

**3-7****Reteaching**

## Absolute Value Equations and Inequalities

Both 5 and  $-5$  are solutions of the equation  $|a| = 5$ . Many absolute value equations have two solutions. The equation  $|a| = -7$  has no solution because an absolute value cannot equal a negative number.

**Problem**

What are the solutions of  $|t - 7| = 8$ ?

The equation  $|t - 7| = 8$  is the same as  $t - 7 = 8$  or  $t - 7 = -8$ .

$$t - 7 = 8 \quad \text{or} \quad t - 7 = -8 \quad \begin{array}{l} \text{Write the absolute value equation as} \\ \text{two equations.} \end{array}$$

$$t - 7 + 7 = 8 + 7 \quad \text{or} \quad t - 7 + 7 = -8 + 7 \quad \begin{array}{l} \text{Add 7 to each side.} \\ \text{Simplify.} \end{array}$$

$$t = 15 \quad \text{or} \quad t = -1$$

The solutions are 15 and  $-1$ .

**Problem**

What are the solutions of  $|5p| + 25 = 15$ ?

First isolate the absolute value.

$$\begin{array}{ll} |5p| + 25 = 15 & \text{Original equation} \\ |5p| + 25 - 25 = 15 - 25 & \text{Subtract 25 from each side.} \\ |5p| = -10 & \text{Simplify.} \end{array}$$

The absolute value cannot have a negative value, so there is no solution for the equation.

**Exercises**

Solve each equation. If there is no solution, write *no solution*.

1.  $|m + 8| = 5$

**$m = -3$  or  $m = -13$**

2.  $|3b - 1| = 11$

**$b = 4$  or  $b = -\frac{10}{3}$**

3.  $|y + 17| - 25 = -10$

**$y = -2$  or  $y = -32$**

4.  $|4s + 1| + 7 = 5$

**no solution**

5.  $|2w - 4| + 18 = 15$

**no solution**

6.  $\left|\frac{h}{3} + 4\right| - 2 = 5$

**$h = 9$  or  $h = -33$**

**3-7****Reteaching** (continued)**Absolute Value Equations and Inequalities**

The inequality  $|a| < 5$  is the same as  $a < 5$  and  $a > -5$ .

The inequality  $|a| > 5$  is the same as  $a > 5$  or  $a < -5$ .

**Problem**

What are the solutions of  $|2n - 3| \geq 9$ ? Graph the solutions.

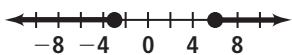
$$2n - 3 \geq 9 \quad \text{or} \quad 2n - 3 \leq -9 \quad \begin{array}{l} \text{Write the absolute value inequality as two} \\ \text{inequalities.} \end{array}$$

$$2n - 3 + 3 \geq 9 + 3 \quad \text{or} \quad 2n - 3 + 3 \leq -9 + 3 \quad \begin{array}{l} \text{Add 3 to each side.} \\ \text{Simplify.} \end{array}$$

$$2n \geq 12 \quad \text{or} \quad 2n \leq -6$$

$$\frac{2n}{2} \geq \frac{12}{2} \quad \text{or} \quad \frac{2n}{2} \leq \frac{-6}{2} \quad \begin{array}{l} \text{Divide each side by 2.} \\ \text{Simplify.} \end{array}$$

$$n \geq 6 \quad \text{or} \quad n \leq -3$$

**Exercises**

Solve and graph each inequality.

7.  $|x - 3| > 5 \quad x > 8 \text{ or } x < -2$



9.  $|n + 1| \leq 7 \quad -8 \leq n \leq 6$



11.  $|2v| > 16 \quad v < -8 \text{ or } v > 8$



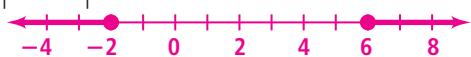
13.  $|2k - 1| \geq 7 \quad k \leq -3 \text{ or } k \geq 4$



15.  $\left|\frac{2}{3}p\right| < 8 \quad -12 < p < 12$



17.  $\left|\frac{b}{2} - 1\right| \geq 2 \quad b \leq -2 \text{ or } b \geq 6$



8.  $|d + 4| < 3 \quad -7 < d < -1$



10.  $|f - 5| \geq 1 \quad f \geq 6 \text{ or } f \leq 4$



12.  $\left|\frac{z}{3}\right| < 2 \quad -6 < z < 6$



14.  $|4r + 1| \leq 9 \quad -\frac{5}{2} \leq r \leq 2$



16.  $|8s - 16| > 16 \quad s < 0 \text{ or } s > 4$



18.  $|5g + 10| \leq 40 \quad -10 \leq g \leq 6$

