3}{2}$
21.  $2.5 < n$
22.  $-\frac{2}{3} < x$
23.  $3 \geq a$

24. Your friend says  $x = 2$  is a solution of the inequality. Is your friend correct? Explain your reasoning.

$4x + 1 < 9$ ; $x = 2$ $4(2) + 1 < 9$ $8 + 1 < 9$ $9 < 9$
--

25. A lifeboat can carry up to 24 people. Write an inequality to represent this situation.

26. A USB flash drive costs \$16. You have \$50.

a. Write an inequality to represent the number of USB flash drives you can buy.

b. Can you buy 4 USB flash drives? Explain.

27. A produce box can hold no more than 25 pounds of potatoes.

a. Write and graph an inequality to represent this situation.

b. Is 9.8 a solution of the inequality?

# Lesson 8.7 Reteach

An **inequality** is a mathematical sentence that compares expressions. It contains the symbols  $<$ ,  $>$ ,  $\leq$ , or  $\geq$ . To write a word sentence as an inequality, look for the following phrases to determine where to place the inequality symbol.

Inequality Symbols				
Symbol	$<$	$>$	$\leq$	$\geq$
<b>Key Phrases</b>	<ul style="list-style-type: none"> <li>is less than</li> <li>is fewer than</li> </ul>	<ul style="list-style-type: none"> <li>is greater than</li> <li>is more than</li> </ul>	<ul style="list-style-type: none"> <li>is less than or equal to</li> <li>is at most</li> <li>is no more than</li> </ul>	<ul style="list-style-type: none"> <li>is greater than or equal to</li> <li>is at least</li> <li>is no less than</li> </ul>

## EXAMPLE Writing Inequalities

Write each word sentence as an inequality.

- a. A number  $p$  is more than  $-3$ .

A number  $p$  is more than  $-3$ .

► An inequality is  $p > -3$ .

- b. A number  $w$  minus 4 is less than or equal to 12.

A number  $w$  minus 4 is less than or equal to 12.

► An inequality is  $w - 4 \leq 12$ .

A **solution of an inequality** is a value that makes the inequality true. An inequality can have more than one solution. The set of all solutions of an inequality is called the **solution set**.

Value of $x$	$x + 3 \leq 7$	Is the inequality true?
3	$3 + 3 \stackrel{?}{\leq} 7$ $6 \leq 7$ ✓	yes
4	$4 + 3 \stackrel{?}{\leq} 7$ $7 \leq 7$ ✓	yes
5	$5 + 3 \stackrel{?}{\leq} 7$ $8 \not\leq 7$ ✗	no

The symbol  $\leq$  means *is less than or equal to*.

**Lesson**  
**8.7**
**Reteach** (continued)

**EXAMPLE** Checking Solutions

Tell whether the given value is a solution of the inequality.

a.  $x - 3 < 10$ ;  $x = 7$

$$x - 3 < 10$$

Write the inequality.

$$7 - 3 < 10$$

Substitute 7 for  $x$ .

$$4 < 10$$

✓ Subtract. 4 is less than 10.

► So, 7 is a solution of  $x - 3 < 10$ .

b.  $5a \geq 45$ ;  $a = 6$

$$5a \geq 45$$

Write the inequality.

$$5(6) \geq 45$$

Substitute 6 for  $a$ .

$$30 \geq 45$$

✗ Multiply. 30 is *not* greater than or equal to 45.

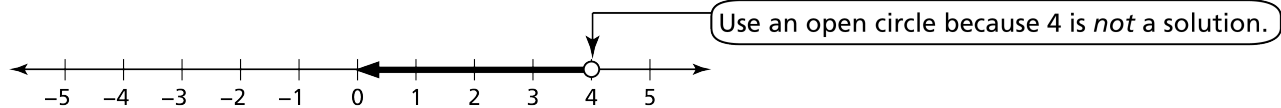
► So, 6 is *not* a solution of  $5a \geq 45$ .

**EXAMPLE** Graphing an Inequality

Graph  $f < 4$ .

Test numbers to the left and right of 4.  $f = 3$  is a solution.  $f = 5$  is *not* a solution.

