

### Lesson 3-5

#### Example 1 Solve an Equation with Variables on Each Side

Solve  $6 - 7j = -2j + 3$ . Then check your solution.

$$6 - 7j = -2j + 3 \quad \text{Original equation}$$

$$6 - 7j + 7j = -2j + 3 + 7j \quad \text{Add } 7j \text{ to each side.}$$

$$6 = 5j + 3 \quad \text{Simplify.}$$

$$6 - 3 = 5j + 3 - 3 \quad \text{Subtract 3 from each side.}$$

$$3 = 5j \quad \text{Simplify.}$$

$$\frac{3}{5} = \frac{5j}{5} \quad \text{Divide each side by 5.}$$

$$\frac{3}{5} = j \quad \text{Simplify.}$$

**Check**  $6 - 7j = -2j + 3$  Original equation

$$6 - 7\left(\frac{3}{5}\right) = -2\left(\frac{3}{5}\right) + 3 \quad \text{Substitute } \frac{3}{5} \text{ for } j.$$

$$6 - \frac{21}{5} = -\frac{6}{5} + 3 \quad \text{Multiply.}$$

$$\frac{30}{5} - \frac{21}{5} = -\frac{6}{5} + \frac{15}{5} \quad \text{LCD is equal to 5.}$$

$$\frac{9}{5} = \frac{9}{5} \quad \text{The solution is } \frac{3}{5}.$$

#### Example 2 Solve an Equation with Grouping Symbols

Solve  $\frac{2}{3}(12 - 3x) = 4(x + 8)$ . Then check your solution.

$$\frac{2}{3}(12 - 3x) = 4(x + 8) \quad \text{Original equation}$$

$$8 - 2x = 4x + 32 \quad \text{Distributive Property}$$

$$8 - 2x + 2x = 4x + 32 + 2x \quad \text{Add } 2x \text{ to each side.}$$

$$8 = 6x + 32 \quad \text{Simplify.}$$

$$8 - 32 = 6x + 32 - 32 \quad \text{Subtract 32 from each side.}$$

$$-24 = 6x \quad \text{Simplify.}$$

$$\frac{-24}{6} = \frac{6x}{6} \quad \text{Divide each side by 6.}$$

$$-4 = x \quad \text{Simplify}$$

**Check**  $\frac{2}{3}(12 - 3x) = 4(x + 8)$  Original equation

$$\frac{2}{3}(12 - 3(-4)) = 4((-4) + 8) \quad \text{Substitute } -4 \text{ for } x.$$

$$\frac{2}{3}(12 - (-12)) = 4((-4) + 8) \quad \text{Multiply.}$$

$$\frac{2}{3}(24) = 4(4) \quad \text{Add.}$$

$$16 = 16$$

The solution is  $-4$ .

### Example 3 No Solution

Solve  $4(s + 2) - s = 3(s + 1)$ .

$$4(s + 2) - s = 3(s + 1)$$

$$4s + 8 - s = 3s + 3$$

$$3s + 8 = 3s + 3$$

$$3s + 8 - 3s = 3s + 3 - 3s$$

$$8 = 3$$

Since  $8 = 3$  is a false statement, this equation has no solution.

Original equation  
Distributive Property  
Simplify.  
Subtract  $3s$  from each side.  
This statement is false.

### Example 4 An Identity

Solve  $4p + 2 = \frac{1}{3}(12p + 3) + 1$ .

$$4p + 2 = \frac{1}{3}(12p + 3) + 1$$

$$4p + 2 = 4p + 1 + 1$$

$$4p + 2 = 4p + 2$$

Since the expressions on each side of the equation are the same, this equation is an identity. The statement  $4p + 2 = \frac{1}{3}(12p + 3) + 1$  is true for all values of  $p$ .

Original equation  
Distributive property  
Reflexive Property

### Example 5 Use Substitution to Solve an Equation

**Multiple-Choice Test Item**

Solve  $x + 4 = 3[x - 2(x + 2)]$ .

A) 4      B) 1      C) -4      D) -1

#### Read the Test Item

You are asked to solve an equation.

#### Solve the Test Item

You can solve the equation or substitute each value into the equation and see if it makes the equation true. We will solve by substitution.

**A**

$$\begin{aligned}x + 4 &= 3[x - 2(x + 2)] \\4 + 4 &=? 3[4 - 2(4 + 2)] \\8 &=? 3[4 - 2(6)] \\8 &=? 3[4 - 12] \\8 &=? 3(-8) \\8 &\neq -24\end{aligned}$$

**B**

$$\begin{aligned}x + 4 &= 3[x - 2(x + 2)] \\1 + 4 &= 3[1 - 2(1 + 2)] \\5 &=? 3[1 - 2(3)] \\5 &=? 3[1 - 6] \\5 &=? 3(-5) \\5 &\neq -15\end{aligned}$$

**C**

$$\begin{aligned}x + 4 &= 3[x - 2(x + 2)] \\-4 + 4 &=? 3[-4 - 2(-4 + 2)] \\0 &=? 3[-4 - 2(-2)] \\0 &=? 3[-4 + 4] \\0 &=? 3(0) \\0 &=? 0\end{aligned}$$

Since the value  $-4$  results in a true statement, you do not need to check  $-1$ . The answer is C.