

1-4

# Study Guide and Intervention *(continued)*

## Solving Absolute Value Equations

**Absolute Value Equations** Use the definition of absolute value to solve equations containing absolute value expressions.

For any real numbers  $a$  and  $b$ , where  $b \geq 0$ , if  $|a| = b$  then  $a = b$  or  $a = -b$ .

Always check your answers by substituting them into the original equation. Sometimes computed solutions are not actual solutions.

### Example

Solve  $|2x - 3| = 17$ . Check your solutions.

Case 1

$$\begin{aligned} a &= b \\ 2x - 3 &= 17 \\ 2x - 3 + 3 &= 17 + 3 \\ 2x &= 20 \\ x &= 10 \end{aligned}$$

CHECK

$$\begin{aligned} |2x - 3| &= 17 \\ |2(10) - 3| &= 17 \\ |20 - 3| &= 17 \\ |17| &= 17 \\ 17 &= 17 \checkmark \end{aligned}$$

Case 2

$$\begin{aligned} a &= -b \\ 2x - 3 &= -17 \\ 2x - 3 + 3 &= -17 + 3 \\ 2x &= -14 \\ x &= -7 \end{aligned}$$

CHECK

$$\begin{aligned} |2(-7) - 3| &= 17 \\ |-14 - 3| &= 17 \\ |-17| &= 17 \\ 17 &= 17 \checkmark \end{aligned}$$

There are two solutions, 10 and  $-7$ .

### Exercises

Solve each equation. Check your solutions.

1.  $|x + 15| = 37$

2.  $|t - 4| - 5 = 0$

3.  $|x - 5| = 45$

4.  $|m + 3| = 12 - 2m$

5.  $|5b + 9| + 16 = 2$

6.  $|15 - 2k| = 45$

7.  $5n + 24 = |8 - 3n|$

8.  $|8 + 5a| = 14 - a$

9.  $\frac{1}{3}|4p - 11| = p + 4$

10.  $|3x - 1| = 2x + 11$

11.  $\left|\frac{1}{3}x + 3\right| = -1$

12.  $40 - 4x = 2|3x - 10|$

13.  $5f - |3f + 4| = 20$

14.  $|4b + 3| = 15 - 2b$

15.  $\frac{1}{2}|6 - 2x| = 3x + 1$

16.  $|16 - 3x| = 4x - 12$