English Spanish

# 3.1 Writing Equations in Slope-Intercept Form

**STATE STANDARDS**
MA.8.A.1.1
MA.8.A.1.2

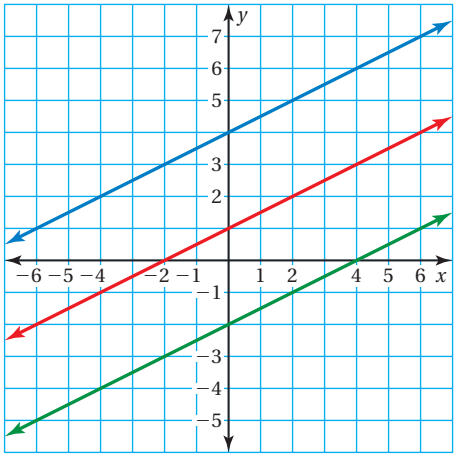
**Essential Question** How can you write an equation of a line when you are given the slope and $y$-intercept of the line?

## 1 ACTIVITY: Writing Equations of Lines

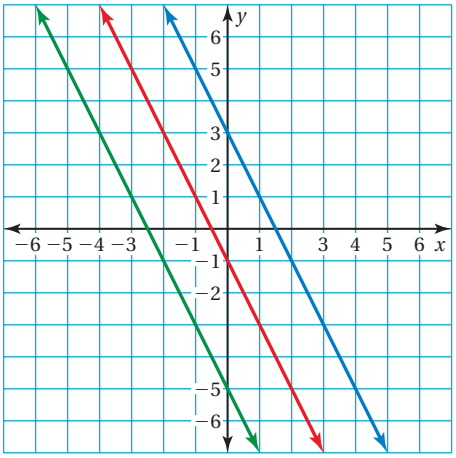
**Work with a partner.**

- **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?**

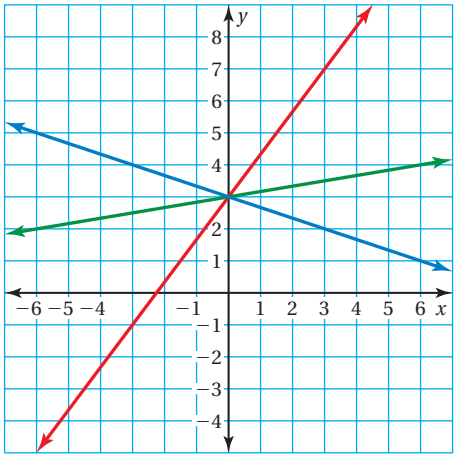
**a.**



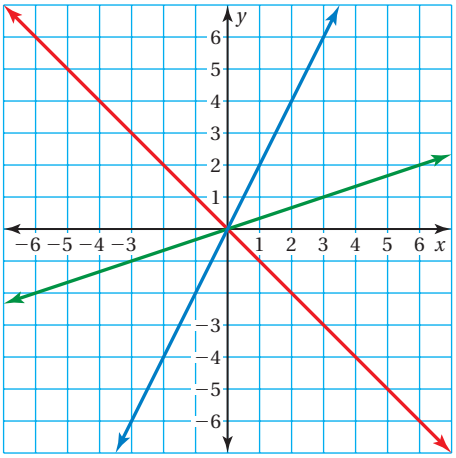

**b.**




**c.**




**d.**



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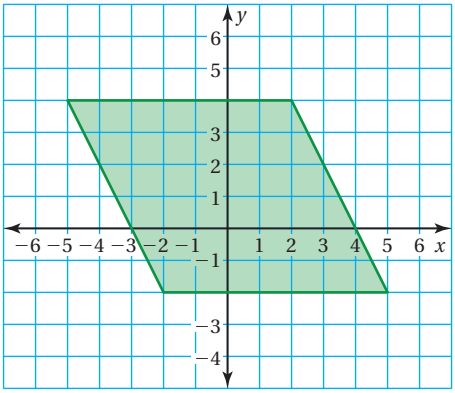
## 2 ACTIVITY: Describing a Parallelogram

