Algebra I **Name ______________________________**
Chapter 4 Notes

Sec 4.1 "Coordinates and Scatter Plots"

<u>Coordinate Plane</u>: Formed by two real number lines that intersect at a right angle.

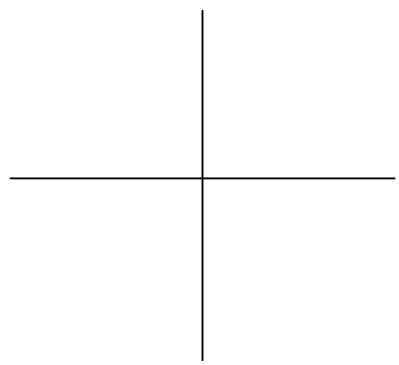
<u>X-axis</u>: The horizontal axis

<u>Y-axis</u>: The vertical axis

<u>Ordered Pair</u>: An X-coordinate and Y-coordinate corresponding to a point on the coordinate plane, written as (x, y).

Ex: (3, -5) means x = 3 and y = -5

Ex : (-1, -4) means x = -1 and y = -4



<u>Graphing</u>- Drawing the point or points on the coordinate plane

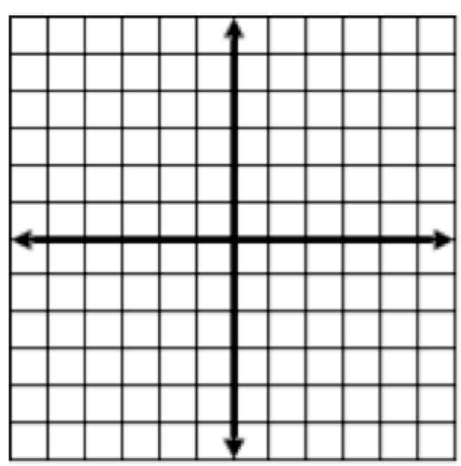
<u>Scatter Plot</u>:
Graphing pairs of data on a coordinate plane that represent relationships between 2 quantities
*Usually comes from collected data

Graph the following ordered pairs, then tell what quadrant each point is in, if any:

A(-5, 4) B(3, 3)

C(-1, -4) D(2, -3)

E(0, 4) F(-2, 0)



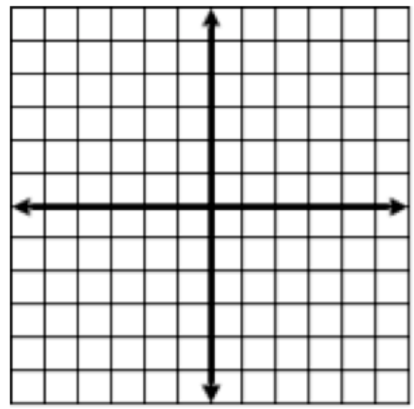
Sec 4.2 "Graphing Linear Equations"

<u>Solution of an Equation</u>:
An ordered pair (x, y) that makes the equation TRUE

Ex 1:
Is (0, 1) a solution to the equation $y = 3x + 1$?

<u>Graph of an Equation</u>:
The set of all points (x, y) that are solutions to the equation

Ex 2: The following are all solutions for $y = 3x + 1$



(0, 1)

(1, 4)

(-2, -5)

(-1, -2)

***The graph of a LINEAR equation is a straight line**
(Linear means only x and y … NO x^2, x^3, etc)

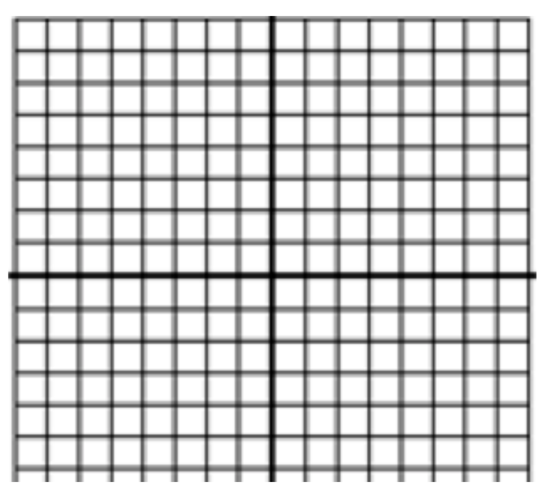
<u>"Rules" for Graphing</u>:
1) Re-write the equation with Y as a function of X….
(y = everything else)

