Lesson 10: Graphing Lines

Linear Equations, Ordered Pairs

Standard Form of a Linear Equation in Two Variables

The **standard form** of the equation of a line is written as**:** $Ax + By = C$

where A, B, and C are real numbers, $A \geq 0$, and both A and B do not equal zero.

$4x - 2y = 8$ $\quad$ $y = \frac{1}{2}x - 4$ $\quad$ $x = 4$ $\quad$ $-9k + 3j = 5$

Ordered Pairs

A solution to a linear equation in two variables is written as an **ordered pair**, (x, y).

Example: A solution to $4x - 2y = 8$ would be (3,2) . This means that when x = 3 and y =2, $4x - 2y = 8$.

Is (6,-1) a solution for $y = \frac{1}{2}x - 4$?

Is (8, 1) a solution for $y = \frac{1}{2}x - 4$?

Complete the ordered pair (10,) for $y = \frac{1}{2}x - 4$.

Sometimes, it is helpful to complete a table of ordered pairs.

$4x - 2y = 8$	X	Y
	3	2
	2	
	1	
	0	

$y = \frac{1}{2}x - 4$	X	Y
	10	
		0
	6	
		-2

Tables and Graphs of Data

Vocabulary

Table	A display of information in parallel rows or columns
Cell	The intersection of a row and column

Example:

This table shows data collected from students in Intermediate Algebra in the Fall of 2008 by this instructor. Students were asked to identify three items that personally helped them the most to learn the material in the course. The top three choices from each group are *highlighted*.

	Class Lectures	Handouts in Class	Hard Copy Text	Graded Daily Homewk	Test Review Handout	Online Computer Help	Online Practice Test	Online Textbook	My Instructor	Tutors in Math Lab	Personal Tutor	Other students or adults
Freshmen Textbook Users	8	8	2	2	9				7	2	1	1
N=12	66.7%	66.7%	16.7%	16.7%	75.0%				58.3%	16.7%	8.3%	8.3%
Other Textbook Users	6	5	3	3	5				2	2	0	0
N=9	66.7%	55.6%	33.3%	33.3%	55.6%				22.2%	22.2%	0.0%	0.0%
Freshmen Computer Users	10	10	0	2	5	14	8	3	10	1	2	0
N=20	50.0%	50.0%	0.0%	10.0%	25.0%	70.0%	40.0%	15.0%	50.0%	5.0%	10.0%	0.0%
Other Computer Users	6	8	1	0	4	9	1	0	7	5	2	1
N=13	42.9%	61.5%	7.7%	0.0%	30.8%	69.2%	7.7%	0.0%	53.8%	38.5%	15.4%	7.7%
All Textbook Users	14	12	5	5	13				8	4	0	1
N=21	66.7%	57.1%	23.8%	23.8%	61.9%				38.1%	19.0%	0.0%	4.8%
All Computer Users	14	17	1	1	8	21	8	3	15	6	4	1
N=33	42.4%	51.5%	3.0%	3.0%	24.2%	63.6%	24.2%	9.1%	45.5%	18.2%	12.1%	3.0%

TRY: Which one item was marked as a "top three" by every group?

[This data helped your instructor decide to create the workbook you are currently using.]

Of all the students who used the textbook only to complete all homework assignments (textbook users), how many indicated the hard copy text was one of the top three sources to help them learn the material?

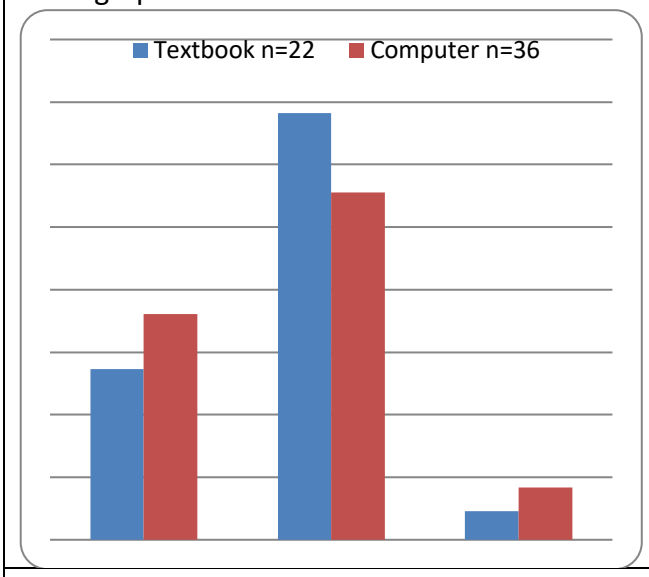
Of all the students who used the computer only to complete all homework assignments (computer users), what percent of all computer users indicated the hard copy text was one of the top three sources to help them learn the material?

Of Freshmen computer users, what item was selected by the highest percentage?

How many selected it?

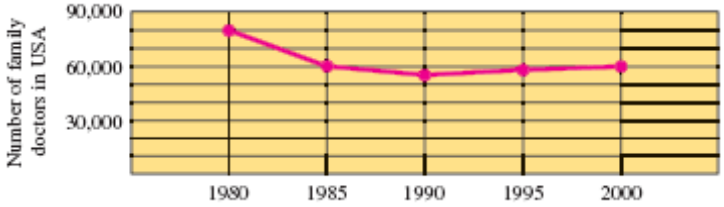
TRY: Reading a Graph

A bar graph:



1. Approximately what percent of textbook users received a grade of B, B-, B+, or C?
2. What is the difference in percentages between textbook users receiving A to B+ and those receiving B to C?

A line graph



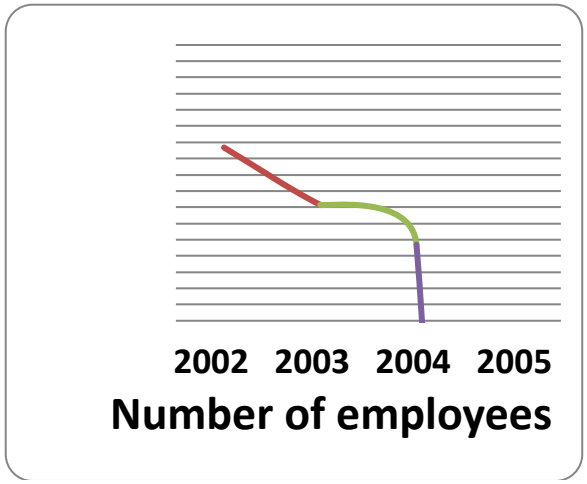
1. How many fewer family doctors were there in the US in 1990 than in 1980?
2. What was the percent of total change in family doctors between 2000 and 1980?

Making a prediction using a line graph:

One should be cautious about using **extrapolation** – using an earlier trend to predict a future value.

TRY:

Use the line graph and table to "predict" the number of employees in the year 2005.

