

# Variables on Both Sides (Pages 171–175)

To solve an equation that has the variable on both sides, use the properties of equality to write an equivalent equation that has the variable on only one side. Then solve. Some equations may have no solution because there is no value of the variable that will result in a true equation. For example,  $x + 1 = x + 2$  has no solution; it cannot be true. An equation that is true for every value of the variable is called an **identity**. For example,  $x + x = 2x$  is true for every value of  $x$ .

## EXAMPLES

**A** Solve  $\frac{4}{5}g = 8 + \frac{2}{5}g$ . Check your solution.

$$\frac{4}{5}g = 8 + \frac{2}{5}g$$

$$\frac{4}{5}g - \frac{2}{5}g = 8 + \frac{2}{5}g - \frac{2}{5}g \quad \text{Subtract } \frac{2}{5}g \text{ from each side.}$$

$$\frac{2}{5}g = 8$$

$$\frac{5}{2}\left(\frac{2}{5}g\right) = \frac{5}{2}(8) \quad \text{Multiply each side by } \frac{5}{2}.$$

$$g = 20$$

Check: Does  $\frac{4}{5}(20) = 8 + \frac{2}{5}(20)$ ? Yes.

**B** Solve  $7x - 6 = 14 + 7x$ .

$$7x - 6 = 14 + 7x$$

$$7x - 6 - 7x = 14 + 7x - 7x \quad \text{Subtract } 7x \text{ from each side.}$$

$$-6 = 14$$

Since  $-6 = 14$  is never true, the equation has no solution.

## Try These Together

1. Solve  $4x + 3 = 5x + 7$ .

HINT: Subtract  $4x$  from each side.

2. Solve  $7 + 3t = 5t + 7 - 2t$ .

HINT: Simplify.

## PRACTICE

Solve each equation. Check your solution.

3.  $18 + 2n = 4n - 9$

4.  $10 - 2.5y = y + 3$

5.  $\frac{2}{3}n + 6 = \frac{1}{3}n - 3$

6.  $8.5 - 2x = 5x - 6.2$

7.  $9 - 4x = -4x + 8$

8.  $\frac{3}{5}d + 5 = \frac{2}{5}d - 3$

9.  $6x - 3 = 9x + 27$

10.  $-10 + 4x = 6x + 4$

11.  $-3 + 11x + 8 = 5 + 11x$

12.  $1.4p - 9 = 1 + p$

13.  $12n + 35 = -7 + 6n$

14.  $\frac{2}{7}t - 4 = 4 - \frac{2}{7}t$



15. **Standardized Test Practice** Nine less than half  $n$  is equal to one plus the product of  $-\frac{1}{8}$  and  $n$ . Find the value of  $n$ .

A 24

B -21

C 8

D 16

Answers: 1. -4 2. identity 3.  $\frac{2}{27}$  or  $13\frac{2}{1}$  4. 2 5. -27 6. 2.1 7. no solution 8. -40 9. -10 10. -7 11. identity 12. 25 13. -7 14. 14 15. D