So, shade the number line on the left side of 4.



Write the word sentence as an inequality.

1. A number  $b$  times 1.5 is no more than 24.
2. The sum of a number  $t$  and 8 is at least 17.
3. 11 less than a number  $m$  is greater than 0.

Tell whether the given value is a solution of the inequality.

4.  $\frac{x}{4} \leq 3$ ;  $x = 20$

5.  $13n > 26$ ;  $n = 5$

6.  $z + 9 \geq 36$ ;  $z = 32$

7.  $y - 10 < 2$ ;  $y = 12$

8.  $a + 6 \geq 0$ ;  $a = -6$

9.  $5d < 100$ ;  $d = -2$

Graph the inequality on a number line.

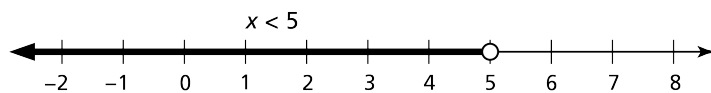
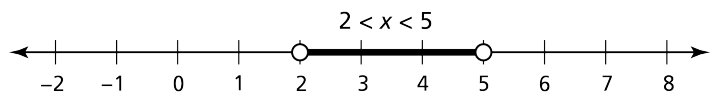
10.  $b < -1$

11.  $q \geq 0$

12.  $k \leq 5$

**Lesson**  
**8.7**
**Enrichment and Extension**
**Compound Inequalities**

A *compound inequality* is a mathematical sentence that uses more than one inequality symbol. It is the result of combining two inequalities. For example, the two inequalities  $x > 2$  and  $x < 5$  can be combined to form the compound inequality  $2 < x < 5$ . It is read as “ $x$  is greater than 2 and  $x$  is less than 5.”

Graph  $x > 2$ .Graph  $x < 5$ .

Graph the common solutions.

Identify each integer that is a solution of the compound inequality.

1.  $0 < x < 6$

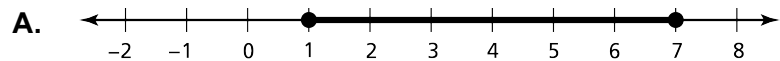
2.  $3 \leq x \leq 8$

3.  $4 \leq x < 11$

4.  $-2 < x \leq 2$

Match each inequality with its graph.

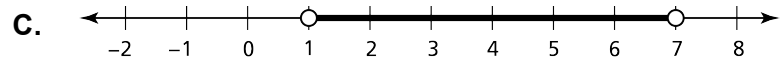
5.  $1 \leq x < 7$



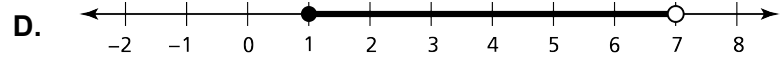
6.  $1 < x < 7$



7.  $1 \leq x \leq 7$



8.  $1 < x \leq 7$



Graph the compound inequality on a number line.

9.  $0 \leq x < 3$

10.  $2 < x < 9$

11.  $5 \leq x \leq 11$

12.  $-1 < x \leq 6$

13.  $-5 < x < -3$

14.  $10 \leq x < 70$

15. A compound inequality can be made up of two inequalities using the word “and” (as shown above) or the word “or.” Graph the compound inequality  $x < 0$  or  $x > 2$ . Can this be written as a single inequality? Explain.

# 8.7 Puzzle Time

## What Kind Of Cheese Comes With A House?

Write the letter of each answer in the box containing the exercise number.

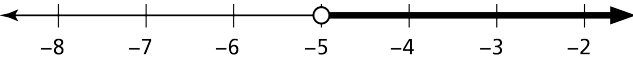
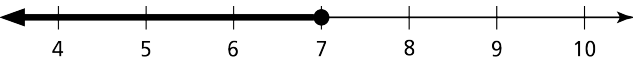
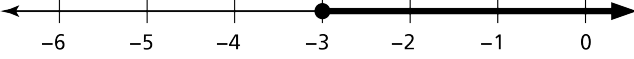
Write the word sentence as an inequality.