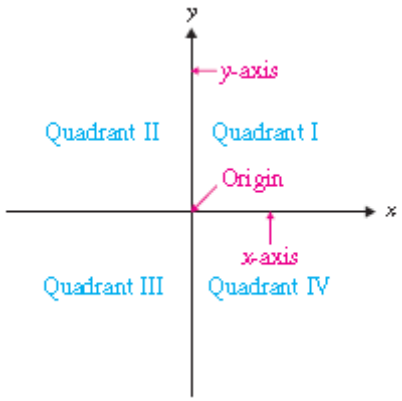


Year	Number of employees
2002	1,506,781
2003	1,471,449
2004	1,446,766
2005	

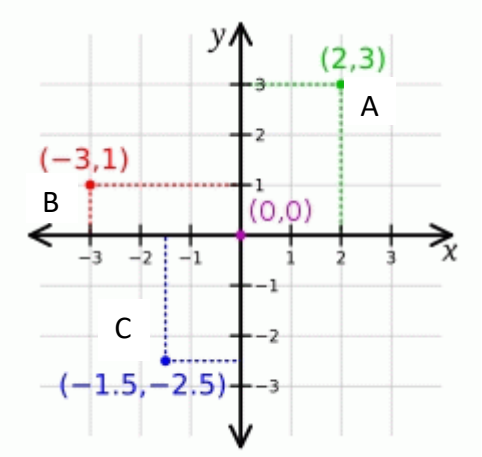
Cartesian Coordinate System - Plotting Ordered Pairs

Vocabulary

Cartesian Coordinate System	System using a set of numbers, or coordinates, to uniquely determine the position of a point
x-axis	Horizontal number line through the center of the coordinate system
y-axis	Vertical number line through the center of the coordinate system
Origin (0,0)	Point of intersection of the x-axis and y-axis
Ordered pair (x,y)	Point on the coordinate system
Quadrants	Four sections of the Cartesian coordinate system



In Quadrant I, the x-coordinate is positive and the y-coordinate is positive. (+, +)
In Quadrant II, the x-coordinate is negative and the y-coordinate is positive. (-, +)
In Quadrant III, the x-coordinate is negative and the y-coordinate is negative. (-, -)
In Quadrant IV, the x-coordinate is positive and the y-coordinate is negative. (+, -)



A represents point (2,3)

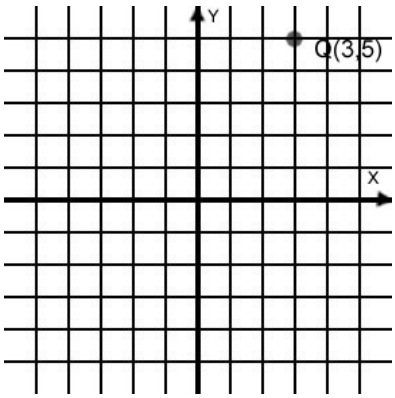
B represents point (-3,1)

C represents point (-1.5, -2.5)

To plot the 'x' value, from the origin, the (0,0) position, move along the horizontal number line or axis, the appropriate number of units going left for a negative number or going right for a positive number.

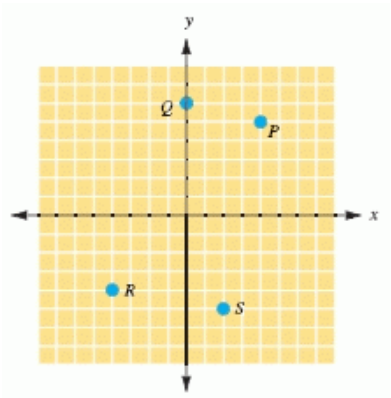
To plot the 'y' value, from the origin, the (0,0) position, move along the vertical axis, the appropriate number of units going down for a negative number or going up for a positive number.

Given the ordered pair, (3, 5), the numbers 3 and 5 are the coordinates of the point. The first coordinate, 3, is the x-coordinate. The second coordinate, 5, is the y-coordinate. Points are usually named by capital letters: Q(3,5) meaning point Q is at (3,5). Points on the axes themselves do not belong to any quadrant.



Where would one plot the following points?
A(4,2) B(4,-3) C(-5, 5) D(-5,-3)
E(-4,3) F(0,3) G(-2,0) H(2,4) J(0,-2)

NOTE: The point (4,7) is written the same way as one would write the interval on the number line from 4 to 7. Therefore, the meaning of (4,7) is always taken from the **context** in which it is used.



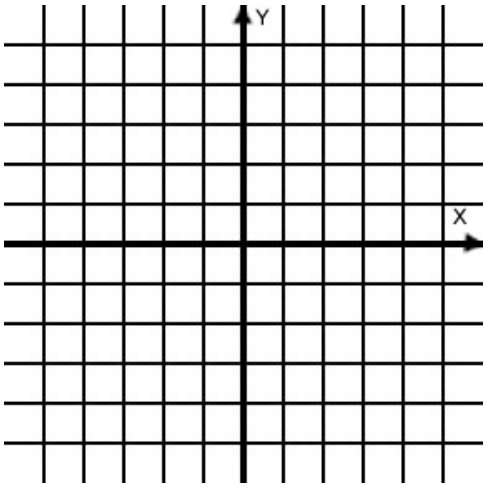
TRY: What are the ordered pairs represented by

P _____ Q _____

R _____ S _____

In what Quadrant is Point R ?

On what axis is Point Q?



TRY:

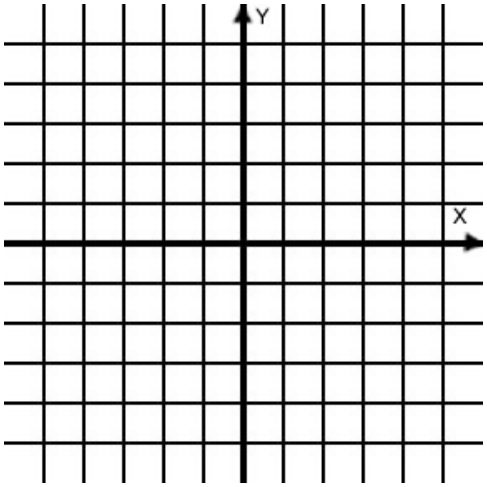
Plot the points

P (-2, 5) Q (-1, 4)

R (0,3) S (1, 2)

Can you give the coordinates of another Point with the same property?

T (,) Plot it.



TRY:

Plot the points

P (-1, 2) Q (0, 0)

R (1, -2)

Can you give the coordinates of another Point with the same property?

S (,) Plot it.

Ordered pairs can help one graph the values associated with situations involving two variables. Consider the problem:

The Cheap Phone Plan charges a monthly base rate of $4.50 plus $0.10 for each minute of long distance calling during the month.

The total monthly long distance charge could be represented by the equation: $L = .10n + 4.50$ where L is the total long distance charge and n is the number of long distance minutes during the month.

What if one wanted to know the following?

If the total long distance charge is $11.50, find the number of long distance minutes used.