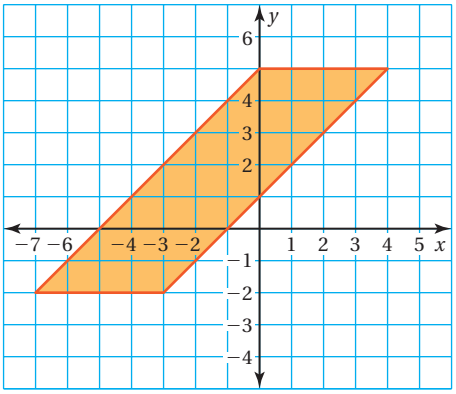
**Work with a partner.**

- **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?**

**a.**




**b.**




## 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 Miami.**

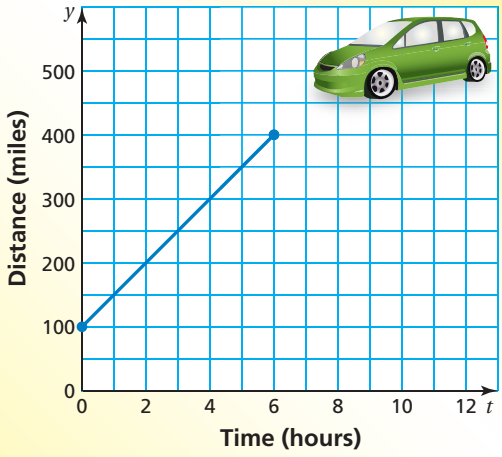
**a.** How far from Miami was the car at the beginning of the trip?

**b.** What was the car's speed?

**c.** How long did the trip last?

**d.** How far from Miami was the car at the end of the trip?

**Car Trip**




## What Is Your Answer?

**4. 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.

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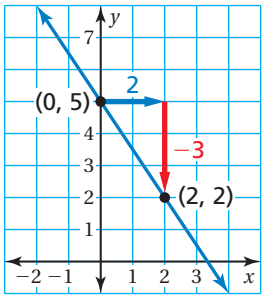
# 3.1 Lesson

Check It Out
Lesson Tutorials
BigIdeasMath.com

## EXAMPLE 1 Writing Equations in Slope-Intercept Form

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

**a.**




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.

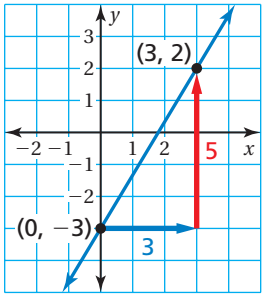
slope: $-\frac{3}{2}$ y-intercept: 5

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

**Study Tip**

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

**b.**




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: $\frac{5}{3}$ y-intercept: $-3$

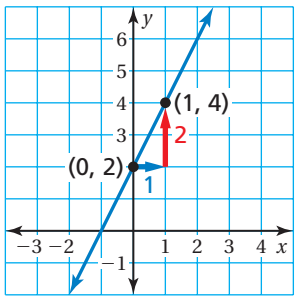
∴ So, the equation is $y = \frac{5}{3}x + (-3)$, or $y = \frac{5}{3}x - 3$.

## On Your Own

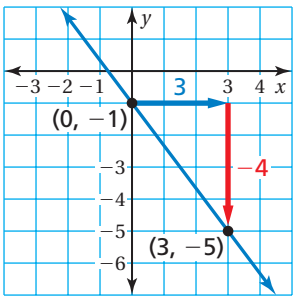
Now You're Ready
Exercises 5–10

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

**1.**




**2.**



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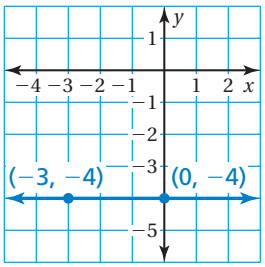
## EXAMPLE 2 Standardized Test Practice

**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.

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

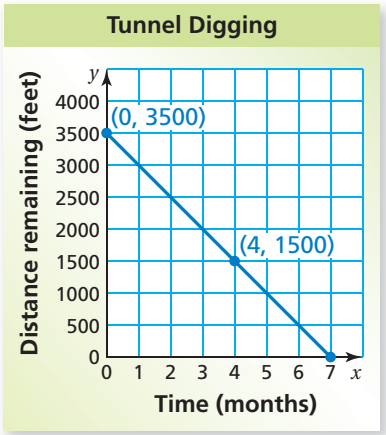
Because the line crosses the $y$-axis at $(0, -4)$, the $y$-intercept is $-4$.