2) Make a table of x and Y values, and plug in x to solve for y.
Choose low values such as: -2, -1, 0, 1, 2 for "x"

3) Plot the points, connect by drawing a straight line, and draw arrows on both ends of the line to show it is "continuous" in both directions

<u>Ex 3</u>: Graph the equation $3x + 3y = 3$

x	y

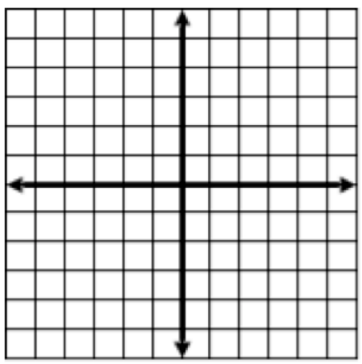


Equations of Horizontal and Vertical Lines:
***All linear equations can be written in the form: Ax + By = C, where A, B, and C are NUMBERS (this is called Standard Form)

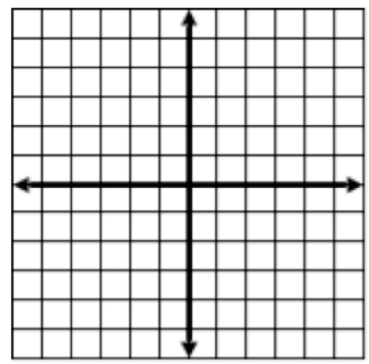
If A = 0.....there will be no "x" term in the equation!
- Solve for y… the equation will look like y = # (Ex: y = 6)
- This is a HORIZONTAL LINE that crosses the y-axis at that #

If B = 0.....there will be no "y" term in the equation!
- Solve for x…. the equation will look like x = # (Ex: x = -2)
- This is a VERTICAL LINE that crosses the x-axis at that #

Ex 4: Graph y = 6



Ex 5: Graph x = -2



Sec 4.3 "Quick Graphs Using Intercepts"

Question:
How many points are needed to determine a line?

<u>**X-Intercept**</u>**:** The point where the graph crosses the x-axis
Always in the form (x, 0)

<u>**Y-Intercept**</u>**:** The point where a graph crosses the y-axis
Always in the form (0, y)

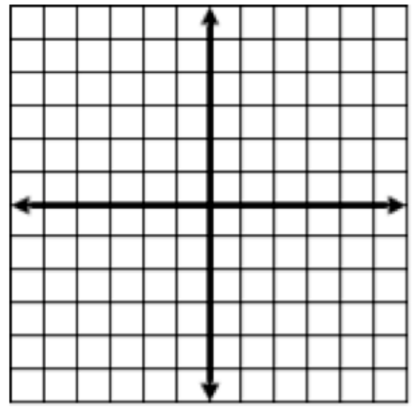
<u>**Ex 1:**</u> Find the x- and y-intercepts of **3x + 4y = 12**

1) To find the x-intercept, plug in ZERO for y and solve for X:

2) To find the y-intercept, plug in ZERO for x and solve for Y:

Graphing Lines Using Intercepts:

Ex 2: Plot the x-intercept, plot the y-intercept, and connect the points to make a line:



x-intercept: (4,0)

