

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

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

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

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

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

$$8 = 3$$

Original equation

Distributive Property

Simplify.

Subtract $3s$ from each side.

This statement is false.

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

Example 4 An Identity

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

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

Original equation

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

Distributive property

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

Reflexive Property

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 .

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.