# Accelerated Math Notes
## Solving Multi-Step Equations and Inequalities
## (Section 8-8)

Infinite # of solutions
(All real #'s)

One Solution

No Solution

Two solutions...

**Steps to solve an equation with grouping symbols:**

**Simplify each side of the equation
*Use distributive property to clear ( )
*Combine like terms

**Choose x term to add or subtract in order to get all x terms on the same side. Simplify.

**Choose constant to add or subtract in order to get constants on the same side. Simplify.

** Divide both sides by the coefficient of x term.

**State solution and then check.

**Solve and check:** $\frac{1}{4}(n - 8) + 2 = \frac{2}{3}(n - 3) - 8$

$\frac{1}{4}n - 2 + 2 = \frac{2}{3}n - 2 - 8$

$\frac{1}{4}n = \frac{2}{3}n - 10$

$-\frac{1}{4}n \quad -\frac{1}{4}n$

$0 = \frac{5}{12}n - 10$

$+10 \quad +10$

$10 = \frac{5}{12}n$

$\frac{12}{5} \cdot 10 = \frac{5}{12}n \cdot \frac{12}{5}$

$24 = n$

$\frac{8}{12} - \frac{3}{12}$

$\frac{1}{4}(n-8)+2 = \frac{2}{3}(n-3)-8$

$\frac{1}{4}(24-8)+2 \quad \frac{2}{3}(24-3)-8$

$\frac{1}{4}(16)+2 \quad \frac{2}{3}\cdot 21 - 8$

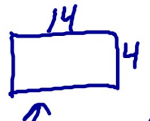
$4+2 \quad 14-8$

$6 = 6$ ✓

Solve this problem by first writing an equation that can be used to solve the problem. The perimeter of a rectangle is 36 inches. Find the dimensions if the length is two inches greater than three times the width.

Let x = width of rectangle (4 in)
3x+2 = length of rectangle $3 \cdot 4 + 2$, $12+2$, 14 in

4 in × 14 in




Check Is P = 36 ✓

P = 2l + 2w

$36 = 2(3x+2) + 2(x)$

$36 = 6x + 4 + 2x$

$36 = 8x + 4$

$-4 \quad -4$

$32 = 8x$

$\frac{32}{8} = \frac{8x}{8}$

$4 = x$

Some equations have **no solution**. There is no value of the variable that results in a true sentence. When this occurs the set of solutions for this equation contains no elements. A set that contains no elements is called the **null or empty set** shown by the symbol **ø** or **{ }**.

**We know there is no solution because we have solved the equation correctly yet arrived at a contradiction.** **8 ≠ 9** **-2 ≠ 5**

**Solve:** $7y - 8 = 3(2y + 4) + y$

$7y - 8 = 6y + 12 + y$

$7y - 8 = 7y + 12$

$-7y \quad -7y$

$-8 \neq 12$

no solution

Some equations have **an infinite number of solutions**. All values for the variable make the equation true. An equation that is true for every value of the variable is called an **identity**. The sentence is always true. The solution set is **all numbers**.

R

all Real #'s

**We know all numbers make the equation true when se solve the equation and it results in an identity.** **7 = 7** **0 = 0**

**Solve:** $3(4x - 2) + 15 = 12x + 9$

$12x - 6 + 15 = 12x + 9$

$* \quad 12x + 9 = 12x + 9$

$-12x \quad -12x$

$9 = 9$

Identity

All real #'s

R

let $x = 0$

$3(4x-2)+15 \neq 12x+9$

$3(4 \cdot 0 - 2) + 15 \quad | \quad 12 \cdot 0 + 9$

$3(-2) + 15 \quad | \quad 0 + 9$

$-6 + 15 \quad | \quad 9$

$9 \quad | \quad \neq$ ✓