**UNIT 5 – Equations & Inequalities**

***SOLVING EQUATIONS***

**Goal** - to get variable alone on 1 side of the equal sign

STEPS:

1. Determine the variable you are solving for
2. SIMPLIFY
* Apply the distributive property (if necessary)
* Combine like terms (if necessary)
1. Get all variables on the same side of the equal sign.
2. Determine what is being done to the variable so you can use inverse operations.
* Use the Order of Operations (P,E,MD,AS) backwards (SA,DM,E,P)
* “Undo” to BOTH sides of the equal sign (=)
1. Check your solution

EXAMPLES:

**1-Step Equations** ( only 1 operation to “undo” to get solution)

 – follow steps 1, 5 & 7 or 1, 6 & 7

 1) 3x = 12 2) m + 5 = 16 3) $\frac{c}{8}$ = 4

 3x = 12 m + 5 = 16 8 • $\frac{c}{8}$ = 4 • 8

 3 3 -5 -5

 x = 4 m = 11 c = 32

**2-Step Equations** ( 2 operations to “undo” to get solution)

 1) 4a – 2 = 10 2) $\frac{b}{5}$ + 1 = 6

 4a –2 = 14 $\frac{b}{5}$ + 1 = 6

 +2 +2 -1 -1

 4a = 16 5 • $\frac{b}{5}$ = 5 • 5

 4 4

 a = 4 b = 25

**Multi-step equations** (more than 2 operations to “undo” to get solution)

2(x - 3) + 4 = - 15 Distribute

 2x – 6 + 4 = -15 Combine like terms

 2x - 2 = -15

 + 2 + 2

 2x = -13

 2 2

 x = $-\frac{13}{2}$ or -6½

***SOLVING INEQUALITIES***

The goal and steps for solving inequalities is the same as those for solving equations EXCEPT….. when **multiplying or dividing by a negative** the **inequality sign reverses direction** ( greater than becomes less than; less than becomes greater than)

EXAMPLES:

**1-Step Equations**

 1) -3x ≤ 12 2) m + 5 ≥ 16 3) $\frac{c}{8}$ ‹ 4

 -3x **≤** 12 m + 5 ≥ 16 8 • $\frac{c}{8}$ ‹ 4 • 8

 -3 -3 -5 -5

 x **≥** 4 m ≥ 11 c ‹ 32

Means: Any number that is 4 or more can be substituted in for *x* and the statement would be true; **notice change in sign**

Means: any number that is 11 or more would create a true statement

Means: any number that is less than 32 (*not* 32) would create a true statement

**2-Step Inequality**

 1) 4a – 2 › 10 2) $\frac{b}{-5}$ + 1 ≥ 6

 4a –2 › 14 $\frac{b}{-5}$ + 1 ≥ 6

 +2 +2 -1 -1

 4a › 16 -5 • $\frac{b}{-5}$ $\geq $ 5 • -5

Notice how direction of sign changed when multiplied by the negative.

 4 4

 a › 4 b **≤** -25

**Multi-step Inequality**

2(x - 3) + 4 ‹ - 15 Distribute

 2x – 6 + 4 ‹ -15 Combine like terms

 2x - 2 ‹ -15

 + 2 + 2

 2x ‹ -13

 2 2

 x ‹ $-\frac{13}{2}$ or -6½

WRITING EXPRESSIONS / EQUATIONS FROM PHRASES / SENTENCES

This is just a translation. Change words into symbols.

Some terms and their symbols: (these are *not* all possibilities)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ADD** | **SUBTRACT** | **MULTIPLY** | **DIVIDE** | **OTHER** |
| sum | difference | product | quotient | equals / is = |
| total | subtract | multiplied | divided by | is greater than > |
| plus | minus | times |  | is less than < |
| add | decreased by |  |  | is less than or equal to ≤ |
| increased by |  |  |  |  is not equal to ≠ |
| More than (switch position of numbers) | Less than (switch position of numbers) | twice (triple, etc) | Half (third, etc) | is greater than or equal to ≥ |

Ex. A number decreased by 11 *n* – 11

 16 more than a number is 21. n + 16 = 21

**Remember the 4 steps to solving word problems (using equations and inequalities)**

1. Define your variable.
2. Write your equation/inequality.
3. Solve your equation/inequality.
4. Answer the question asked.