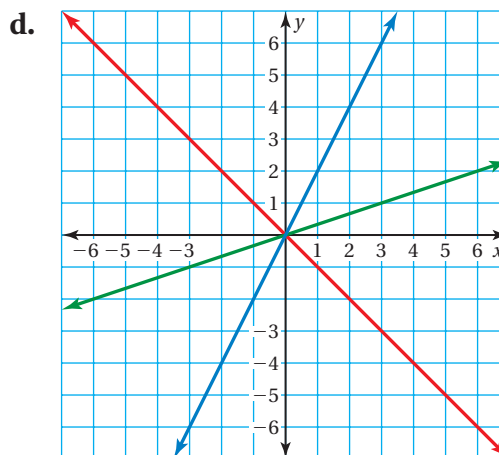
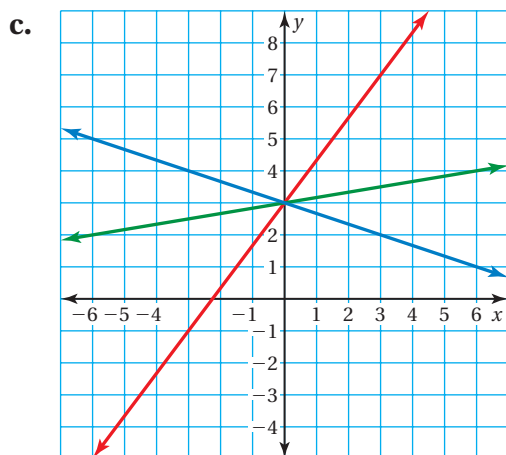
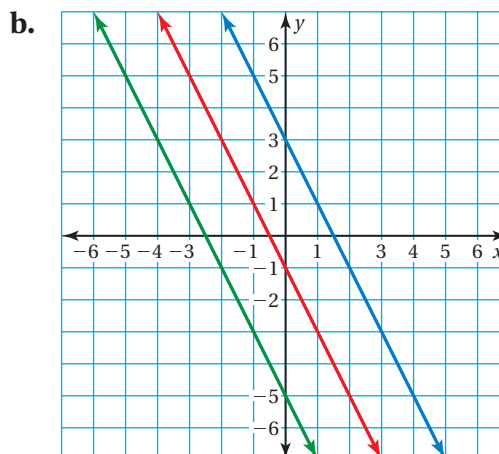
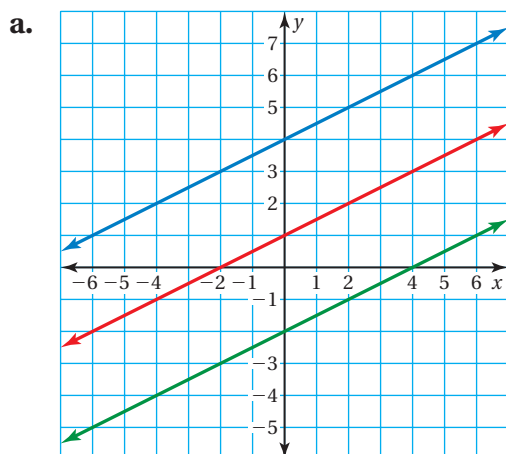


**Essential Question** How can you write an equation of a line when you are given the slope and  $y$ -intercept of the line?

## 1 ACTIVITY: Writing Equations of Lines

Work with a partner.

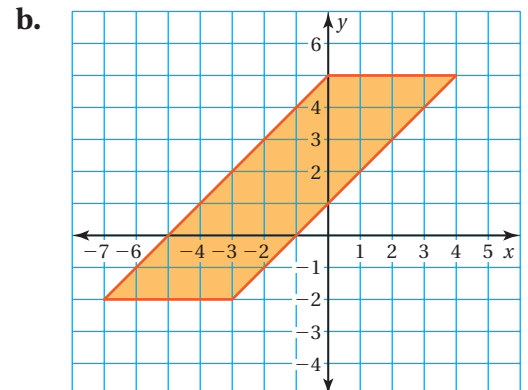
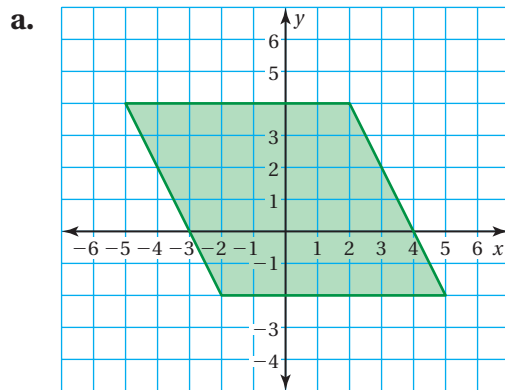
- Find the slope of each line.
- Find the  $y$ -intercept of each line.
- Write an equation for each line.
- What do the three lines have in common?