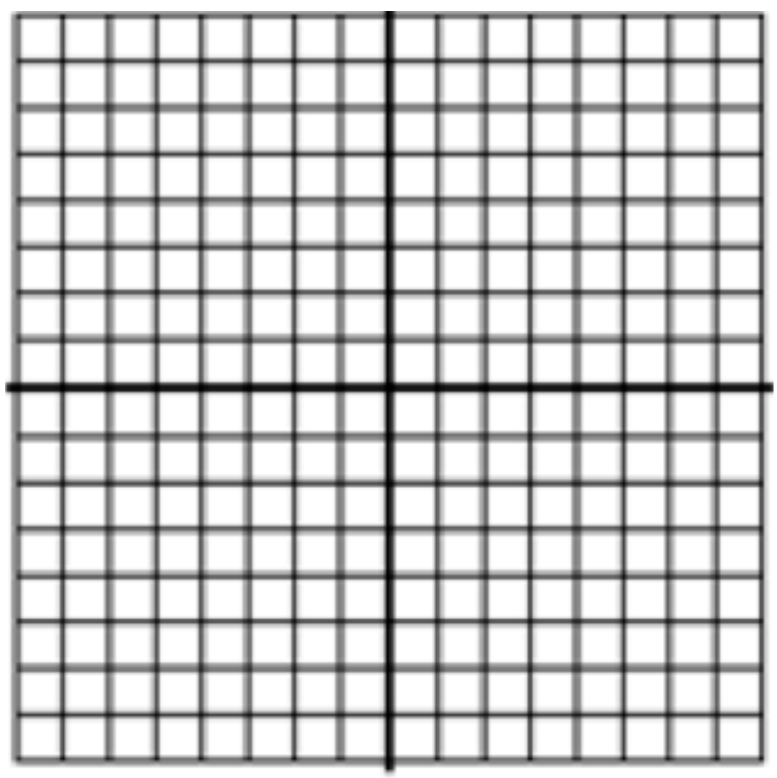
y-intercept: (0,3)

<u>Adjusting Scales Appropriately</u>

Ex 3: Graph y = 4x + 40 by finding the intercepts.

x-intercept: y-intercept:

*Remember that the axes must <u>ALWAYS have even increments</u>!



Sec 4.4 "The Slope of a Line"

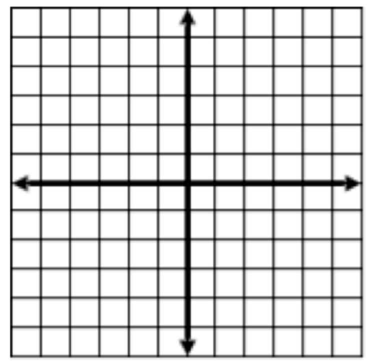
Slope- the number of units the line rises or falls for each unit of horizontal change from left to right

Other names for slope:
"m"
rise/run
rate of change
steepness of a line
*constant variation

$$m = \frac{y_1 - y_2}{x_1 - x_2}$$

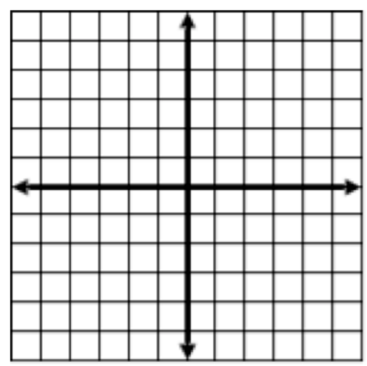
Finding the Slope of a Line with 2 points:

Ex 1: (-2,2) and (3,4) m =



What does this mean?

Ex 2: (1,4) and (-3,-5) m =



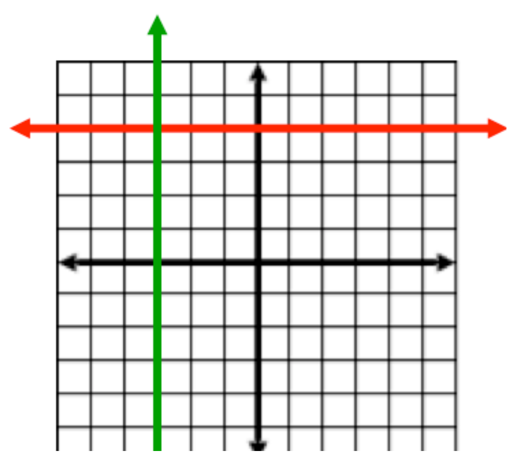
What does this mean?