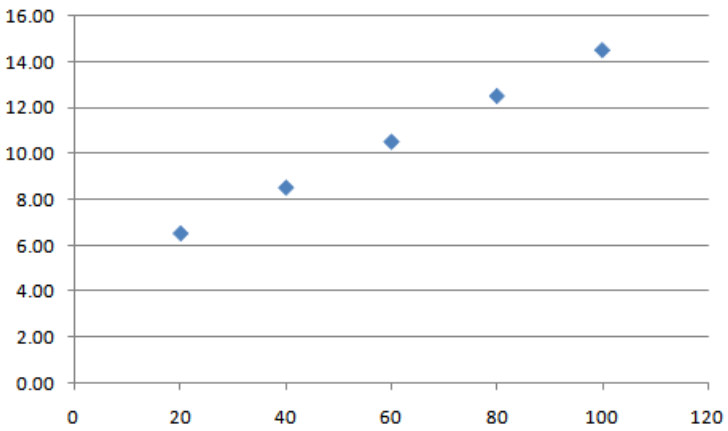
If the total number of long distance minutes is 35, find the total long distance bill.

Plotting some values on a graph can help discover the 'line' that represents all the points (the total charges) for this problem.

N	L
20	6.50
40	8.50
60	10.60

and so on …

This graph shows the ordered pairs from the table. The y-axis (charges) is marked in $2 increments. The x-axis (minutes) is marked in 20 minute increments.



a) Find *n* if the long distance charge is $11.50.

b) Find L for 35 minutes.

It is always important to label the units represented by each mark on the coordinate system. Typically, each mark represents 1 unit. Sometimes, as in the previous example, one labels the graph with larger units and uses units for the x-axis different than the units for the y-axis.

Algebra: Linear Equations in Two Variables

Consider the equation $x+y=8$

If $x=3$ what is y? (3 , ___)
If $x=7$, what is y? (7 , __)
If $y=6$, what is x? (__, 6)

"Ordered pairs" of values (x, y) are considered solutions to the equation because they make the equation TRUE.

TRY:

Which of the following ordered pairs (3, 1), (-1, 3), (2, 3), (-2, 6) and (1, 3)

are solutions for the equation $x+y=4$?

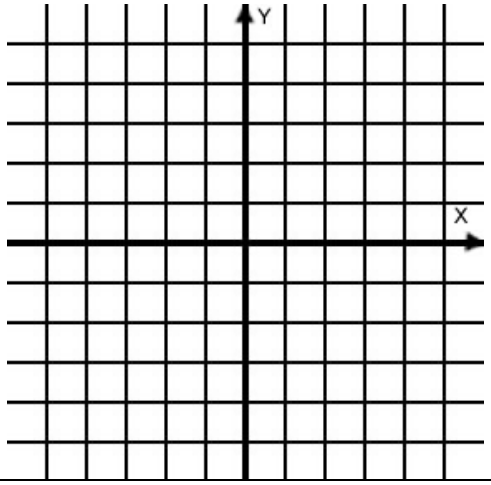
Find four solutions, ordered pairs, for the equation: $x+2y=6$ and complete the table.

X	Y
?	0
0	?
	2
4	

If $y=0$, what is x?
If $x=0$, what is y?
If $y=2$, what is x?
If $x=4$, what is y?

(, 0) (0 ,) (, 2) (4 ,)

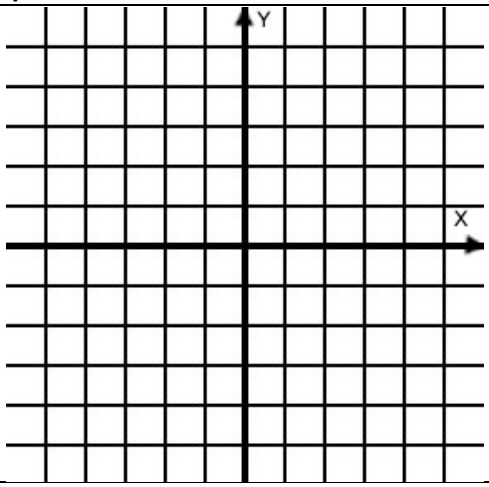
Plot the ordered pair solutions for $x+2y=6$, then **graph** the line.



Complete the table. **Plot** the ordered pair solutions, then **graph** the line.

$4x-2y=8$

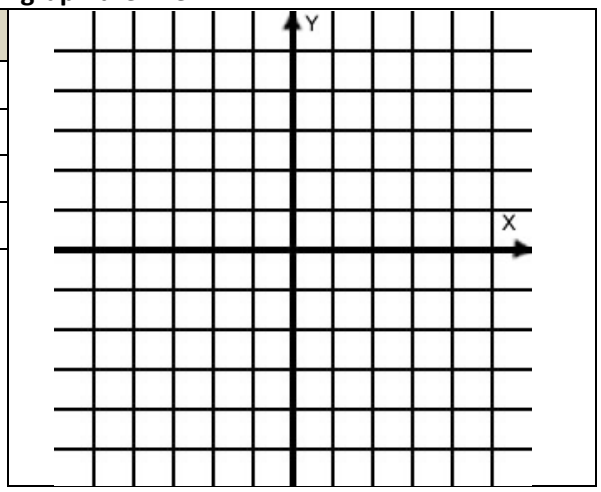
X	Y
3	2
2	
1	
0	



Complete the table. **Plot** the ordered pair solutions, then **graph** the line.

$y = \frac{1}{2}x - 4$

X	Y
4	
2	
0	
-2	

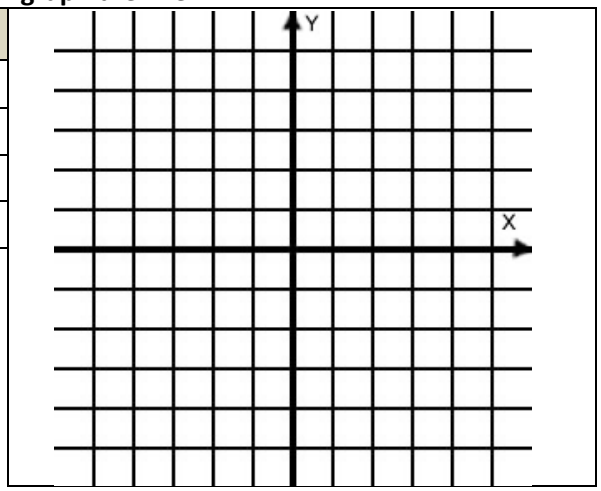


Complete the table. **Plot** the ordered pair solutions, then **graph** the line.

$y = 3$

X	Y
4	
2	
0	
-2	

What is always true about y?



