Name _____ Date _____

# 4.2 Writing Equations in Point-Slope Form

**For use with Exploration 4.2**

**Essential Question** How can you write an equation of a line when you are given the slope and a point on the line?

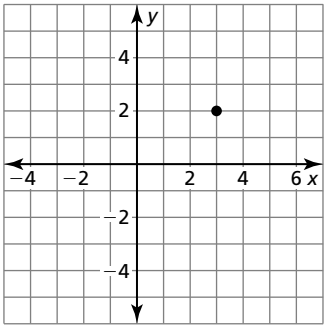
## 1 EXPLORATION: Writing Equations of Lines

**Go to *BigIdeasMath.com* for an interactive tool to investigate this exploration.**

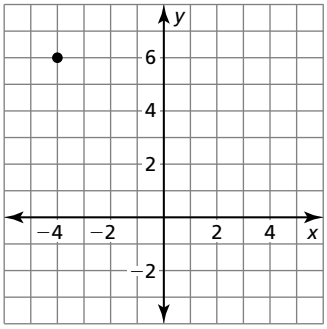
**Work with a partner.**

- Sketch the line that has the given slope and passes through the given point.
- Find the $y$-intercept of the line.
- Write an equation of the line.

**a.** $m = \frac{1}{2}$



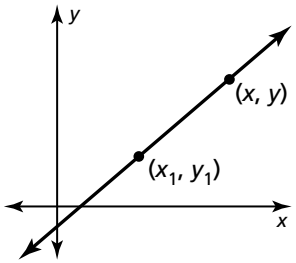

**b.** $m = -2$




## 2 EXPLORATION: Writing a Formula

**Work with a partner.**

The point $(x_1, y_1)$ is a given point on a nonvertical line. The point $(x, y)$ is any other point on the line. Write an equation that represents the slope $m$ of the line. Then rewrite this equation by multiplying each side by the difference of the $x$-coordinates to obtain the **point-slope form** of a linear equation.



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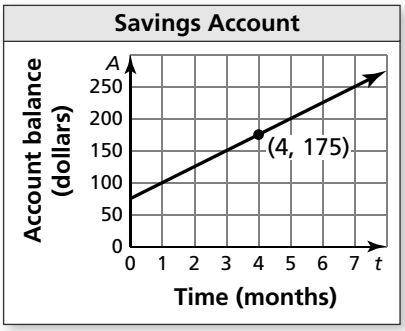
## 4.2 Writing Equations in Point-Slope Form (continued)

### 3 EXPLORATION: Writing an Equation

**Go to *BigIdeasMath.com* for an interactive tool to investigate this exploration.**

**Work with a partner.**

For four months, you have saved \$25 per month. You now have \$175 in your savings account.




**a.** Use your result from Exploration 2 to write an equation that represents the balance $A$ after $t$ months.

**b.** Use a graphing calculator to verify your equation.

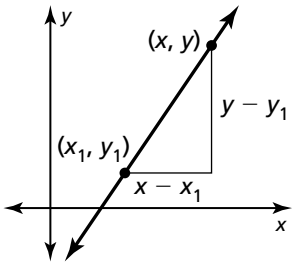
## Communicate Your Answer

**4.** How can you write an equation of a line when you are given the slope and a point on the line?

**5.** Give an example of how to write an equation of a line when you are given the slope and a point on the line. Your example should be different from those above.

## Core Concepts

### Point-Slope Form




**Words** A linear equation written in the form $y - y_1 = m(x - x_1)$ is in **point-slope form**. The line passes through the point $(x_1, y_1)$, and the slope of the line is $m$.

**Algebra** $y - y_1 = m(x - x_1)$

slope

passes through $(x_1, y_1)$

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# 4.2 Practice

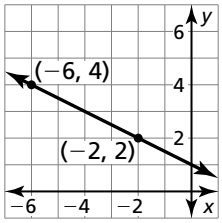
**For use after Lesson 4.2**

**Notes:**

## Worked-Out Examples

### Example #1

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




$$m = \frac{4-2}{-6-(-2)} = \frac{4-2}{-6+2} = \frac{2}{-4} = -\frac{1}{2}$$

$$y - y_1 = m(x - x_1)$$

$$y - 2 = -\frac{1}{2}[x - (-2)]$$

$$y - 2 = -\frac{1}{2}(x + 2)$$

$$y - 2 = -\frac{1}{2}(x) - \frac{1}{2}(2)$$

$$y - 2 = -\frac{1}{2}x - 1$$

$$\underline{+2} \qquad \underline{+2}$$

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

The equation is $y = -\frac{1}{2}x + 1$.

### Example #2

**Write an equation in slope-intercept form of the line that passes through the given points.**

(6, –2), (12, 1)

$$m = \frac{1-(-2)}{12-6} = \frac{1+2}{12-6} = \frac{3}{6} = \frac{1}{2}$$

$$y - y_1 = m(x - x_1)$$

$$y - (-2) = \frac{1}{2}(x - 6)$$

$$y + 2 = \frac{1}{2}(x) - \frac{1}{2}(6)$$

$$y + 2 = \frac{1}{2}x - 3$$

$$\underline{-2} \qquad \underline{-2}$$

$$y = \frac{1}{2}x - 5$$

The equation is $y = \frac{1}{2}x - 5$.