Classifying Lines By Their Slope:

Positive Slope (m > 0) The line RISES from left to right

Negative Slope (m < 0) The line FALLS from left to right

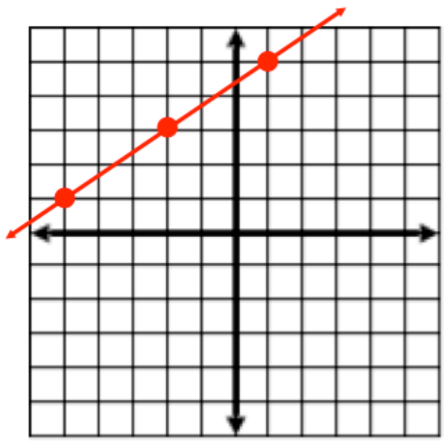
Zero Slope (m = 0)
The line is HORIZONTAL



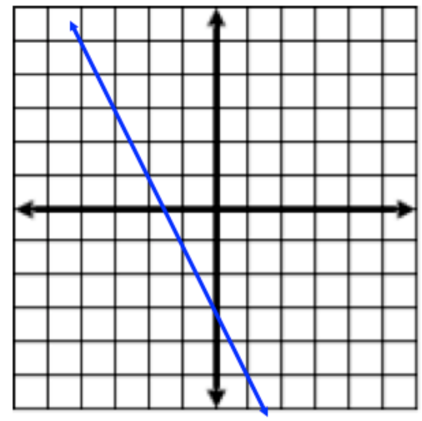
Undefined Slope
The line is VERTICAL

Find the slope by counting the rise over the run.

Ex 3:



Ex 4:



Given the slope, find the missing x or y-coordinate.

Ex 5:

Find the value of y so that the line passing through (-2,1) and (4,y) has a slope of $\frac{2}{3}$.

Ex 6:

Find the value of x so that the line passing through (-4, 9) and (x, 0) has a slope of -1.

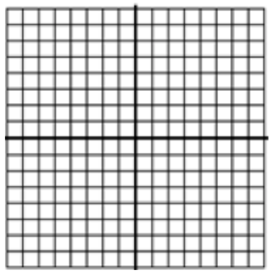
Sec 4.5 “Direct Variation”

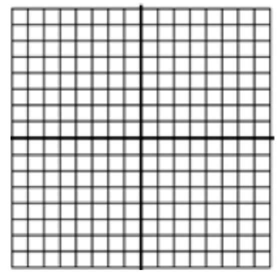
*Two variables x and y vary **directly** if there is a non-zero number k such that **y = kx**

Direct Variation Equation:

K is the constant of variation   **To find K:**

The graph of y = kx is a line through the origin:





If K > 0 (_____________ slope)   If K < 0 (______________ slope)

The slope of the graph of y = kx is “ ___ “, and the y-intercept is always ________

Direct Variation is a special case of y = mx + b form....
the y-intercept is always ________ and "K" is always the _____________

So this means... ________________________________ = ____________

Remember that you need TWO ordered pairs to find SLOPE (m):   m = _____________

But you only need ONE ordered pair to find K: k = _____

How to write Direct Variation Equations

Ex 1: The variables x and y vary directly. When x = 5, y = 20.

A) Find K:

B) Write an equation that relates x and y:

C) Find the value of y when x = 10:

D) Find the value of x when y = 28:

*In a set of data, if x and y have direct variation, then the ratio of y to x ("k") is the ________ for all ordered pairs!

Ex 2: Show the table of values represents Direct Variation:

x	1	2	3	4	5	6
y	3	6	9	12	15	18

Sec 4.6 "Quick Graphs Using Slope-Intercept Form"

Slope-Intercept Form: y = mx + b
*where **m** is the **slope** and **b** is the **y-intercept***

For y = 2x + 3… slope m = ____ and y-intercept b = _____

Equation	Slope-Intercept Form	Slope	Y-Intercept
y = -x + 2			
y = $\frac{x+3}{2}$			
2x – 4y = 16			

Graph an equation using slope-intercept form:

1) Equation *MUST BE* in y = mx + b form first!

