

Name: _____

Date: _____

The Coordinate Plane and Linear Equations Algebra 1

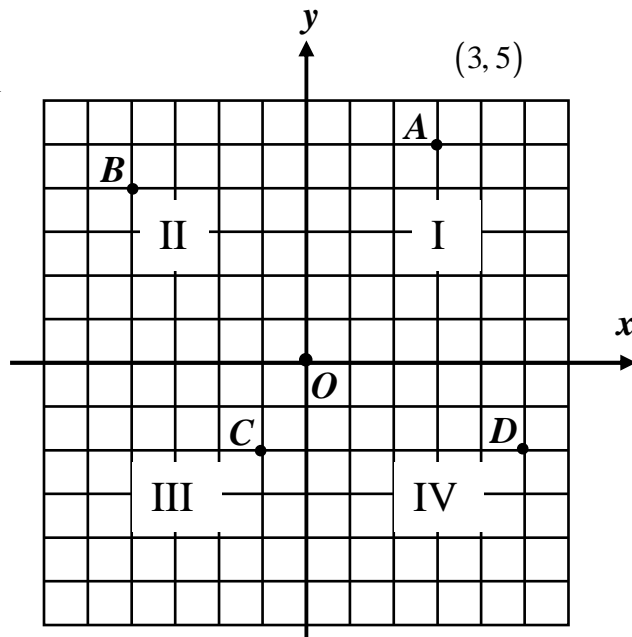
We use the Cartesian Coordinate plane to locate points in two-dimensional space. We can do this by measuring the directed distances the point lies away from a horizontal and vertical axis. The first exercise and diagram will review some major features of the coordinate plane.

Exercise #1:

(a) On the diagram, the coordinates of point A are shown. State the coordinates of points B , C , and D .

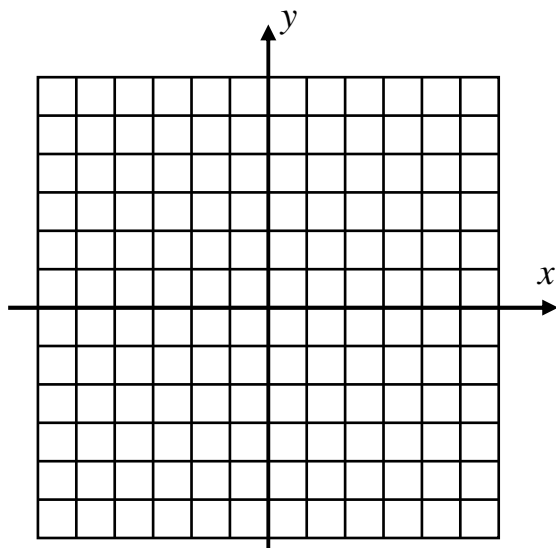
(b) What are the coordinates of the origin, point O ?

(c) If a point is plotted in the first quadrant, I, then what is true about the signs of both its x and y coordinates?



It is **extremely important** for every Algebra student to be able to quickly and accurately plot points when given in coordinate form. Practice this skill in *Exercise #2*.

Exercise #2: Given the points $A(1, 2)$, $B(-3, 4)$, $C(2, -5)$, and $D(-4, -6)$, plot and label them on the grid given below and state the quadrant that each point lies in.



QUADRANTS

A : _____

B : _____

C : _____

D : _____

Graphing a Linear Equation

When we plot any equation, we are creating a picture, called a graph, of all coordinate pairs (x, y) that are solutions to the equation. Graphs allow the Algebra student to quickly see many solutions to an equation. When we plot multiple points, sometimes these points will form a **linear relationship**; that is, when plotted, the solutions will form a **line**. The general form of a linear equation is shown below.

GENERAL FORM OF A LINEAR EQUATION IN TWO VARIABLES

$$Ax + By = C$$

where A , B , and C are any real numbers such that $A \neq 0$ and $B \neq 0$.