- A number  $x$  is more than 15.
- A number  $b$  is less than 23.
- A number  $y$  is at most 8.
- Three plus a number  $a$  is greater than or equal to 19.

Tell whether the given value is a solution of the inequality.

- $\frac{a}{4} > 5$ ;  $a = 28$
- $z + 4.5 \leq 13$ ;  $z = 9.5$

Write an inequality that represents the graph.

- 
- 
- 

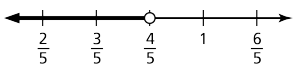
Match each inequality with its graph.

- $x < \frac{4}{5}$
- $a \geq -3$
- $p \leq 2.6$
- $y > -\frac{2}{3}$


**Answers**

**E.**  $x > -5$       **C.**  $y \leq 8$

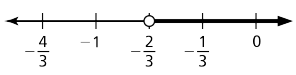
**T.**  $x \geq -3$

**H.** 

**E.**  $x > 15$       **A.** no

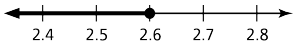
**G.** 

**E.**  $3 + a \geq 19$

**S.** 

**O.**  $b < 23$

**C.**  $x \leq 7$

**T.** 

**E.** yes

8	2	12	9	6	11	5		3	10	1	7	13	4
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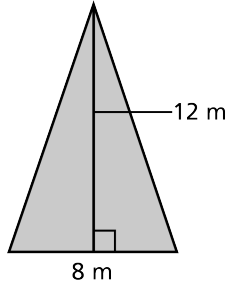


**Lesson**  
**8.8**

**Cumulative Practice**

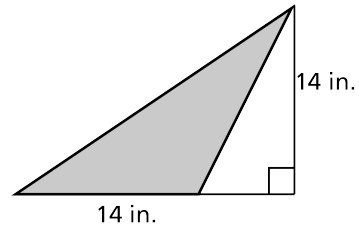
For use before Lesson 8.8

1. Find the area of the triangle.



$A = \underline{\hspace{2cm}} \text{ m}^2$

2. Find the area of the gray triangle.



$A = \underline{\hspace{2cm}} \text{ in.}^2$

**Lesson**  
**8.8**

**Vocabulary Practice**

For use before Lesson 8.8

1. Write what you know about this phrase.

**Preview: solution set**

**Lesson**  
**8.8**

**Prerequisite Skills Practice**

For use before Lesson 8.8

Graph the inequality on a number line.

1.  $a < 2$

2.  $b > 1$

**Lesson  
8.8****Extra Practice**

Solve the inequality. Graph the solution.

1.  $n - 9 \geq 2$

2.  $v + 10 \leq 14$

3.  $p + \frac{1}{4} < \frac{5}{4}$

4.  $x - 3 > 8$

5.  $20 < k + 15$

6.  $\frac{4}{5} \leq m - \frac{1}{5}$

7.  $12 \geq h - 8$

8.  $4.4 > 2.4 + b$

9.  $w - 36 \leq 64$

10.  $a + 16 \geq 25$

11.  $r + \frac{2}{3} > \frac{8}{3}$

12.  $y - 19 < 51$

13. Your friend solves the inequality.  
Is your friend correct?  
Explain your reasoning.

$x + 5 \geq 11$
$\frac{-5}{x} \geq \frac{+5}{16}$

Write the word sentence as an inequality. Then solve the inequality.

14. 6 more than a number  $d$  is at most 10.
15. Four less than a number  $x$  is more than 3.
16. 0.6 is no less than 2.4 subtracted from a number  $n$ .
17. The sum of a number  $z$  and 14 is at least 18.
18. You can spend at most \$10 at the mall. You want to buy a book that costs \$6.75 and a cold drink. Write and solve an inequality to represent the amount of money you can spend on your cold drink.
19. An order from an online bookstore takes at least four weeks to arrive. You ordered some books online nine days ago. Write and solve an inequality to represent the possible number of days it will take for your books to arrive.
20. The school auditorium can hold at most 480 people. There were 185 advance tickets sold for the school play. Write and solve an inequality to represent the number of people who can attend the play if all the people who bought advance tickets attend the play.