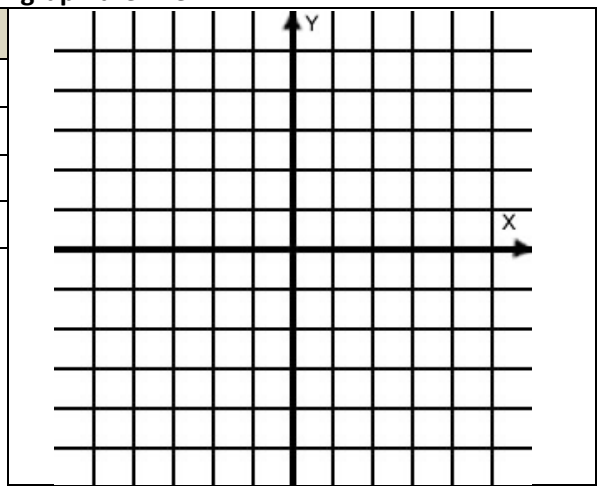
TRY:

Complete the table. **Plot** the ordered pair solutions, then **graph** the line.

$x = -2$

X	Y
	4
	2
	0
	-2

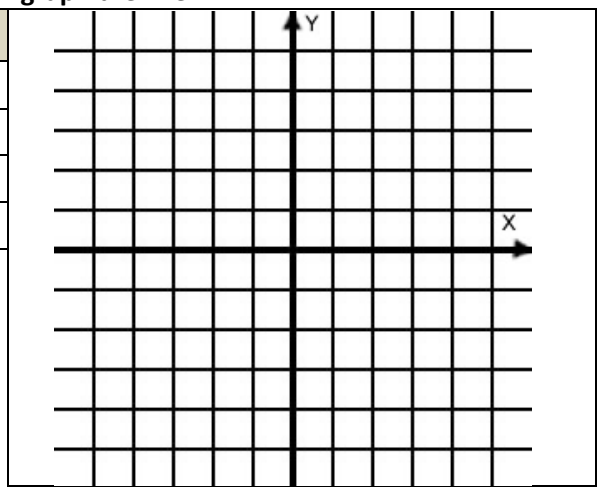
What is always true about x?



Complete the table. **Plot** the ordered pair solutions, then **graph** the line.

$x - y = -3$

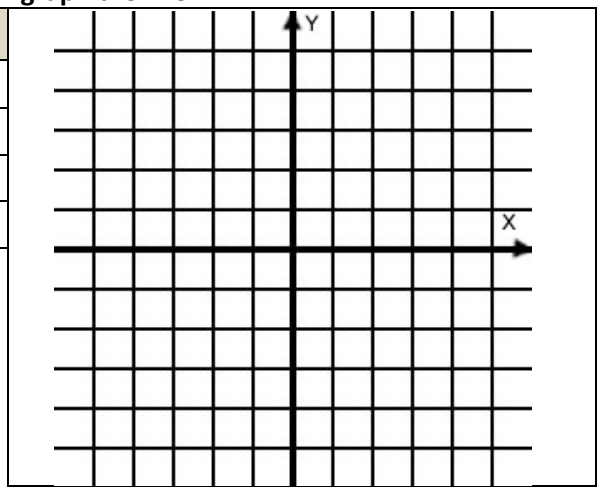
X	Y



Complete the table. **Plot** the ordered pair solutions, then **graph** the line

$y = -2x$

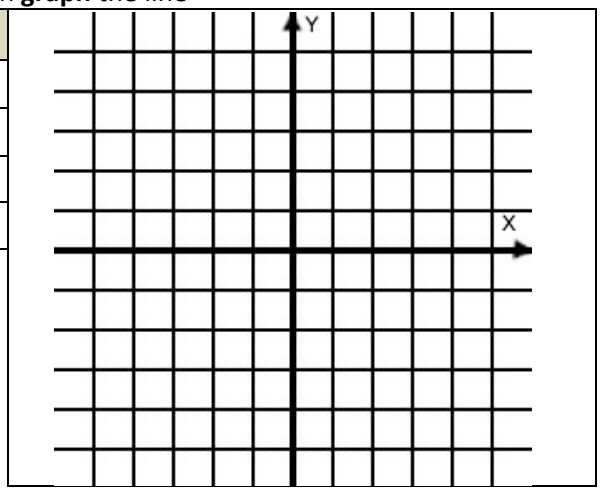
X	Y



Complete the table. **Plot** the ordered pair solutions, then **graph** the line

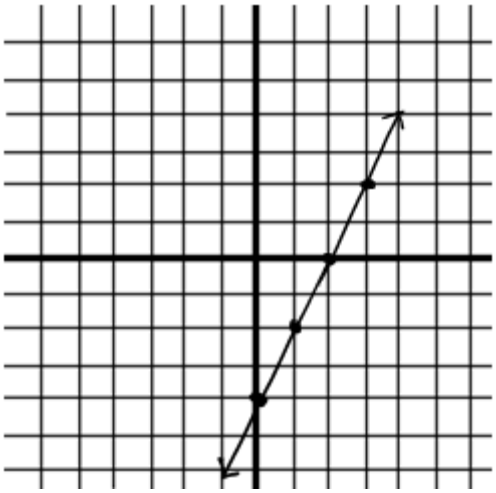
$2x - y = 6$

X	Y



Graphing Lines using Intercept Points

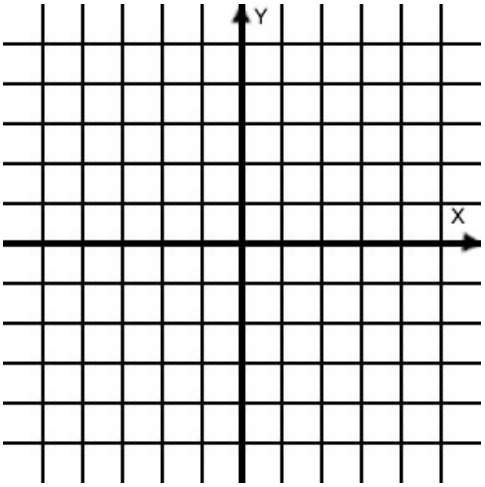
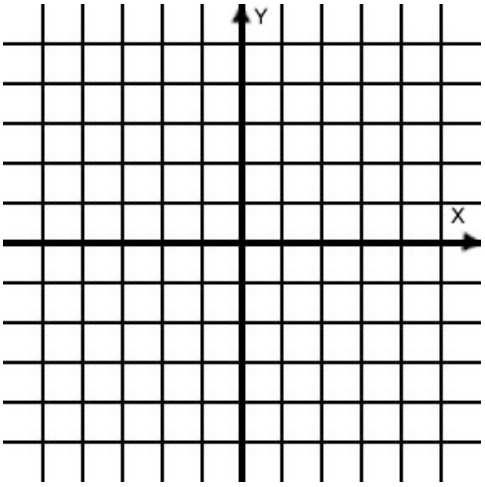
Consider the equation: $4x-2y=8$ and the ordered pairs found earlier that were solutions to this equation. Plot (graph) these points. (3,2) (2,0) (1,-2) (0,-4)



The graph of a linear equation in two variables is a **straight line**. Because that line has infinite points and each point on that line is a solution to the equation, there are an infinite number of solutions to the linear equation in two variables.

The point where the equation crosses the x-axis is called the **x-intercept point. It has the form (x , 0).** Here it is (2,0).