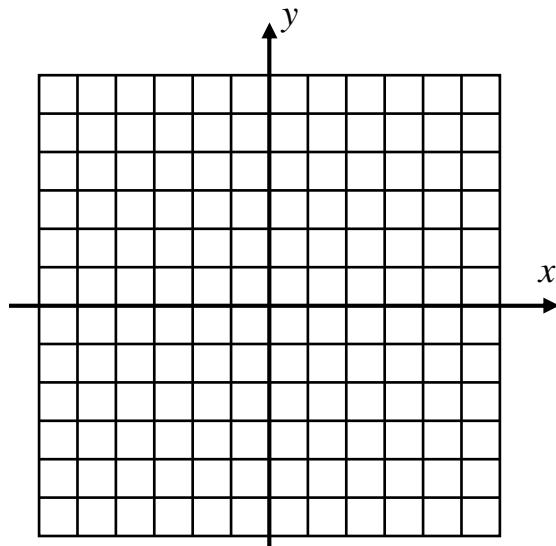
The following exercises will illustrate the important skill of plotting such linear equations.

Exercise #3: Consider the linear relationship given by the equation $y = 4x - 3$.

(a) Create a table of values for this linear relationship.

x	$4x - 3$	y	(x, y)
-1			
0			
1			
2			

(b) Graph the linear equation on the axes below.



Keep in mind the big idea when graphing any equation, linear or otherwise:

GRAPHING SOLUTIONS TO EQUATIONS

If an ordered pair (x, y) satisfies the equation (makes it a true statement), then it falls on the graph of that equation. Likewise, if a point (x, y) falls on the graph of an equation, then it lies in the solution set of that equation. Thus a graph represents a “picture” of all solutions to an equation.

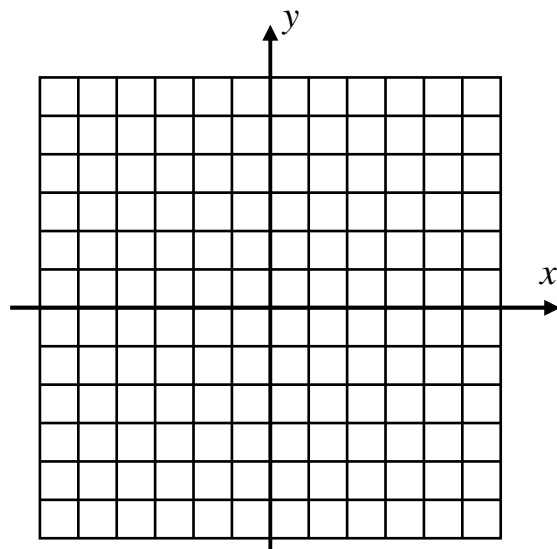
Exercise #4: Consider the linear equation $2x + 4y = 10$.

(a) Solve this equation for y so that it may be entered into your graphing calculator.

(b) Fill in the xy -chart below by creating a table on your calculator.

x	Y_1	(x, y)

(c) Graph the linear equation on the axes below.



The following sets of exercises will try to reinforce the big idea of graphing by having you work more with ordered pairs and linear equations.

Exercise #5 Given the linear equation $y = 4x - 3$ answer the following questions.

(a) Does the point $(2, 5)$ satisfy this equation? Justify.

(b) Does the point $(2, 5)$ lie on the graph of this linear equation? Explain.

Exercise #6 Is the ordered pair $(-8, 1)$ a solution to the equation $y = \frac{1}{2}x - 3$? Justify.

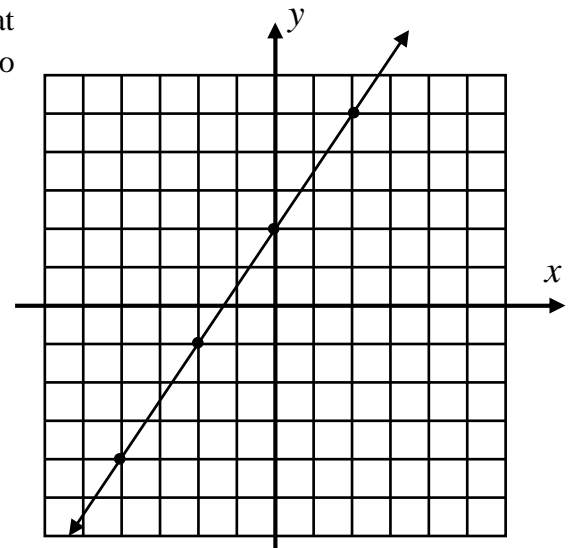
Exercise #7 Given the equation $y = \frac{1}{2}x - 3$, find the value of b given the fact that the point $(0, b)$ satisfies the equation.