## 2 ACTIVITY: Describing a Parallelogram

Work with a partner.

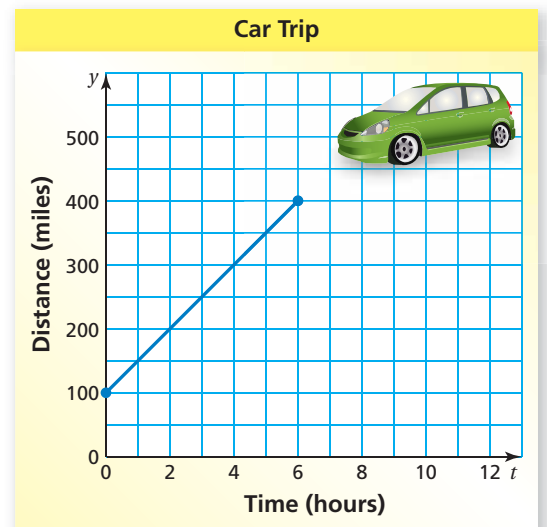
- Find the area of each parallelogram.
- Write an equation for each side of each parallelogram.
- What do you notice about the slopes of the opposite sides of each parallelogram?



## 3 ACTIVITY: Interpreting the Slope and y-Intercept

Work with a partner. The graph shows a trip taken by a car where  $t$  is the time (in hours) and  $y$  is the distance (in miles) from Phoenix.

- How far from Phoenix was the car at the beginning of the trip?
- What was the car's speed?
- How long did the trip last?
- How far from Phoenix was the car at the end of the trip?



## What Is Your Answer?

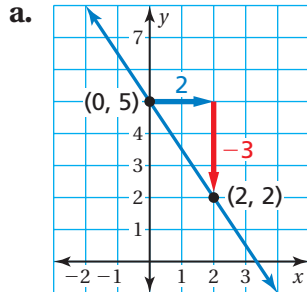
- IN YOUR OWN WORDS** How can you write an equation of a line when you are given the slope and  $y$ -intercept of the line? Give an example that is different from those in Activities 1, 2, and 3.

**Practice** →

Use what you learned about writing equations in slope-intercept form to complete Exercises 3 and 4 on page 110.

## EXAMPLE 1 Writing Equations in Slope-Intercept Form

Write an equation of the line in slope-intercept form.



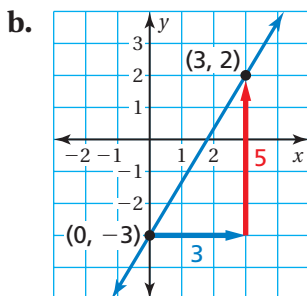
Find the slope and y-intercept.

$$\text{slope} = \frac{\text{rise}}{\text{run}} = \frac{-3}{2} = -\frac{3}{2}$$

Because the line crosses the y-axis at (0, 5), the y-intercept is 5.

slope      y-intercept

∴ So, the equation is  $y = -\frac{3}{2}x + 5$ .



Find the slope and y-intercept.

$$\text{slope} = \frac{\text{rise}}{\text{run}} = \frac{5}{3}$$

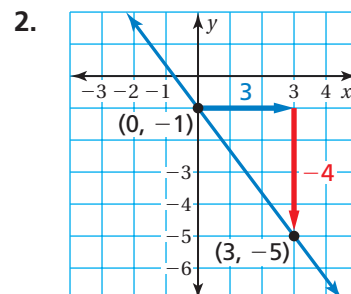
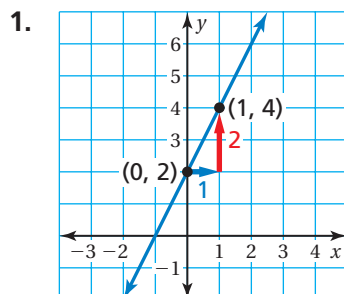
Because the line crosses the y-axis at (0, -3), the y-intercept is -3.

slope      y-intercept

∴ So, the equation is  $y = \frac{5}{3}x + (-3)$ , or  $y = \frac{5}{3}x - 3$ .

### On Your Own

Write an equation of the line in slope-intercept form.



### Study Tip

After writing an equation, check that the given points are solutions of the equation.