2) Plot "b" the y-intercept

3) *From b*, use the slope fraction to make the next point by counting:

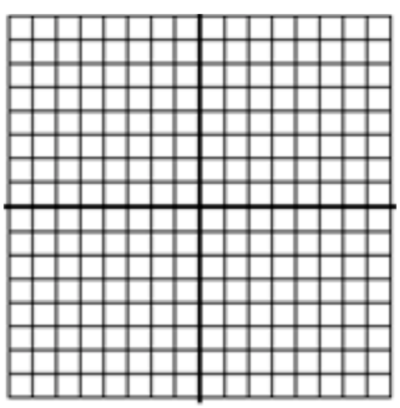
$$m = \frac{top\#}{bottom\#} = \frac{if(+)up / if(-)down}{RIGHT!}$$

*If there is a NEGATIVE SIGN, it goes with the top!

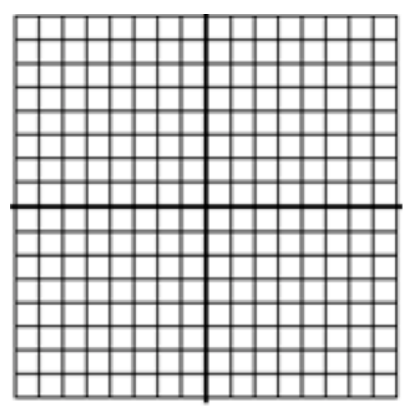
4) REPEAT step 3 (make a 3rd point)

5) Connect the points with a straight line, ARROWS on both ends

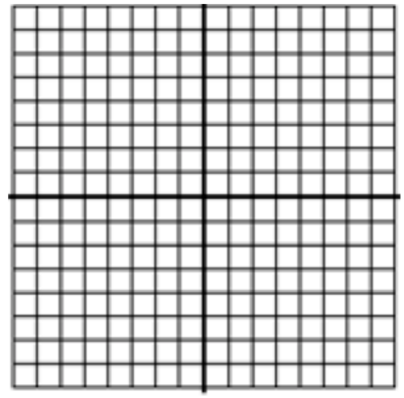
Ex 1:
Y = 4x + 4



Ex 2:
y = -3x + 2



Ex 3:
$5x + 2y = -4$

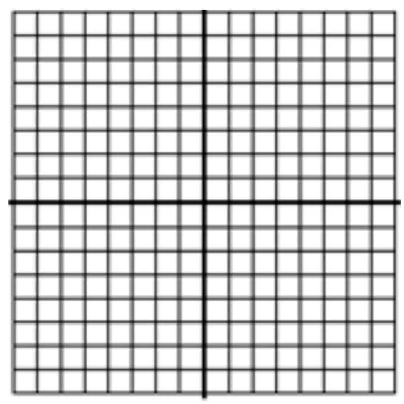


Parallel Lines: Lines in the same plane that *never intersect*

*Any two non-vertical lines are parallel if and only if they have the SAME SLOPE!

Ex 4: Are the following lines parallel?

$y = 2x + 2$ $y = 2x - 6$



Sec 4.8 "Functions and Relations"

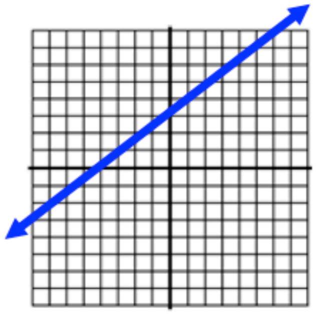
*Recall that the definition of a function says for every input there is exactly one output.
(You can't put in the same value for x and get different values for y)

Relation- a set of ordered pairs where an input *may have* more than one output.

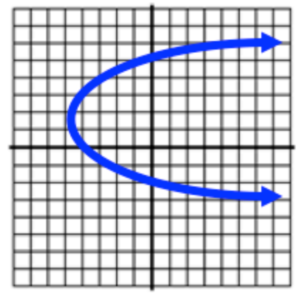
*A function is always a relation, but a relation is NOT always a function.