The point where the equation crosses the y-axis is called the **y-intercept point. It has the form (0 , y).** Here it is (0,-4).

Graph: $y=3x-1$ Identify the x-intercept (, 0) Identify the y-intercept (0 ,) Identify one other point. (,) Plot the points. Draw the graph.	
Graph: $x=3$ Identify the x-intercept (, 0) Identify the y-intercept (0 ,) Identify one other point. (,) Plot the points. Draw the graph. $x=C$ a vertical line at $(C,0)$	

Graph: $y = -2$

Identify the x-intercept (, 0)

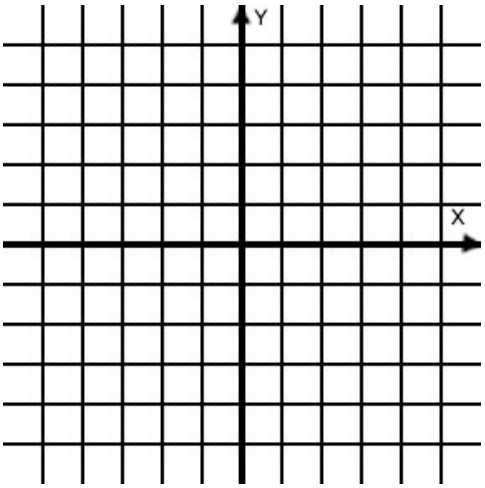
Identify the y-intercept (0 ,)

Identify one other point. (,)

Plot the points.

Draw the graph.

$y = C$ a horizontal line at $(0, C)$



Graph: $-x + 2y = 4$

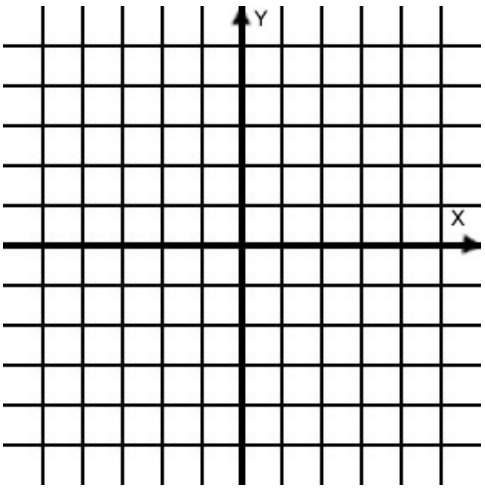
Identify the x-intercept (, 0)

Identify the y-intercept (0 ,)

Identify one other point. (,)

Plot the points.

Draw the graph.



Graph: $y = -\frac{1}{2}x - 1$

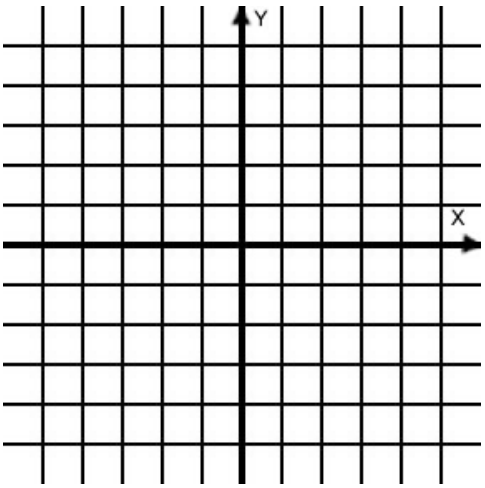
Identify the x-intercept (, 0)

Identify the y-intercept (0 ,)

Identify one other point. (,)

Plot the points.

Draw the graph.



Slope

The slope of a line is the "slant" or "steepness" of the line.
Definition: If $x_1 \neq x_2$, the **slope** (m) of the line containing points (x_1, y_1) and (x_2, y_2) is defined by

$$m = \frac{y_2 - y_1}{x_2 - x_1} \quad \text{or} \quad m = \frac{\text{Rise}}{\text{Run}} \quad \text{or} \quad m = \frac{\text{the vertical change in the y-coordinate}}{\text{the horizontal change in the x-coordinate}}$$

Note: The x- and y-values may be subtracted in any order so long as the coordinates of each point are in the same position in the numerator and the denominator.

The Slope of a Line Is …

- **Positive** if the line slants up from left to right. As the value of x increases, the value of y increases.
- **Negative** if the line slants down from left to right. As the value of x increases, the value of y decreases.
- **Zero** if the line is horizontal (parallel to the x-axis).
- **Undefined** if the line is vertical (parallel to the y-axis).

What is the slope of:

1) a line through (2, 5) and (6, 3)

$$m = \frac{5-3}{2-6} = \frac{2}{-4} = -\frac{1}{2}$$

Let (2,5) be point 1 and (6,3) be point 2. It doesn't matter which one uses for point 1. What is important is that one uses the same point for x_1 and y_1 and the same point for x_2 and y_2.

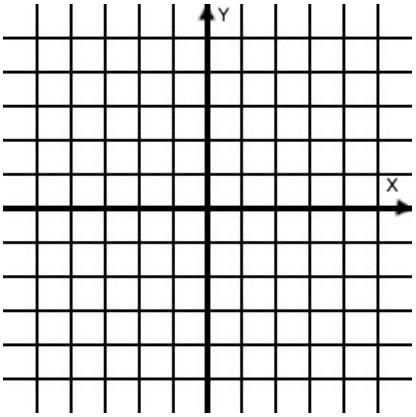
With a slope of $-\frac{1}{2}$, the line slopes downward.
It has a negative slope.

Another point would be "down 1, over 2" from (2, 5).
[Think of – ½ as -1 / 2.]

This means the change in Y will be -1 and the change in X will be +2 resulting in the point (2 + 2 , 5 - 1) or (4, 4).

Another point would be "down 1, over 2" or (4+2, 4-1) or (6,3) – the second point given.

Plot the original two points and draw the line.
Is the point (4, 4) included?



2) a line through (-2, 3) and (-5,-1)

$$m = \frac{3-(-1)}{-2-(-5)} = \frac{4}{3}$$

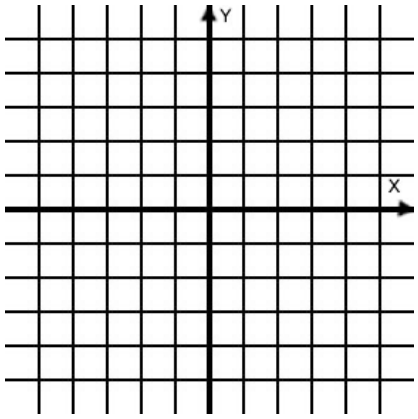
slopes upward; has a positive slope;
another point "up four, over 3" or (1,7)

CAUTION: It is very easy to make an error and use the wrong x or y value for finding another point. Be careful.

$$(-2, 3)$$

Sometimes it help to write it as: $\dfrac{+3, +4}{(1, 7)}$

Plot the three points. Graph the line.