Now You're Ready  
Exercises 5–10

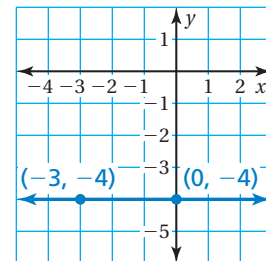
## EXAMPLE 2 Standardized Test Practice

Which equation is shown in the graph?

- Ⓐ  $y = -4$       Ⓑ  $y = -3$   
 Ⓒ  $y = 0$       Ⓓ  $y = -3x$

### Remember

The graph of  $y = a$  is a horizontal line that passes through  $(0, a)$ .



Find the slope and  $y$ -intercept.

The line is horizontal, so the rise is 0.

$$\text{slope} = \frac{\text{rise}}{\text{run}} = \frac{0}{3} = 0$$

Because the line crosses the  $y$ -axis at  $(0, -4)$ , the  $y$ -intercept is  $-4$ .

∴ So, the equation is  $y = 0x + (-4)$ , or  $y = -4$ . The correct answer is Ⓐ.

## EXAMPLE 3 Real-Life Application



Engineers used a tunnel boring machine like the one shown above to dig the main tunnel of the Yucca Mountain Repository in Nevada. The main tunnel is 5 miles long and 25 feet wide.

The graph shows the distance remaining to complete a tunnel.

(a) Write an equation that represents the distance  $y$  (in feet) remaining after  $x$  months. (b) How much time does it take to complete the tunnel?

a. Find the slope and  $y$ -intercept.

$$\text{slope} = \frac{\text{rise}}{\text{run}} = \frac{-2000}{4} = -500$$

Because the line crosses the  $y$ -axis at  $(0, 3500)$ , the  $y$ -intercept is 3500.

∴ So, the equation is  $y = -500x + 3500$ .

b. The tunnel is complete when the distance remaining is 0 feet. So, find the value of  $x$  when  $y = 0$ .

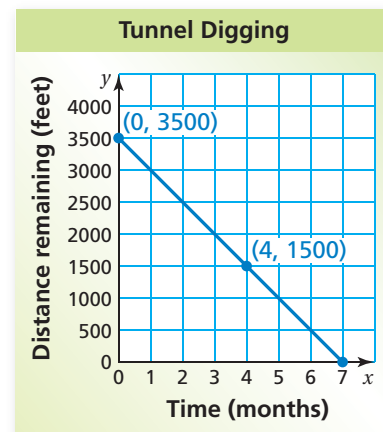
$$y = -500x + 3500 \quad \text{Write the equation.}$$

$$0 = -500x + 3500 \quad \text{Substitute 0 for } y.$$

$$-3500 = -500x \quad \text{Subtract 3500 from each side.}$$

$$7 = x \quad \text{Solve for } x.$$

∴ It takes 7 months to complete the tunnel.



### On Your Own

- Write an equation of the line that passes through  $(0, 5)$  and  $(4, 5)$ .
- WHAT IF?** In Example 3, the points are  $(0, 3500)$  and  $(5, 1500)$ . How long does it take to complete the tunnel?

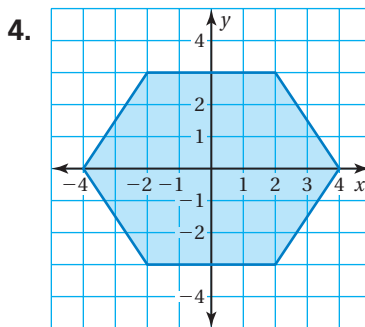
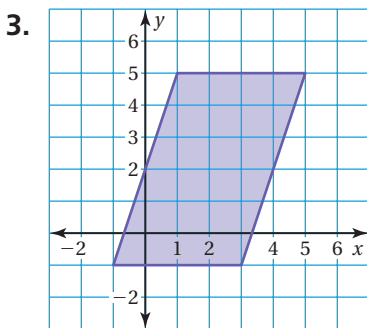
# 3.1 Exercises

