

# Solving Equations with Variables on Each Side

## Steps:

- 1) Decide which side you want to have contain the variables.
- 2) Move the variable terms to that side by addition/subtraction.
  - note: cannot combine like terms across the equals sign.
- 3) Move the non-variable terms to the other side.
- 4) Using steps 2 and 3 solve the equation by isolating the variable.
  - handle parentheses first
  - addition/subtraction second
  - multiplication/division third

## Consider

- integer rules
- leave, change, opposite
- clearing fractions by multiplying by the reciprocal

Solve.

$$1) 5x + 12 = 2x$$

Variable on left.

$$5x + 12 = 2x$$

$$-2x \quad -2x$$

$$3x + 12 = 0$$

$$-12 \quad -12$$

$$\frac{3x}{3} = \frac{-12}{3}$$

$$x = -4$$

Variable on right.

$$5x + 12 = 2x$$

$$-5x \quad -5x$$

$$\frac{12}{-3} = \frac{-3x}{-3}$$

$$-4 = x$$

Solve.     2)  $-8x + 7 = 4x - 5$

Variable on left.

$$2) -8x + 7 = 4x - 5$$

$$\begin{array}{r} -4x \qquad \qquad -4x \\ -8x + 7 = 4x - 5 \end{array}$$

$$-12x + 7 = -5$$

$$\begin{array}{r} -7 \qquad -7 \\ -12x + 7 = -5 \end{array}$$

$$-12x = -12$$

$$x = 1$$

Variable on right.

$$2) -8x + 7 = 4x - 5$$

$$\begin{array}{r} +8x \qquad \qquad +8x \\ -8x + 7 = 4x - 5 \end{array}$$

$$7 = 12x - 5$$

$$\begin{array}{r} +5 \qquad \qquad +5 \\ 7 = 12x - 5 \end{array}$$

$$12 = 12x$$

$$1 = x$$

Solve.

$$3) 5(y - 2) = -2(12 - 9y) + y$$

$$5y - 10 = -24 + 18y + 1y$$

$$5y - 10 = -24 + 19y$$

$-5y$

$-5y$

$$-10 = -24 + 14y$$

$+24$

$+24$

$$14 = 14y$$

$$1 = y$$

## Special Solutions

$$4) \quad 2(3x + 4) = 6x + 9$$

$$6x + 8 = 6x + 9$$

$-6x$

$-6x$

$$8 = 9$$

no solution  
null set

## Special Solutions

$$5) \quad 4(x - 5) = 4x - 20$$

$$4x - 20 = 4x - 20$$

All or infinite  
solutions