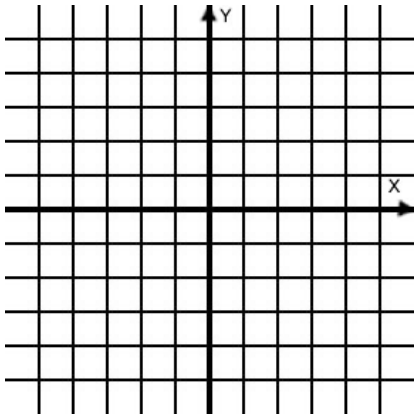


3) a line through (-6, 4) and the origin

$$m = \frac{4-0}{-6-0} = \frac{4}{-6} = -\frac{2}{3}$$

Slopes downward, negative
another point "down 2, over 3"
(-6 +3, 4 -2) or (-3, 2)

Plot the points. Graph the line.

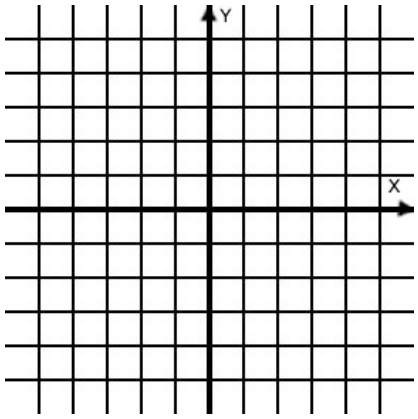


4) a line through (1,2) and (1,-3)

$$m = \frac{2-(-3)}{1-1} = \frac{5}{0}$$ Slope is UNDEFINED.

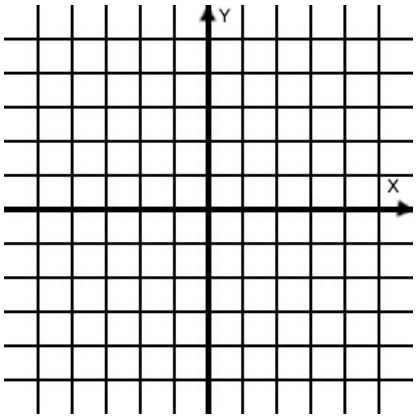
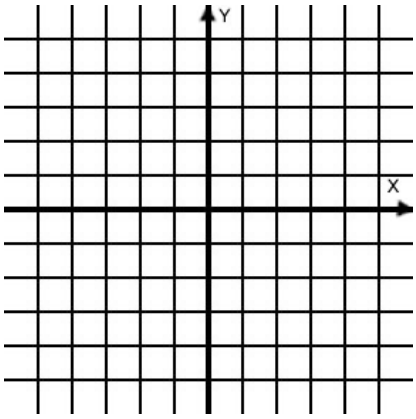
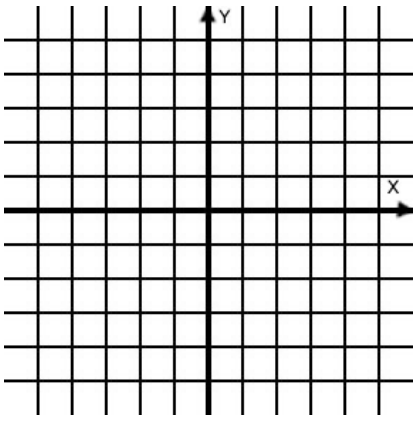
This is a VERTICAL line crossing the x-axis at $x = 1$.
Graph the line.

What is another point on the line?



Note:
Had the slope of the problem had 0 for the numerator instead of the denominator, the slope would have been 0 and the line would have been a HORIZONTAL line crossing the y-axis.

TRY:

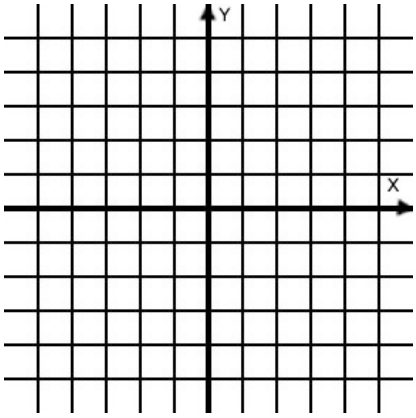
5) a line through (-3, 2) and (-1, 5) Slope? Direction of slope? Another point? Plot the three points. Graph the line.	
6) a line through the origin and (3, -2) Slope? Direction of slope? Another point? Plot the three points. Graph the line.	
7) a line through (-2, 2) and (3, 2) Slope? Direction of slope? Another point? Plot the three points. Graph the line.	

Using Points and Slope to Graph Lines

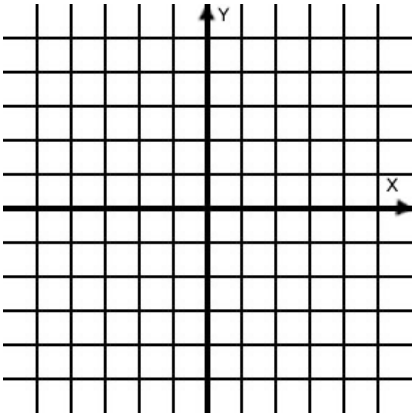
Using the process for finding another point on a line given one point and the slope, graph the following.

Graph the line containing the point (3, -2) and $m = $-2

Think of this as $m = -\frac{2}{1}$ or $\frac{-2}{1}$

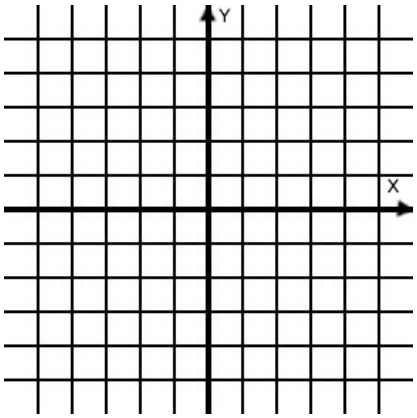


Graph the line containing the point (3,0) and $m = $undefined

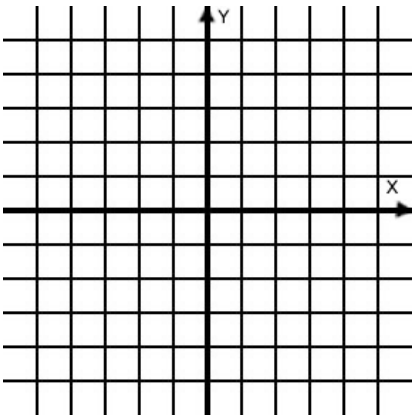


Try:

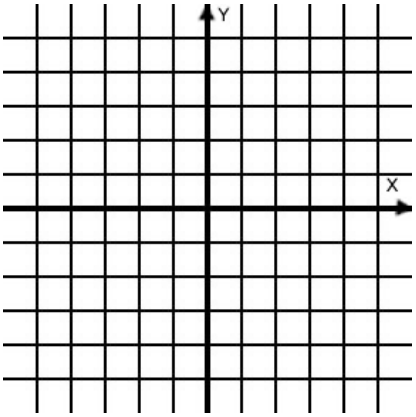
Graph the line containing the point (0,-2) and $m = 2$



Graph the line containing the point (1,3) and $m = \frac{1}{4}$



Graph the line containing the point (-3, 2) and $m = 0$ (Horizontal line)



Slope-Intercept Form

The slope-intercept form of the equation of a non-vertical line is written as:

$y = mx + b$ where m is the slope and the point (0, b) is the y-intercept.