## Vocabulary and Concept Check

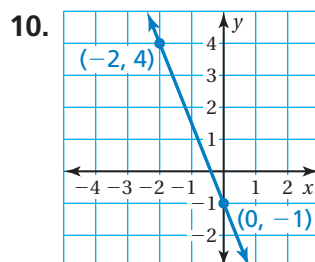
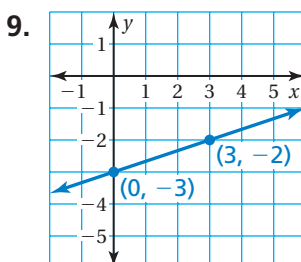
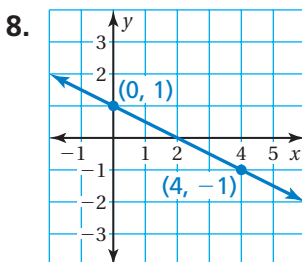
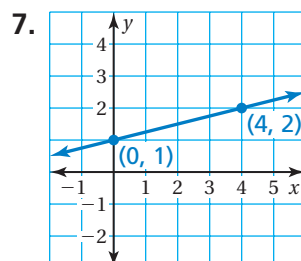
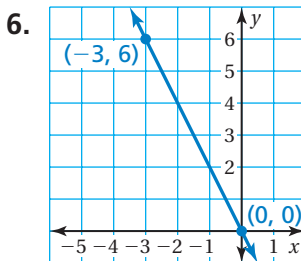
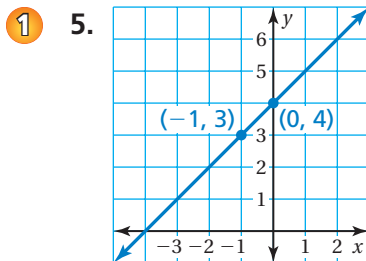
- WRITING** Explain how to find the slope of a line given the intercepts of the line.
- WRITING** Explain how to write an equation of a line using its graph.

## Practice and Problem Solving

Write an equation for each side of the figure.

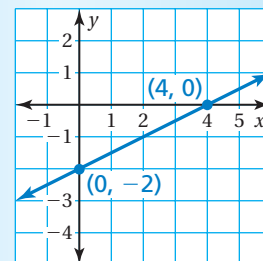


Write an equation of the line in slope-intercept form.



11. **ERROR ANALYSIS** Describe and correct the error in writing the equation of the line.

**X**  $y = \frac{1}{2}x + 4$



12. **BOA** A boa constrictor is 18 inches long at birth and grows 8 inches per year. Write an equation that represents the length  $y$  (in feet) of a boa constrictor that is  $x$  years old.

Write an equation of the line that passes through the points.

- 2 13.  $(2, 5), (0, 5)$       14.  $(-3, 0), (0, 0)$       15.  $(0, -2), (4, -2)$

16. **WALKATHON** One of your friends gives you \$10 for a charity walkathon. Another friend gives you an amount per mile. After 5 miles, you have raised \$13.50 total. Write an equation that represents the amount  $y$  of money you have raised after  $x$  miles.



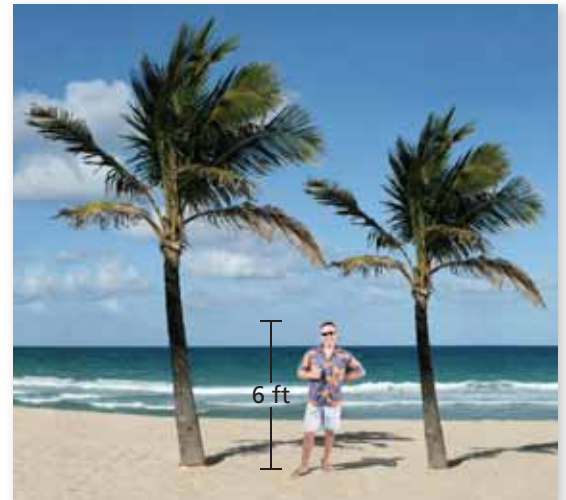
17. **BRAKING TIME** During each second of braking, an automobile slows by about 10 miles per hour.

- Plot the points  $(0, 60)$  and  $(6, 0)$ . What do the points represent?
- Draw a line through the points. What does the line represent?
- Write an equation of the line.

18. **PAPER** You have 500 sheets of notebook paper. After 1 week, you have 72% of the sheets left. You use the same number of sheets each week. Write an equation that represents the number  $y$  of pages remaining after  $x$  weeks.

19. **Critical Thinking** The palm tree on the left is 10 years old. The palm tree on the right is 8 years old. The trees grow at the same rate.

- Estimate the height  $y$  (in feet) of each tree.
- Plot the two points  $(x, y)$ , where  $x$  is the age of each tree and  $y$  is the height of each tree.
- What is the rate of growth of the trees?
- Write an equation that represents the height of a palm tree in terms of its age.



## Fair Game Review what you learned in previous grades & lessons

Plot the ordered pair in a coordinate plane.

20.  $(1, 4)$       21.  $(-1, -2)$       22.  $(0, 1)$       23.  $(2, 7)$

24. **MULTIPLE CHOICE** Which of the following statements is true?

- The  $x$ -intercept is 5.
- The  $x$ -intercept is  $-2$ .
- The  $y$ -intercept is 5.
- The  $y$ -intercept is  $-2$ .

