

## 2-4

**Reteaching**

## More About Linear Equations

You can use the point-slope form to write equations of lines if you are given two points on the line. The point-slope form of a linear equation is:

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

**Problem**

What is the point-slope form of an equation of the line through (3, 4) and (5, -2)?

Find the slope. Substitute for each variable using the coordinates of the given points.

Let  $(x_1, y_1) = (3, 4)$  and  $(x_2, y_2) = (5, -2)$ . Identify each point.

So  $x_1 = 3, y_1 = 4, x_2 = 5,$  and  $y_2 = -2$ . Identify  $x_1, x_2, y_1,$  and  $y_2$ .

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-2 - 4}{5 - 3} = \frac{-6}{2} = -3 \quad \text{Substitute the } x\text{- and } y\text{-values and simplify.}$$

The slope is  $-3$ .

Write the equation of the line in point-slope form. Substitute one point and the slope into the point-slope formula. It does not matter which point is substituted into the point-slope formula.

Let  $(x_1, y_1) = (3, 4)$ . Use either of the points as  $(x_1, y_1)$ .

So  $x_1 = 3, y_1 = 4,$  and  $m = -3$ . Identify the values of  $x_1, y_1,$  and  $m$ .

$$y - y_1 = m(x - x_1) \quad \text{Write the point-slope form.}$$

$$y - 4 = -3(x - 3) \quad \text{Substitute the values of } x_1, y_1, \text{ and } m.$$

An equation for the line in point-slope form is  $y - 4 = -3(x - 3)$ .

**Exercises**

Using point-slope form, write an equation of the line through each pair of points.

- $(6, -7)$  and  $(4, -1)$   $y + 7 = -3(x - 6)$
- $(3, 5)$  and  $(0, 7)$   $y - 5 = -\frac{2}{3}(x - 3)$
- $(-1, 3)$  and  $(2, 6)$   $y - 3 = x + 1$
- $(-1, -2)$  and  $(0, -1)$   $y + 2 = x + 1$
- $(-2, -5)$  and  $(8, -3)$   $y + 5 = \frac{1}{5}(x + 2)$
- $(-1, 3)$  and  $(-7, -6)$   $y - 3 = \frac{3}{2}(x + 1)$
- $(-3, 8)$  and  $(-2, 4)$   $y - 8 = -4(x + 3)$
- $(0, -2)$  and  $(9, 3)$   $y + 2 = \frac{5}{9}x$

## 2-4 Reteaching (continued)

### More About Linear Equations

The slopes of parallel and perpendicular lines have special relationships. Parallel lines have the same slope. Lines that are perpendicular have slopes that are negative reciprocals of each other.

#### Problem

What is the equation for the line through the point  $(-1, 2)$  and parallel to  $y = -2x + 4$ ? Write the equation in slope-intercept form.

Find the slope of the line. Parallel lines have the same slope, so the slope is  $-2$ .

Write the equation in point-slope form.

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

$$y - 2 = -2(x + 1)$$

Write the equation in slope-intercept form.

$$y - 2 = -2(x + 1)$$

$$y - 2 = -2x - 2$$

$$\frac{+2}{+2} \quad \frac{+2}{+2}$$

$$y = -2x$$

#### Problem

What is the equation for the line through the point  $(3, -1)$  and perpendicular to  $y = 5x + 2$ ? Write the equation in slope-intercept form.

Find the slope of the line. Perpendicular lines have slopes that are negative reciprocals of each other. The negative reciprocal of  $5$  is  $-\frac{1}{5}$ .

Write the equation in point-slope form.

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

$$y + 1 = -\frac{1}{5}(x - 3)$$

Write the equation in slope-intercept form.

$$y + 1 = -\frac{1}{5}(x - 3)$$

$$y + 1 = -\frac{1}{5}x + \frac{3}{5}$$

$$\frac{-1}{-1} \quad \frac{-1}{-1}$$

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

## Exercises

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

9. through  $(-2, -2)$  and parallel to  $y = -5x - 4$   $y = -5x - 12$

10. through  $(-4, 1)$  and perpendicular to  $y = -3x + 7$   $y = \frac{1}{3}x + \frac{7}{3}$

11. through  $(0, 5)$  and parallel to  $y = \frac{1}{2}x - 5$   $y = \frac{1}{2}x + 5$

12. through  $(0, -3)$  and perpendicular to  $y = \frac{2}{3}x + 2$   $y = -\frac{3}{2}x - 3$