For Slope-Intercept form, be sure the coefficient for the y, if present, is positive 1.

Consider the equation: $y = \frac{2}{3}x + 4$

This equation has a slope of $\frac{2}{3}$ and intercepts the y-axis at (0, 4).

If the slope and the y-intercept are known, one can easily write the equation of the line in Slope-Intercept form.

Given: L has slope 4 and y-intercept (0, -2)

Write the equation of the line in slope-intercept form.

$y = mx + b$ where m is the slope, 4, and the point (0, b) is the y-intercept (0, -2).
So b in this example is -2.
The equation would be: $y = 4x - 2$

Given: L has slope $-\frac{2}{3}$ and passes through (0,3)

Write the equation in slope-intercept form.
The point given is a y-intercept since it is in the form (0,3).
Therefore the equation would be: $y = -\frac{2}{3}x + 3$

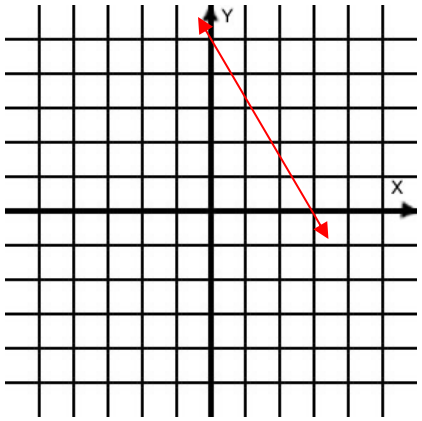
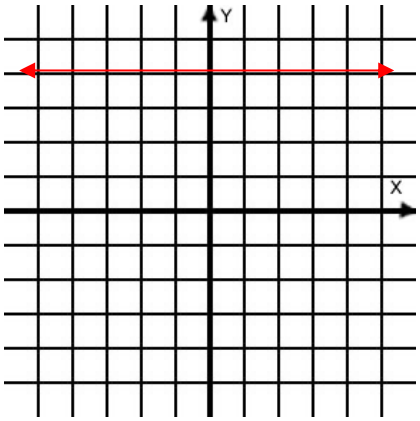
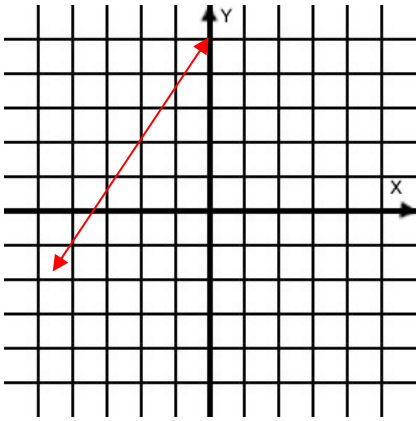
TRY:

Given the point (0,-1) and slope 3, write the equation in slope-intercept form.

Sometimes an equation in non slope-intercept form is given and one must rewrite the equation first to be able to identify the slope and y-intercept.

$5x+3y=15$ $3y=-5x+15$ $\frac{3}{3}y=-\frac{5}{3}x+\frac{15}{3}$ $y=-\frac{5}{3}x+5$ $m=-\frac{5}{3}$ y-intercept = (0,5)	$y-4=0$ $y=4$ Could be thought of as: $y=0x+4$ $m=0$ y-intercept = (0,4) The form: $y=4$ is acceptable, but is not as easy to see the slope.	$\frac{y+1}{x+4}=\frac{3}{2}$ $2(y+1)=3(x+4)$ use what you know about proportions $2y+2=3x+12$ $2y=3x+10$ $y=\frac{3}{2}x+5$ $m=\frac{3}{2}$ y-intercept = (0,5)

Use this information and graph the lines.

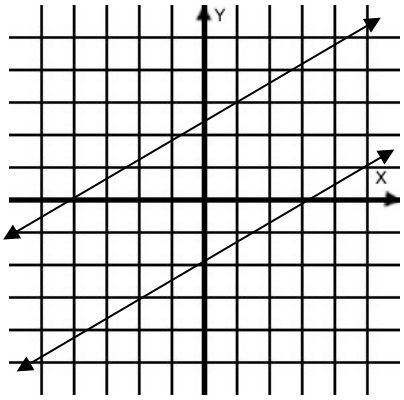
$5x+3y=15$ $y=-\frac{5}{3}x+5$ $m=-\frac{5}{3}$ y-intercept = (0,5)	$y-4=0$ $y=0x+4$ $m=0$ y-intercept = (0,4)	$\frac{y+1}{x+4}=\frac{3}{2}$ $y=\frac{3}{2}x+5$ $m=\frac{3}{2}$ y-intercept = (0,5)
		

In the last example, the graph was not big enough to go up 3 and over 2 from the point (0,5). One can either think of each block as 2 units OR one can think in reverse and go down 3 and back 2.

Parallel and Perpendicular Lines

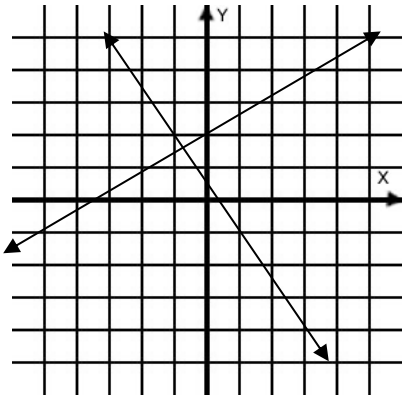
Parallel Lines:
Have the same slope, but different y-intercepts.

The slope of both lines is $\frac{3}{5}$. They cross the y-axis at different points.



Vertical lines are considered parallel even though their slopes are undefined.

Perpendicular Lines:
Have slopes that are negative reciprocals of each other. The slope of one line is $\frac{3}{5}$; the other is $-\frac{5}{3}$.



Horizontal and vertical lines are considered to be perpendicular even though one slope is 0 and the other is undefined.

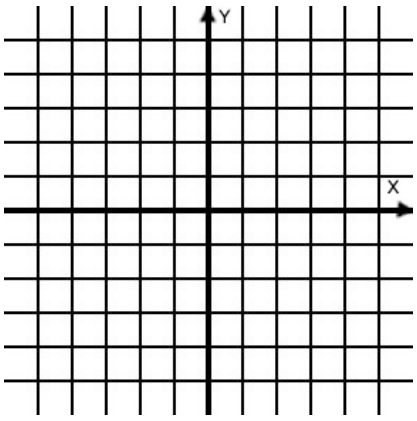
Determine if the following lines are parallel, perpendicular, or neither.