**Lesson**  
**8.8**

**Reteach**

<b>Addition Property of Inequality</b>		
<b>Words</b> When you add the same number to each side of an inequality, the inequality remains true.	<b>Numbers</b> $3 < 5$ $\begin{array}{r} +2 \\ +2 \\ \hline 5 < 7 \end{array}$	<b>Algebra</b> $x - 4 > 5$ $\begin{array}{r} +4 \\ +4 \\ \hline x > 9 \end{array}$
<b>Subtraction Property of Inequality</b>		
<b>Words</b> When you subtract the same number from each side of an inequality, the inequality remains true.	<b>Numbers</b> $3 < 5$ $\begin{array}{r} -2 \\ -2 \\ \hline 1 < 3 \end{array}$	<b>Algebra</b> $x + 4 > 5$ $\begin{array}{r} -4 \\ -4 \\ \hline x > 1 \end{array}$

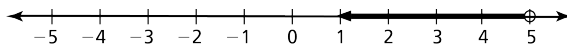
These properties are also true for  $\leq$  and  $\geq$ .

**EXAMPLE Solving Inequalities Using Addition or Subtraction**

**a. Solve  $g - 4 < 1$ . Graph the solution.**

$$\begin{array}{ll}
 g - 4 < 1 & \text{Write the inequality.} \\
 \begin{array}{r} +4 \\ +4 \\ \hline g < 5 \end{array} & \begin{array}{l} \text{Use the Addition Property of Inequality to undo the subtraction.} \\ \text{Simplify.} \end{array}
 \end{array}$$

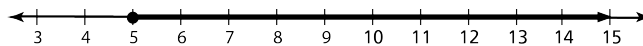
► The solution is  $g < 5$ .



**b. Solve  $r + 7 \geq 15$ . Graph the solution.**

$$\begin{array}{ll}
 r + 7 \geq 15 & \text{Write the inequality.} \\
 \begin{array}{r} -7 \\ -7 \\ \hline r \geq 8 \end{array} & \begin{array}{l} \text{Use the Subtraction Property of Inequality to undo the addition.} \\ \text{Simplify.} \end{array}
 \end{array}$$

► The solution is  $r \geq 8$ .



<b>Multiplication Property of Inequality</b>		
<b>Words</b> When you multiply each side of an inequality by the same <i>positive</i> number, the inequality remains true.	<b>Numbers</b> $8 > 6$ $8 \times 2 > 6 \times 2$ $16 > 12$	<b>Algebra</b> $\frac{x}{4} < 2$ $\frac{x}{4} \cdot 4 < 2 \cdot 4$ $x < 8$
<b>Division Property of Inequality</b>		
<b>Words</b> When you divide each side of an inequality by the same <i>positive</i> number, the inequality remains true.	<b>Numbers</b> $8 > 6$ $8 \div 2 > 6 \div 2$ $4 > 3$	<b>Algebra</b> $4x < 8$ $\frac{4x}{4} < \frac{8}{4}$ $x < 2$

**Lesson 8.8 Reteach** (continued)

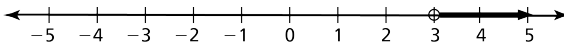
**EXAMPLE Solving Inequalities Using Multiplication or Division**

**Solve the inequality. Graph the solution.**

a.  $\frac{y}{3} > 1$

$\frac{y}{3} > 1$  Write the inequality.

$\frac{y}{3} \cdot 3 > 1 \cdot 3$  Use the Multiplication Property of Inequality to undo the division.

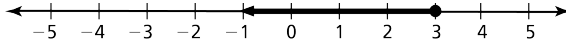
$y > 3$  Simplify. 

▶ The solution is  $y > 3$ .

b.  $8a \leq 24$

$8a \leq 24$  Write the inequality.

$\frac{8a}{8} \leq \frac{24}{8}$  Use the Division Property of Inequality to undo the multiplication.

$a \leq 3$  Simplify. 

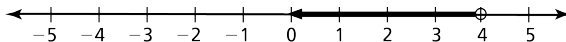
▶ The solution of the inequality is  $a \leq 3$ .

