

## LESSON 2.5

### Study Guide

#### 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 $x$ .
$-5 = 3(?) - 14$	Simplify left side.
$-5 = -5$ ✓	Simplify right side. Solution checks.

#### Exercises for Example 1

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Solve the equation. Check your solution.

- $9a = 7a - 8$
- $17 - 8b = 3b - 5$
- $-5c + 6 = 9 - 4c$

**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.

## Exercises for Example 2

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**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.	$4(3x - 2) = 2(6x + 1)$	Write original equation.
	$12x - 8 = 12x + 2$	Distributive property
	$12x = 12x + 10$	Add 8 to each side.

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.

$12x - 12x = 12x + 10 - 12x$	Subtract $12x$ from each side.
$0 = 10$	Simplify

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

b.	$4(4x - 5) = 2(8x - 10)$ .	Write original equation
	$16x - 20 = 16x - 20$	Distributive property

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

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**Solve the equation, if possible.**

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

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

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

## *Answer Key*

### *Lesson 2.5*

#### **Study Guide**

1.  $a = -4$
2.  $b = 2$
3.  $c = -3$
4.  $m = -31$
5.  $n = 2$
6.  $p = -6$
7.  $x = -15$
8. no solution
9. identity