$L1$ through (-2, -3) and (4, 3) and $L2$
Line through (1, 3) and (3, 5)

Slope of $L1$: $m = \frac{-3-3}{-2-4} = \frac{-6}{-6} = 1$

Slope of $L2$: $m = \frac{3-5}{1-3} = \frac{-2}{-2} = 1$

$L1$ and $L2$ are _____

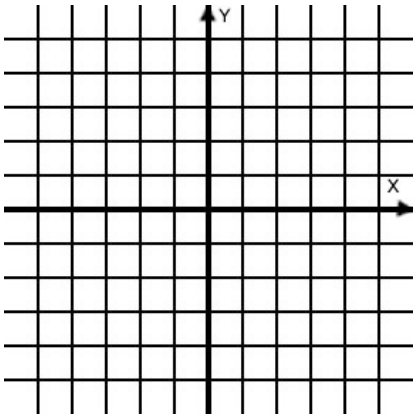


$L1$ through (5, 4) and (3, -1) and $L2$ through (4, 1) and (-1, -2)

Slope of $L1$: $m = \frac{4 - -1}{5 - 3} = \frac{5}{2}$

Slope of $L2$: $m = \frac{1 - -2}{4 - -1} = \frac{3}{5}$

$L1$ and $L2$ are _____



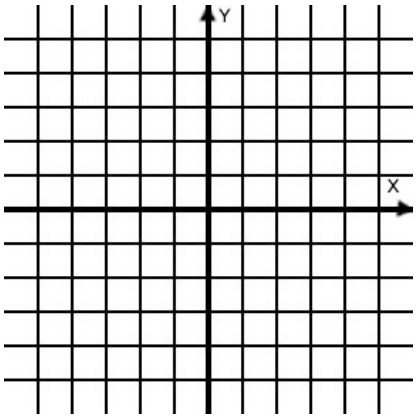
$L1$ through (-2, 1) and (1, 5) and $L2$ through (-1, -1) and (-5, 2)

Slope of $L1$: $m = \frac{1 - 5}{-2 - 1} = \frac{-4}{-3} = \frac{4}{3}$

Slope of $L2$:

$$m = \frac{-1 - 2}{-1 - -5} = \frac{-3}{4} = -\frac{3}{4}$$

$L1$ and $L2$ are _____



Standard Form of a Line

The standard form of the equation of a line is written as: $Ax + By = C$

where A, B, and C are real numbers, $A \geq 0$, and both A and B do not equal zero.

For Standard Form, be sure the x coefficient (the A), if present, is positive.

Rewrite $y = \frac{2}{3}x + 4$ in Standard Form.

$y = \frac{2}{3}x + 4$

$3y = 2x + 12$

$-2x + 3y = 12$

Standard Form: $2x - 3y = -12$

TRY: Rewrite $5x + 8 = -2y$ in Standard Form.

Write the equation of line L with slope $\frac{5}{4}$ and y-intercept (0, -5) in Slope-intercept form first, then write it in Standard Form.

Point-Slope Formula

If (x_1, y_1) is a point on a nonvertical line L and m is the slope of line L, then the equation of line L is given by the point-slope formula: $y - y_1 = m(x - x_1)$

Example:

Write the Standard Form of line L with slope $-\frac{4}{5}$ that passes through (5,0).

(Note this is the x-intercept, therefore the Point-Slope formula is used.)

$$y - y_1 = m(x - x_1)$$
$$y - 0 = -\frac{4}{5}(x - 5)$$
$$y = -\frac{4}{5}x + 4$$

Now change the Slope-Intercept form into Standard Form.

$$y = -\frac{4}{5}x + 4$$
$$5y = 5\left(-\frac{4}{5}x\right) + 5(4)$$ Standard Form is written without fractions.
$$5y = -4x + 20$$

$4x + 5y = 20$ Note: The Ax term must be positive. If it is negative, multiply by -1.

Writing Equations of Lines

SUMMARY:

To write the equation of a line in Standard Form or Slope-Intercept Form, when given….

The slope and the y-intercept, write it first in Slope-Intercept Form.
Then, convert to Standard Form if necessary.

The slope and any point on the line, put the information in the Point-Slope formula. Distribute and isolate the y for Slope-Intercept form or isolate the constant for Standard Form.

Two points on a line, use the two points to find the slope. Then, use that slope and one of the points in the Point-Slope formula. Distribute and isolate the y for Slope-Intercept form or isolate the constant for Standard Form.

TRY:

Write the slope-intercept form of line L with slope $\frac{2}{5}$ that passes through (5, -3).

Write the Standard Form of line L with slope -3 that passes through (-2, -3).

Given two points (3, -2) and (6, 4), write the equation of the line passing through them in Slope-intercept form.

Since neither of the points given is the y-intercept, one cannot use the slope-intercept form.
The Point-Slope formula needs a slope, so the first step is to find the slope.

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

[Notice if one were to think of this equation as a proportion and cross multiply, one develops the Point-Slope formula!]

$$m = \frac{4-(-2)}{6-3} = \frac{6}{3} = 2$$

Now, pick one of the points, it doesn't matter which one, and use it for (x_1, y_1)

Using (3, -2)	Using (6, 4)
$y-(-2) = 2(x-3)$	$y-4 = 2(x-6)$
$y+2 = 2x-6$	$y-4 = 2x-12$
$y = 2x-8$	$y = 2x-8$

TRY:
Write the slope-intercept form of line L that passes through (-1, 3) and (4, -2).

Special forms:

The equation of a **horizontal** line containing the point (c,d) is y = d.
(The middle example, $y-4=0$, of the slope-intercept form section. $y=4$)

The equation of a **vertical** line containing the point (c, d) is x = c.
Ex: $x=-2$ would be a line through (-2,0)

TRY:
Write the standard form of line L that passes through (2, -3) and (2, 4).

Find the **equation** of each of the following lines. State it in slope-intercept form.

L has y-intercept (0,3) and is parallel to a line with equation $y = 3x - 5$

Since L is parallel to the line $y = 3x - 5$, the slope of L must be 3. Use that information along with the y-intercept point to find the equation of line L.

L passes through (-4,5) and is parallel to a line with equation $y = -4x + 5$.

This information provides a slope and a point to determine the equation of line L.

L passes through (-2,-1) and is perpendicular to a line with equation $y = 3x + 1$

L is perpendicular to the line $y = 3x + 1$, so the slope of L must be $-\frac{1}{3}$ (the negative reciprocal of 3).

Use this slope and the point to determine the equation of line L.

L passes through (3,-1) and perpendicular to a line with equation $y = -\frac{2}{3}x + 5$

Determine the slope of line L (remember it is perpendicular) and use that slope along with the point.

L passes through (-3,5) and parallel to the x-axis

All lines parallel to the x-axis are horizontal lines. Use the point given to write the equation of the line.

L passes through (2,-4) and parallel to a line through (6,2) and (-2,6)

First find the slope of a line through the two points. The slope of line L is the same. Write the equation using the information in the point given.