

Notes 5.2 – Solving Equations and Inequalities

Warmup – Solve each equation.

1.  $9 - x = 12$   
 $-9 \quad -9$   
 $\frac{-x}{-1} = \frac{3}{-1}$   
 $X = -3$

2.  $-40 = 8 - 6x$   
 $-8 \quad -8$   
 $\frac{-48}{-6} = \frac{-6x}{-6}$   
 $X = 8$

3.  $\frac{x}{4} + 7 = -2$   
 $-7 \quad -7$   
 $(4) \frac{x}{4} = -9(4)$   
 $X = -36$

4.  $12 - \frac{1}{3}x = 2$   
 $-12 \quad -12$   
 $(-3) \frac{-1}{3}x = -10(-3)$   
 $X = 30$

5.  $6x - 8 - 2x = 16$   
 $4x - 8 = 16$   
 $+8 \quad +8$   
 $\frac{4x}{4} = \frac{24}{4}$   
 $X = 6$

6.  $\frac{1}{2}(3x - 5) + 7 = 15$   
 $-7 \quad -7$   
 $(2) \frac{1}{2}(3x - 5) = 8(2)$   
 $3x - 5 = 16$   
 $+5 \quad +5$   
 $\frac{3x}{3} = \frac{21}{3}$   
 $X = 7$

Lesson

Word	Meaning/Notation	Example
Coefficient	The number in front of a variable that you multiply the	$2x$ ← variable $\uparrow$ coefficient

Simplify	Solve
What you do to only one side of the equal sign using $\downarrow$ P E MD AS	Isolate the variable on one side of the equal sign to find its value $\downarrow$ AS MD E P

\* Try to keep the coefficient positive

Solving with Variable on Both Sides

a)  $24 - 3x = 5x$   
 $+3x +3x$   
 $\frac{24}{8} = \frac{8x}{8}$   
 $x = 3$

b)  $20 + x = 4x - 7$   
 $-1x -1x$   
 $20 = 3x - 7$   
 $+7 +7$   
 $\frac{27}{3} = \frac{3x}{3}$   
 $x = 9$

c)  $7 - 8x = 4x - 17$   
 $+8x +8x$   
 $7 = 12x - 17$   
 $+17 +17$   
 $\frac{24}{12} = \frac{12x}{12}$   
 $x = 2$

d)  $3 - 4x = 5(x - 3)$   
 $3 - 4x = 5x - 15$   
 $+4x +4x$   
 $3 = 9x - 15$   
 $+15 +15$   
 $\frac{18}{9} = \frac{9x}{9}$   
 $x = 2$

e)  $8x - 6 = \frac{2}{3}(6x + 15)$   
 $8x - 6 = 4x + 10$   
 $-4x -4x$   
 $4x - 6 = 10$   
 $+6 +6$   
 $\frac{4x}{4} = \frac{16}{4}$   
 $x = 4$

f)  $9x - 5 = \frac{1}{4}(16x + 60) + 10$   
 $9x - 5 = 4x + 15 + 10$   
 $9x - 5 = 4x + 25$   
 $-4x -4x$   
 $5x - 5 = 25$   
 $+5 +5$   
 $\frac{5x}{5} = \frac{30}{5}$   
 $x = 6$



## Things to Remember

- Simplify each side first
- move all variables to the same side
- try to keep the coefficient positive
- then solve the equation

## Special Cases

### No Solution

g)  $9x + 12 = 9(x + 3)$

$$\begin{array}{r} 9x + 12 = 9x + 27 \\ -9x \quad -9x \end{array}$$

$$12 = 27$$

↙ never true

There is not an  $x$  value that will make the two expressions equal.

### $\infty$ solutions

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

$$\begin{array}{r} 6x + 6 = 6x + 6 \\ -6x \quad -6x \end{array}$$

$$6 = 6$$

↑  
always  
true

Any value will make the two expressions equal.