EXAMPLE 2   **Solve an absolute value equation**

Solve $|5x - 10| = 45$.

$$|5x - 10| = 45 \qquad \text{Write original equation.}$$

$$5x - 10 = 45 \quad \text{or} \quad 5x - 10 = -45 \qquad \text{Expression can equal 45 or } -45.$$

$$5x = 55 \quad \text{or} \quad 5x = -35 \qquad \text{Add 10 to each side.}$$

$$x = 11 \quad \text{or} \quad x = -7 \qquad \text{Divide each side by 5.}$$

▶ The solutions are 11 and -7. Check these in the original equation.

CHECK

$$|5x - 10| = 45 \qquad\qquad |5x - 10| = 45$$

$$|5(11) - 10| \overset{?}{=} 45 \qquad\qquad |5(-7) - 10| \overset{?}{=} 45$$

$$|45| \overset{?}{=} 45 \qquad\qquad |-45| \overset{?}{=} 45$$

$$45 = 45 \checkmark \qquad\qquad 45 = 45 \checkmark$$

EXTRANEOUS SOLUTIONS When you solve an absolute value equation, it is possible for a solution to be *extraneous*. An **extraneous solution** is an apparent solution that must be rejected because it does not satisfy the original equation.

EXAMPLE 3   **Check for extraneous solutions**

Solve $|2x + 12| = 4x$. Check for extraneous solutions.

$$|2x + 12| = 4x \qquad\qquad \text{Write original equation.}$$

$$2x + 12 = 4x \quad \text{or} \quad 2x + 12 = -4x \qquad \text{Expression can equal } 4x \text{ or } -4x.$$

$$12 = 2x \quad \text{or} \quad 12 = -6x \qquad \text{Subtract } 2x \text{ from each side.}$$

$$6 = x \quad \text{or} \quad -2 = x \qquad \text{Solve for } x.$$

Check the apparent solutions to see if either is extraneous.

AVOID ERRORS
Always check your solutions in the original equation to make sure that they are not extraneous.

CHECK

$$|2x + 12| = 4x \qquad\qquad |2x + 12| = 4x$$

$$|2(6) + 12| \overset{?}{=} 4(6) \qquad\qquad |2(-2) + 12| \overset{?}{=} 4(-2)$$

$$|24| \overset{?}{=} 24 \qquad\qquad |8| \overset{?}{=} -8$$

$$24 = 24 \checkmark \qquad\qquad 8 \neq -8$$

▶ The solution is 6. Reject -2 because it is an extraneous solution.