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

## EXAMPLE 3 Real-Life Application

The Florida Department of Transportation plans to use a 42-foot wide tunnel boring machine to dig a 3900-foot long tunnel connecting Watson Island and Port of Miami by 2014.

**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 $y = 0$.

| | |
|---|---|
| $y = -500x + 3500$ | Write the equation. |
| $0 = -500x + 3500$ | Substitute 0 for $y$. |
| $-3500 = -500x$ | Subtract 3500 from each side. |
| $7 = x$ | Solve for $x$. |

∴ It takes 7 months to complete the tunnel.

## On Your Own

Now You're Ready
Exercises 13–15

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

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# 3.1 Exercises

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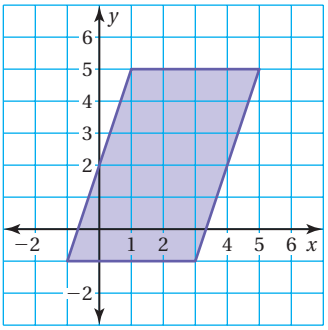
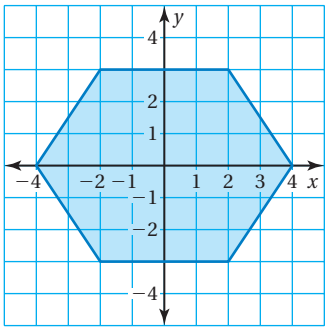
## Vocabulary and Concept Check

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

## Practice and Problem Solving

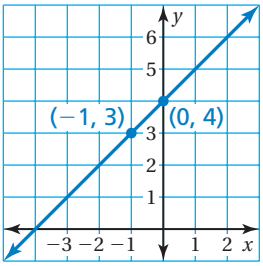
**Write an equation for each side of the figure.**

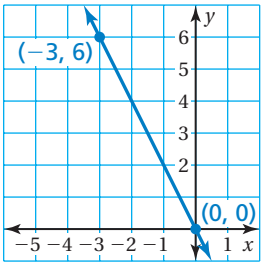
3. 

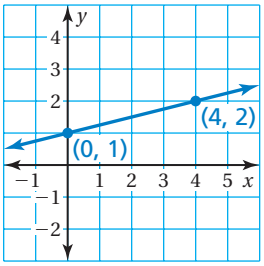
4. 

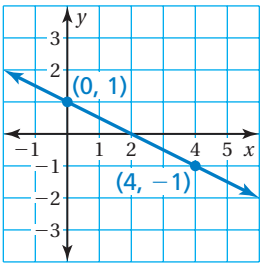
**Write an equation of the line in slope-intercept form.**

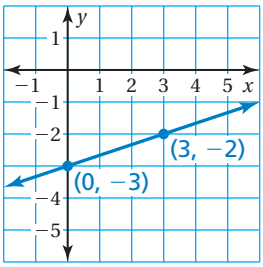
1

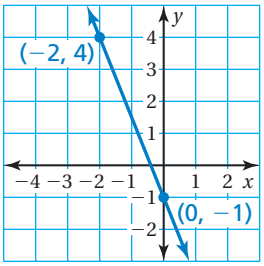
5. 


6. 


7. 

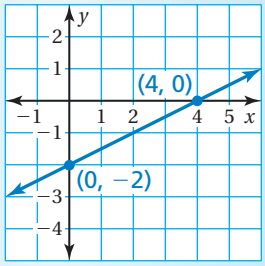

8. 


9. 


10. 


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

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




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.

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**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.

**a.** Plot the points (0, 60) and (6, 0). What do the points represent?

**b.** Draw a line through the points. What does the line represent?

**c.** 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.

**a.** Estimate the height $y$ (in feet) of each tree.

**b.** Plot the two points $(x, y)$, where $x$ is the age of each tree and $y$ is the height of each tree.

**c.** What is the rate of growth of the trees?

**d.** 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.** SKILLS REVIEW HANDBOOK

**20.** (1, 4) **21.** (−1, −2) **22.** (0, 1) **23.** (2, 7)

**24. MULTIPLE CHOICE** Which of the following statements is true? SECTION 2.3

Ⓐ The $x$-intercept is 5.

Ⓑ The $x$-intercept is −2.

Ⓒ The $y$-intercept is 5.

Ⓓ The $y$-intercept is −2.