Exercise #8 Find the value of a such that the point $(a, 0)$ lies on the graph of $y = -2x + 8$.

Exercise #9 The graph of the equation $2y - 3x = 4$ is shown at the right. Which of the following ordered pairs is *not* a solution to this equation? Explain your choice.

- | | |
|----------------|---------------|
| (1) $(-2, -1)$ | (3) $(-3, 4)$ |
| (2) $(0, 2)$ | (4) $(2, 5)$ |

Explanation:



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The Coordinate Plane and Linear Equations Algebra 1 Homework

Skills

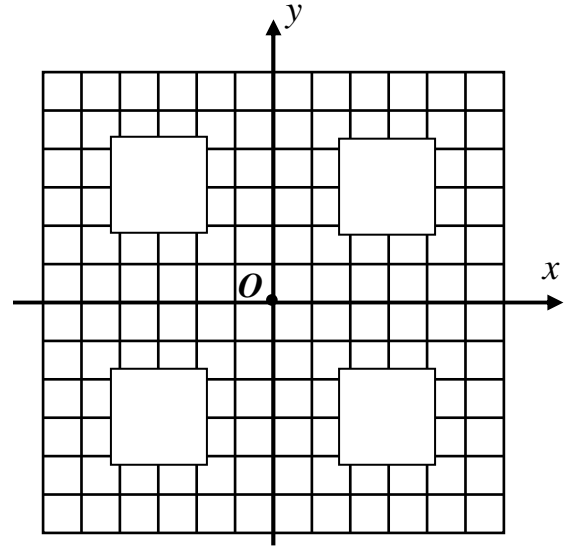
1. On the set of axes to the right, fill the quadrant numbers in the boxes.

2. State which quadrant each of the following points lies.

$(3, -2)$ _____ $(1, 3)$ _____

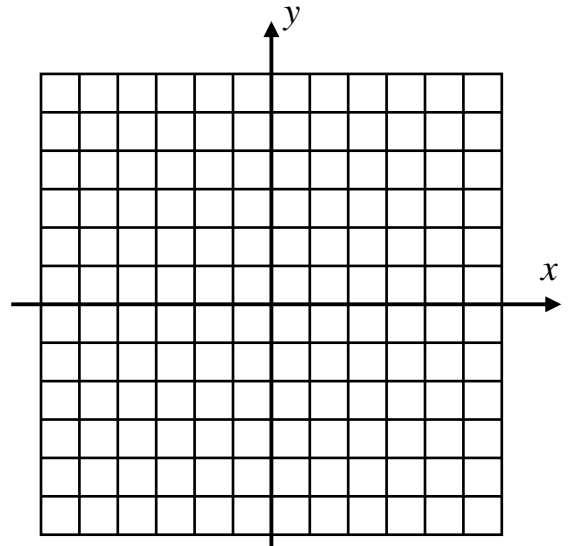
$(-7, 5)$ _____ $(-4, -6)$ _____

3. State the coordinates of the origin, O .



4. Fill in the xy -chart below for the linear function $y = 2x - 2$ without the use of your calculator. Then, graph the equation on the axes to the right.

