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## 2-3 Equations with Variables on Both Sides

**Examples:**

Solve each equation:

a.  $7y = 12 + 4y$

$$\begin{array}{r} -4y \\ 3y = 12 \\ \hline y = 4 \end{array}$$

Step 1  $\text{subt. } 4y \text{ b.s.}$   
 Step 2  $\text{div } 3 \text{ b.s.}$   
 Step 3

b.  $6x + 3 = 8x - 21$

$$\begin{array}{r} -6x \\ -2x + 3 = -21 \\ -3 \\ \hline -2x = -24 \\ \hline x = 12 \end{array}$$

Step 1  $\text{sub } 6x \text{ b.s.}$   
 Step 2  $\text{sub } 3 \text{ b.s.}$   
 Step 3  $\text{div } b.y. -2 \text{ b.s.}$

**Check**

$$\begin{array}{l} 7(4) = 12 + 4(4) \\ 28 = 12 + 16 \\ 28 = 28 \checkmark \end{array}$$

$$\begin{array}{l} 6(12) + 3 = 8(12) - 21 \\ 72 + 3 = 96 - 21 \\ 75 = 75 \checkmark \end{array}$$

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## Variables on Both Sides Word Problems

**Examples:**

Translate to an algebraic equation and solve:

- a. Two less than six times a number is the same as thirteen more than a number. Find the number.

$$\begin{array}{rcl} 6x - 2 & = & 13 + x \\ + 2 & & + 2 \\ \hline 6x & = & 15 + x \\ -x & & -x \\ \hline 5x & = & 15 \\ \frac{5x}{5} & = & \frac{15}{5} \\ x & = & 3 \end{array}$$

- b. Three less than four times a number is the same as three times a number increased by four. Find the number.

$$4x - 3 = 3x + 4$$

$$x = 7$$

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## 2-5 Solving Multi-Step Equations

Examples:

Solve each equation:

a.  $3(5x - 4) = 8x + 2$

$$\begin{array}{rcl}
 15x - 12 & = & 8x + 2 \\
 7x & = & 14 \\
 x & = & 2
 \end{array}$$

Step 1 dist. 3

Step 2 sub  $8x$  b.s. // add 12 b.s.

Step 3 div by 7 b.s.

Check

b.  $2(9x - 1) = 99 - 7(3 - 4x)$

$$\begin{array}{rcl}
 18x - 2 & = & 99 - 21 + 28x \\
 -10x & = & 80 \\
 x & = & -8
 \end{array}$$

Step 1 dist. 2 and dist. -7

Step 2 com. L.T. // sub  $28x$  b.s. // add 2

Step 3 div by -10

Step 4 \_\_\_\_\_