



5 (-) Translate, then solve:  $2n - 3$   
"Five times the difference of twice a number and three, decreased by the sum of the number and eight equals 13"  
 $- + n 8 =$

$$5(2n - 3) - (n + 8) = 13$$

$$10n - 15 - n - 8 = 13$$

$$9n - 23 = 13$$
$$+ 23 \quad + 23$$

$$\hline 9n = 36$$

$$\frac{9}{9} \quad \frac{36}{9}$$
$$n = 4$$

## Solving Variables on Both Sides

### HW # 5, 6, 9, 10

Main Ideas/Questions	Notes
Steps	1.) Distribute, if necessary.
	2.) Combine like terms.
	3.) Move the smallest variable.

4.) Solve the remaining two step equation.

$$\begin{array}{r}
 1.) \quad 5y - 8 = 3y + 12 \\
 \quad \underline{-3y} \quad \quad \underline{-3y} \\
 \quad 2y - 8 = 12 \\
 \quad \quad \underline{+8} \quad \quad \underline{+8} \\
 \quad \quad 2y = 20 \\
 \quad \quad \underline{\quad} \quad \underline{\quad} \\
 \quad \quad y = 10
 \end{array}$$

$$\begin{array}{r}
 2.) \quad -6x + 14 = 12 - 8x \\
 \quad \quad \underline{+8x} \quad \quad \quad \underline{+8x} \\
 \quad \quad 2x + 14 = 12 \\
 \quad \quad \quad \underline{-14} \quad \quad \underline{-14} \\
 \quad \quad \quad 2x = -2 \\
 \quad \quad \quad \underline{\quad} \quad \underline{\quad} \\
 \quad \quad \quad x = -1
 \end{array}$$

$$\begin{array}{r|l} 3.) & 7k = 3k - 36 \\ & -3k \quad -3k \\ \hline & 4k = -36 \\ & \frac{4}{4} \quad \frac{4}{4} \\ & k = -9 \end{array}$$

$$4.) 15 - m = 22 - 8m$$

Matches ATA

$$7.) 3(6p - 1) = 11p - 45$$

$$18p - 3 = 11p - 45$$

$$\begin{array}{r|l} -11p & +11p \\ \hline 7p - 3 & = -45 \end{array}$$

$$\begin{array}{r|l} +3 & +3 \\ \hline 7p & = -42 \end{array}$$

$$p = -6$$

$$p = -6$$

$$8.) 2(4w - 1) = -10(w - 3) + 4$$

$$8w - 2 = -10w + 30 + 4$$

$$\begin{array}{r|l} +10w & +10w \\ \hline 18w - 2 & = 34 \end{array}$$

$$18w - 2 = 34$$

$$\begin{array}{r|l} +2 & +2 \\ \hline 18w & = 36 \end{array}$$

$$18w = 36$$

$$\frac{18w}{18} = \frac{36}{18}$$

$$w = 2$$

Matches ATA

## Variables on Both Sides...With Fractions!

When an equation contains fractions on both sides, it is helpful to multiply **both sides** by a common denominator.

$$\frac{x}{2} + 5 = \frac{x}{3} + 8$$

What is the common denominator?

$$\frac{4}{1} \left( \frac{5x}{4} + 2 \right) = 4 \left( \frac{x}{4} + 7 \right)$$

$$\frac{5x}{-x} + \frac{8}{-x} = \frac{x}{-x} + \frac{28}{-x}$$

$$4x + 8 = 28$$

$$\frac{-8}{-8} \quad \frac{-8}{-8}$$

$$4x = 20$$

$$x = 5$$

$$\frac{10}{1} \left( \frac{x}{5} + 7 \right) = \frac{10}{1} \left( \frac{x}{10} + 8 \right)$$

$$\frac{10x}{5} + \frac{70}{1} = \frac{10x}{10} + \frac{80}{1}$$

$$\frac{2x}{-x} + \frac{70}{-x} = \frac{x}{-x} + \frac{80}{-x}$$

$$x + 70 = 80$$

$$\frac{-70}{-70} \quad \frac{-70}{-70}$$

$$x = 10$$

$$\frac{9}{1} \left( \frac{x}{3} - 6 \right) = \left( \frac{x}{9} \right) \frac{9}{1}$$

$$\frac{9x}{3} - 54 = \frac{9x}{9}$$

$$3x - 54 = x$$

$$\frac{-x}{-x} \quad \frac{-x}{-x}$$

$$2x - 54 = 0$$

$$\frac{+54}{+54} \quad \frac{+54}{+54}$$



$$2x = 54$$

$$x = 27$$

## NO SOLUTION & INFINITE SOLUTION

No Solution:	Infinite Solution:
$\begin{array}{r l} -4(2x + 1) = -8x - 2 & \\ \hline -8x - 4 = -8x - 2 & \\ +8x & +8x \\ \hline -4 = -2 & \\ \text{no sol.} & \emptyset \end{array}$	$\begin{array}{r l} -5 - 9x = 3(1 - 3x) - 8 & \\ \hline -5 - 9x = 3 - 9x - 8 & \\ -5 - 9x = -5 - 9x & \\ +9x & +9x \\ \hline -5 = -5 & \\ \text{inf. sol.} & \infty \end{array}$
<p>There is <b>no possible number</b> that could work as a solution to the equation!</p>	<p><b>Every number</b> could work as a solution!</p>

## More Examples!

<b>1</b> $3(2x + 2) - 3x = 6 + 3x$ $6x + 6 - 3x = 6 + 3x$ $3x + 6 = 6 + 3x$ $\begin{array}{r} 3x + 6 \\ -3x \end{array} = \begin{array}{r} 6 + 3x \\ -3x \end{array}$ $6 = 6$ 	<b>2</b> $6(2x - 6) = -7(-2x + 4)$ $12x - 36 = 14x - 28$ $\begin{array}{r} 12x - 36 \\ -12x \end{array} = \begin{array}{r} 14x - 28 \\ -12x \end{array}$ $\begin{array}{r} -36 = 2x - 28 \\ +28 \end{array}$ $\begin{array}{r} -8 = 2x \\ \div 2 \end{array}$ $-4 = x$ 
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3

$$8(5x - 3) = 6(-3x - 4)$$

$$\begin{array}{r} 40x - 24 = -18x - 24 \\ +18x \end{array}$$

$$\begin{array}{r} 58x - 24 = -24 \\ +24 \end{array}$$

$$\frac{58x}{58} = \frac{0}{58}$$

$$x = 0$$

4

$$3x - 13 = 7(x + 2) - 4(x - 7)$$