

LESSON
2.5**Study Guide**

For use with the lesson "Solve Equations with Variables on Both Sides"

GOAL Solve equations with variables on both sides.**Vocabulary**An equation that is true for all values of the variable is an **identity**.**EXAMPLE 1** Solve an equation with variables on both sides**Solve** $13 - 6x = 3x - 14$.**Solution**

$$13 - 6x = 3x - 14$$

Write original equation.

$$13 - 6x + 6x = 3x - 14 + 6x$$

Add 6x to each side.

$$13 = 9x - 14$$

Simplify.

$$27 = 9x$$

Add 14 to each side.

$$3 = x$$

Divide each side by 9.

The solution is 3. Check by substituting 3 for x in the original equation.

CHECK $13 - 6x = 3x - 14$

Write original equation.

$$13 - 6(3) = 3(3) - 14$$

Substitute 3 for x .

$$-5 = 3(3) - 14$$

Simplify left side.

$$-5 = -5 \checkmark$$

Simplify right side. Solution checks.

Exercises for Example 1**Solve the equation. Check your solution.**

1. $9a = 7a - 8$

2. $17 - 8b = 3b - 5$

3. $-5c + 6 = 9 - 4c$

EXAMPLE 2 Solve an equation with grouping symbols**Solve** $4x - 7 = \frac{1}{3}(9x - 15)$.**Solution**

$$4x - 7 = \frac{1}{3}(9x - 15)$$

Write original equation.

$$4x - 7 = 3x - 5$$

Distributive property

$$x - 7 = -5$$

Subtract $3x$ from each side.

$$x = 2$$

Add 7 to each side.

The solution is 2.

LESSON
2.5**Study Guide** *continued**For use with the lesson "Solve Equations with Variables on Both Sides"***Exercises for Example 2****Solve the equation. Check your solution.**

4. $2m - 7 = 3(m + 8)$

5. $\frac{1}{5}(15n + 5) = 8n - 9$

6. $7p - 3 = \frac{3}{4}(8p - 12)$

EXAMPLE 3**Identify the number of solutions of an equation****Solve the equation, if possible.**

a. $4(3x - 2) = 2(6x + 1)$

b. $4(4x - 5) = 2(8x - 10)$

Solution

a. $4(3x - 2) = 2(6x + 1)$

$12x - 8 = 12x + 2$

$12x = 12x + 10$

The equation $12x = 12x + 10$ is not true because the number $12x$ cannot be equal to 10 more than itself. So, the equation has no solution. This can be demonstrated by continuing to solve the equation.

$12x - 12x = 12x + 10 - 12x$

$0 = 10$

The statement $0 = 10$ is not true, so the equation has no solution.

b. $4(4x - 5) = 2(8x - 10)$

$16x - 20 = 16x - 20$

Notice that the statement $16x - 20 = 16x - 20$ is true for all values of x . So, the equation is an identity.

Exercises for Example 3**Solve the equation, if possible.**

7. $11x + 7 = 10x - 8$

8. $5(3x - 2) = 3(5x - 1)$

9. $\frac{1}{2}(6x + 18) = 3(x + 3)$