Vertical Line Test- For the graph of a relation, it is a function if and only if <u>no vertical line</u> can pass through two or more points on the graph.

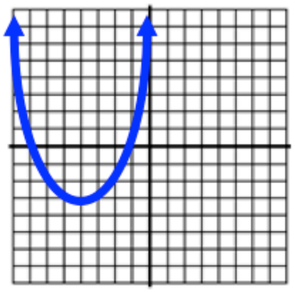
Ex 1:



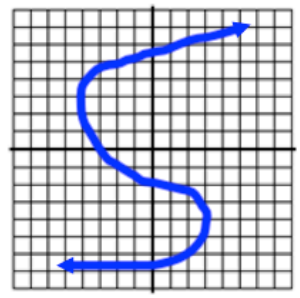
Ex 2:



Ex 3:



Ex 4:

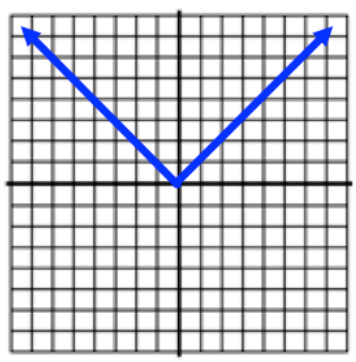


Are the following relations a function?

Ex 5:

x	y
7	-2
5	-4
3	-6
1	-8

Ex 6:



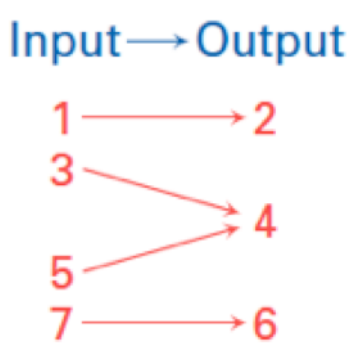
Ex 7:

x	y
1	2
3	7
5	12
3	19

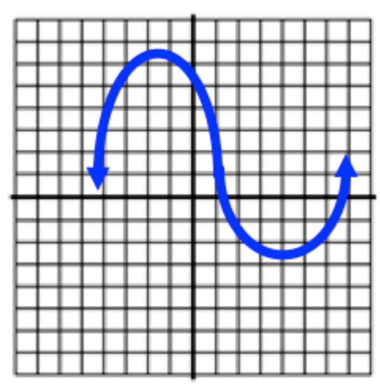
Ex 8:

x	y
-2	7
-3	7
-4	7
-5	7

Ex 9:



Ex 10:



Function Notation
F(x) replaces y, and is called "the value of f at x" or "f of x"

It DOES NOT mean f times x!

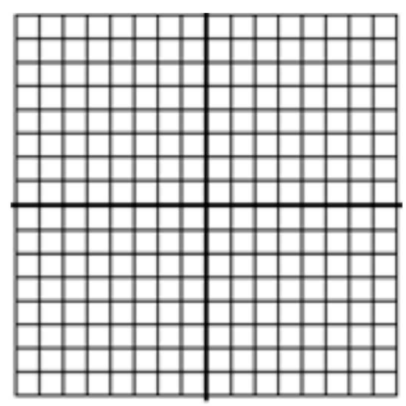
*f(x) and y mean the same thing!
*Other variables are sometimes used, such as h(x) or g(x)...especially when comparing two functions

Ex 11: Create a table for the function f(x) = 3x +2

x	-2	-1	0	1	2
f(x) = 3x + 2					

Graph of a Function
The graph of *f* (a function) is the set of all point (x , f(x)) where **x is the domain** of the function and **f(x) is the range**

Ex 12:
g(x) = 4x + 5   is just like   y = 4x + 5



m =

b =

Ex 13: Find the slope if
f(2) = 4 and f(-1) = 3

Ex 14: Find the slope if
f(1) = 5 and f(-2) = -4