**EXAMPLE Solving an Inequality Using a Reciprocal**

**Solve  $\frac{3b}{2} < 6$ . Graph the solution.**

$\frac{3}{2}b < 6$  Write the inequality.

$\frac{2}{3} \cdot \frac{3}{2}b < \frac{2}{3} \cdot 6$  Multiplication Property of Inequality:  
Multiply each side by the reciprocal of  $\frac{3}{2}$ .

$b < 4$  Simplify. 

▶ The solution of the inequality is  $b < 4$ .

**Solve the inequality. Graph the solution.**

- |                           |                         |                        |
|---------------------------|-------------------------|------------------------|
| 1. $x + 10 \geq 11$       | 2. $c - 4 > 0$          | 3. $q - 3 \leq 1$      |
| 4. $t + 32 \leq 37$       | 5. $\frac{k}{3} \geq 1$ | 6. $4h > 8$            |
| 7. $\frac{m}{2} < 2$      | 8. $9n < 27$            | 9. $3f < 6$            |
| 10. $\frac{4}{5}y \geq 8$ | 11. $\frac{1}{2}q < 4$  | 12. $\frac{3}{4}v > 6$ |

**Lesson**  
**8.8**
**Enrichment and Extension**
**Solving Compound Inequalities Using Addition or Subtraction**

**Example:** Solve  $3 < x + 1 < 6$ . Graph the solution.

$$3 < x + 1 < 6 \quad \text{Write inequality.}$$

$$\underline{-1} \quad \underline{-1} \quad \underline{-1} \quad \text{Subtract 1 from each part of the inequality.}$$

$$2 < x < 5 \quad \text{Simplify.}$$



**Example:** Solve  $x + 2 \geq 7$  or  $x - 1 \leq 1$ . Graph the solution.

Solve each inequality separately.

$$x + 2 \geq 7 \quad \text{Write inequality.}$$

$$x - 1 \leq 1 \quad \text{Write inequality.}$$

$$\underline{-2} \quad \underline{-2} \quad \text{Subtract 2 from each side.}$$

$$\underline{+1} \quad \underline{+1} \quad \text{Add 1 to each side.}$$

$$x \geq 5 \quad \text{Simplify.}$$

$$x \leq 2 \quad \text{Simplify.}$$



**Solve the inequality. Graph the solution.**

1.  $1 < x - 2 < 4$

2.  $3 \leq x + 3 \leq 7$

3.  $2 < x - 5 \leq 6$

4.  $8 \leq x + 4 < 12$

5.  $x > 6$  or  $x + 10 < 14$

6.  $x + 1 \leq 4$  or  $x - 3 \geq 2$

7.  $x - 5 \geq 2$  or  $x + 8 < 8$

8.  $x + 7 < 10$  or  $9 + x \geq 13$

9. What do you notice about the solution of the compound inequality  $x + 3 > 3$  or  $x + 3 \leq 3$ ?

# 8.8 Puzzle Time

## A Man Went To the Rocket Station And Asked For A Ticket To The Moon...

A	B	C	D	E	F
G	H	I	J	K	L

Complete each exercise. Find the answer in the answer column. Write the word under the answer in the box containing the exercise letter.

$x < 11$  I'M
$x \leq 22.4$  FULL
$x \leq 17$  ATTENDANT
$x > \frac{1}{6}$  NOW
$x < 110$  THE
$x \geq 9$  SAID

Solve the inequality. Graph the solution.

- A.  $x - 5 < 6$
- B.  $7 + x > 9$
- C.  $5 \geq x - 7$
- D.  $12 \leq x + 3$
- E.  $20 > 14 + x$
- F.  $39 + x \leq 56$
- G.  $x - 23 < 87$
- H.  $x - 19 \geq 19$
- I.  $8.4 < x + 4.2$
- J.  $14.9 \geq x - 7.5$
- K.  $\frac{7}{8} \leq \frac{1}{4} + x$
- L.  $\frac{1}{2} + x > \frac{2}{3}$

$x \geq \frac{5}{8}$  RIGHT
$x \leq 12$  SIR
$x < 6$  THE
$x \geq 38$  MOON
$x > 2$  SORRY
$x > 4.2$  IS