x	2x - 2	y	(x, y)
-2			
-1			
0			
1			
2			



5. For each linear equation shown below, solve the equation for y in terms of x .

(a) $3x + y = 1$

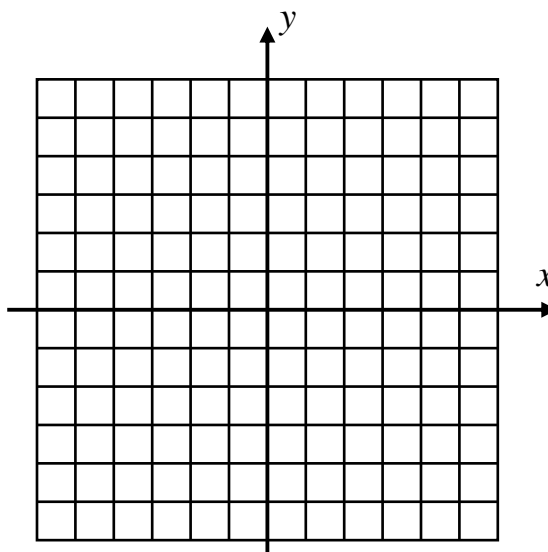
(b) $2y - 3x = 2$

(c) $4x + 2y = -8$

For problems 6 through 8, use your answers from problem 5 and your graphing calculator to create x,y -charts and plots of the linear equations.

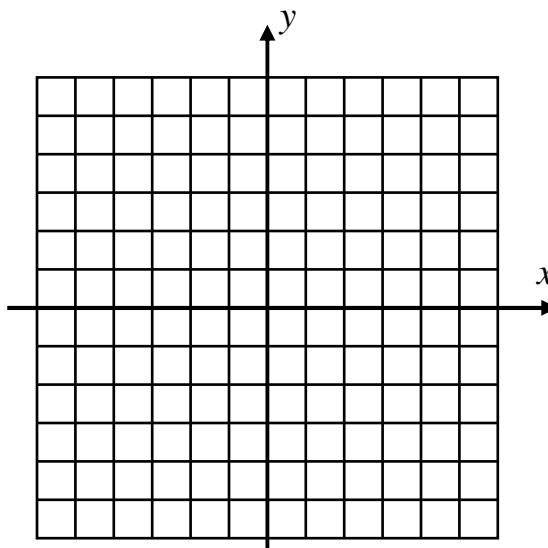
6. $3x + y = 1$

x	Y_1	(x, y)



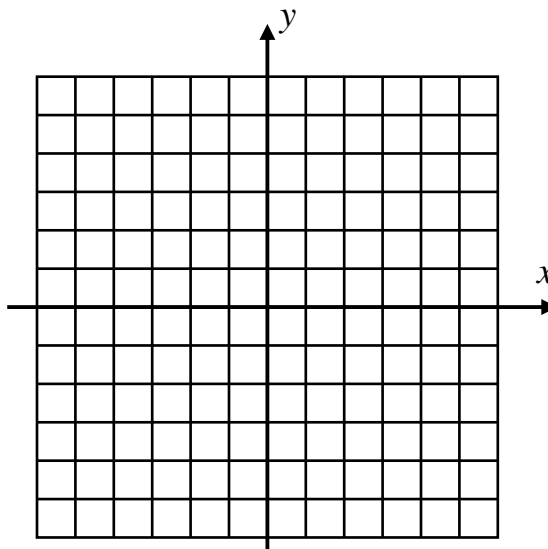
7. $2y - 3x = 2$

x	Y_1	(x, y)



8. $4x + 2y = -8$

x	Y_1	(x, y)



Reasoning

9. Two equations are shown below. One is linear and one is not. Which is the linear one and why is it linear?

$$y_1 = x^2 + 2x \qquad y_2 = \frac{2}{3}x + 6$$

10. Consider the linear equation $5x + 2y = 3$.

(a) Does the point $(-1, 6)$ lie in the solution set of this equation? Justify.

(b) Does the point $(-1, 6)$ lie on the graph of this linear equation? Explain.

(c) For what value of a will the point $(-1, a)$ fall on the graph of this linear equation?

11. The graph of a linear equation is shown on the axes below. Answer the following questions based on this graph.

(a) For what value of b is the point $(0, b)$ a solution to this linear equation? Justify.

(b) For what value of a will the point $(a, 3)$ be a solution to this linear equation? Justify.

