

**EXAMPLE 2** Find a missing coordinate

The distance between  $(3, -5)$  and  $(7, b)$  is 5 units. Find the value of  $b$ .

**Solution**

Use the distance formula with  $d = 5$ . Let  $(x_1, y_1) = (3, -5)$  and  $(x_2, y_2) = (7, b)$ . Then solve for  $b$ .

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \quad \text{Distance formula}$$

$$5 = \sqrt{(7 - 3)^2 + (b - (-5))^2} \quad \text{Substitute.}$$

$$5 = \sqrt{16 + b^2 + 10b + 25} \quad \text{Multiply.}$$

$$5 = \sqrt{b^2 + 10b + 41} \quad \text{Simplify.}$$

$$25 = b^2 + 10b + 41 \quad \text{Square each side.}$$

$$0 = b^2 + 10b + 16 \quad \text{Write in standard form.}$$

$$0 = (b + 2)(b + 8) \quad \text{Factor.}$$

$$b + 2 = 0 \quad \text{or} \quad b + 8 = 0 \quad \text{Zero-product property}$$

$$b = -2 \quad \text{or} \quad b = -8 \quad \text{Solve for } b.$$

► The value of  $b$  is  $-2$  or  $-8$ .

**INTERPRET GEOMETRICALLY**

The point  $(7, b)$  lies on the line  $x = 7$ . If you let the point  $(3, -5)$  be the center of a circle with radius 5, you will see that the circle crosses the line at  $(7, -2)$  and  $(7, -8)$ .

**GUIDED PRACTICE** for Examples 1 and 2

Find the distance between the points.

- $(3, 0), (3, 6)$
- $(-2, 1), (2, 5)$
- $(6, -2), (-4, 7)$
- The distance between  $(1, a)$  and  $(4, 2)$  is 3 units. Find the value of  $a$ .

**MIDPOINT** The **midpoint** of a line segment is the point on the segment that is equidistant from the endpoints. You can find the coordinates of the midpoint of a line segment using the following formula, called the **midpoint formula**.

**KEY CONCEPT***For Your Notebook***The Midpoint Formula**

The midpoint  $M$  of the line segment with endpoints  $A(x_1, y_1)$  and  $B(x_2, y_2)$  is

$$M\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right).$$