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**4.2 Practice (continued)**

# Practice A

**In Exercises 1–6, write an equation in point-slope form of the line that passes through the given point and has the given slope.**

**1.** $(-2, 1); m = -3$

**2.** $(3, 5); m = 2$

**3.** $(-1, -2); m = -1$

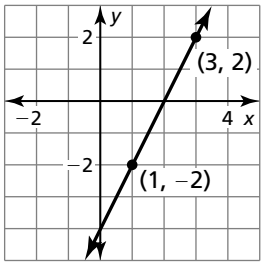
**4.** $(5, 0); m = \frac{4}{3}$

**5.** $(0, 4); m = 7$

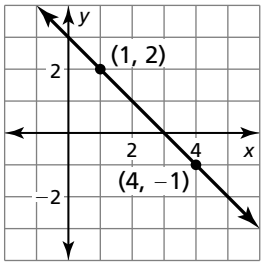
**6.** $(1, 2); m = -\frac{1}{2}$

**In Exercises 7–12, write an equation in slope-intercept form of the line shown.**

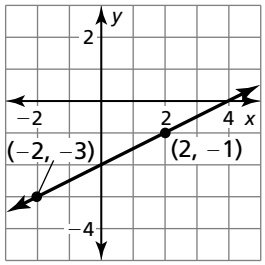
**7.**



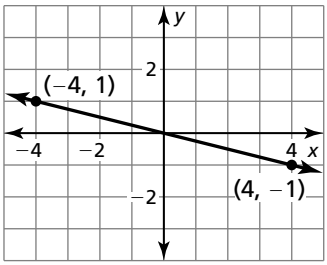

**8.**



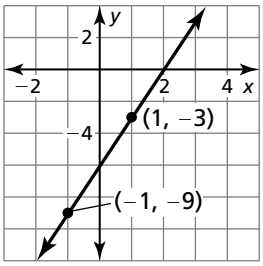

**9.**



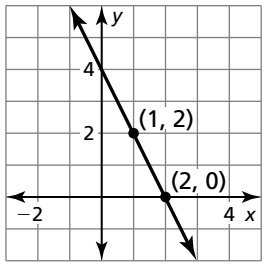

**10.**




**11.**




**12.**



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## 4.2 Practice (continued)

**In Exercises 13–18, write a linear function *f* with the given values.**

**13.** $f(-3) = -1, f(-2) = 4$ **14.** $f(-2) = 1, f(1) = 7$ **15.** $f(-1) = 2, f(3) = 3$

**16.** $f(0) = -2, f(4) = -1$ **17.** $f(1) = 0, f(0) = 8$ **18.** $f(3) = 5, f(2) = 6$

**In Exercises 19 and 20, tell whether the data in the table can be modeled by a linear equation. Explain. If possible, write a linear equation that represents *y* as a function of *x*.**

**19.**

| *x* | –3 | –1 | 0 | 1 | 3 |
|---|---|---|---|---|---|
| *y* | –110 | –60 | –35 | –10 | 40 |

**20.**

| *x* | –3 | –1 | 0 | 1 | 3 |
|---|---|---|---|---|---|
| *y* | –98 | 18 | 8 | 62 | 142 |

**21.** Your friend is driving at a constant speed of 60 miles per hour. After driving 3 hours, his odometer reads 265 miles. Write a linear function $D$ that represents the miles driven after $h$ hours. What does the odometer read after 7 hours of continuous driving?

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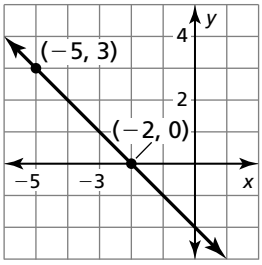
# Practice B

**In Exercises 1–3, write an equation in point-slope form of the line that passes through the given point and has the given slope.**

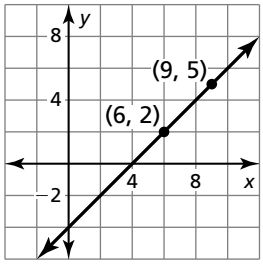
**1.** $(-4, 5)$; $m = 1$ **2.** $(3, 4)$; $m = \frac{1}{3}$ **3.** $(2, -6)$; $m = -\frac{1}{4}$

**In Exercises 4 and 5, write an equation in slope-intercept form of the line shown.**

**4.**




**5.**




**In Exercises 6–8, write an equation in slope-intercept form of the line that passes through the given points.**

**6.** $(-3, 6), (-5, -6)$ **7.** $(2, -4), (5, -4)$ **8.** $(-7, 18), (7, 14)$

**In Exercises 9–11, write a linear function *f* with the given values.**

**9.** $f(-5) = 2$, $f(7) = -4$ **10.** $f(-2) = 1$, $f(12) = 7$ **11.** $f(-8) = 12$, $f(-3) = -3$

**In Exercises 12 and 13, tell whether the data in the table can be modeled by a linear equation. Explain. If possible, write a linear equation that represents *y* as a function of *x*.**

**12.**

| *x* | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| *y* | 3.5 | 3 | 2.5 | 2 | 1.5 |

**13.**

| *x* | 0 | 2 | 4 | 6 | 8 |
|---|---|---|---|---|---|
| *y* | 1 | 2 | 4 | 8 | 16 |

**14.** The equation $y - 2 = \frac{5}{4}(x + 8)$ represents the cost (in dollars) of making your own juice (in fluid ounces).

**a.** What is the slope of the line? Interpret the slope in the context of this situation.

**b.** Write the equation as a linear function.

**c.** Use the linear function in part (b) to determine the base cost of making your own juice.