

Linear Equations in Two Variables

A **linear equation** is an equation of the form.

$$Ax + By = C$$

Notice that this equation has **2** variables: **x** and **y**.

Consider the equation:

$$2x + y = 5$$

- The **A** term is **2**
- The **B** term is **1**
- The **C** term is **5**

This equation has an infinite number of solutions and these solutions are expressed as **Ordered Pairs** written in the form **(x, y)**.

Order is very important, hence the name **Ordered Pairs**. The **x** is **always first** and the **y** is **always second**.

To find some solutions to the equation

$$2x + y = 5$$

We make a chart:

x	y
2	

To fill out the "**y**" column, we substitute **2** for **x** and solve for **y**.

If **x = 2**, we have

$$2(2) + y = 5$$

$$4 + y = 5$$

$$y = \underline{\hspace{2cm}}$$

So we can fill out the chart

x	y
2	1

As an ordered pair, we write this solution **(2, 1)** indicating that when **x = 2**, **y = 1**.


Consider the equation:

$$\mathbf{x + y = 3}$$

To find ordered pairs that satisfy this equation we set up a chart:

x	y
2	
1	
0	
-1	

Fill in the corresponding **y** values



NOTE: We can choose any value for **x** and find its corresponding **y**-value, but it is helpful to choose small, whole numbers to make the calculations a bit easier.

Example 1:

Find three solutions to the equation

$$2x - y = 4$$

x	y

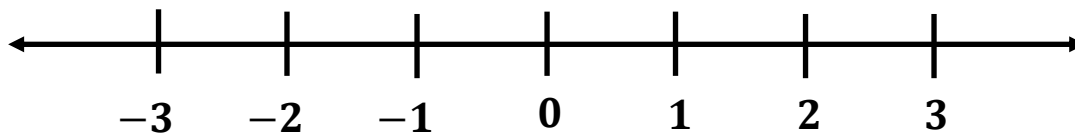
Plotting Solutions

Consider the equation

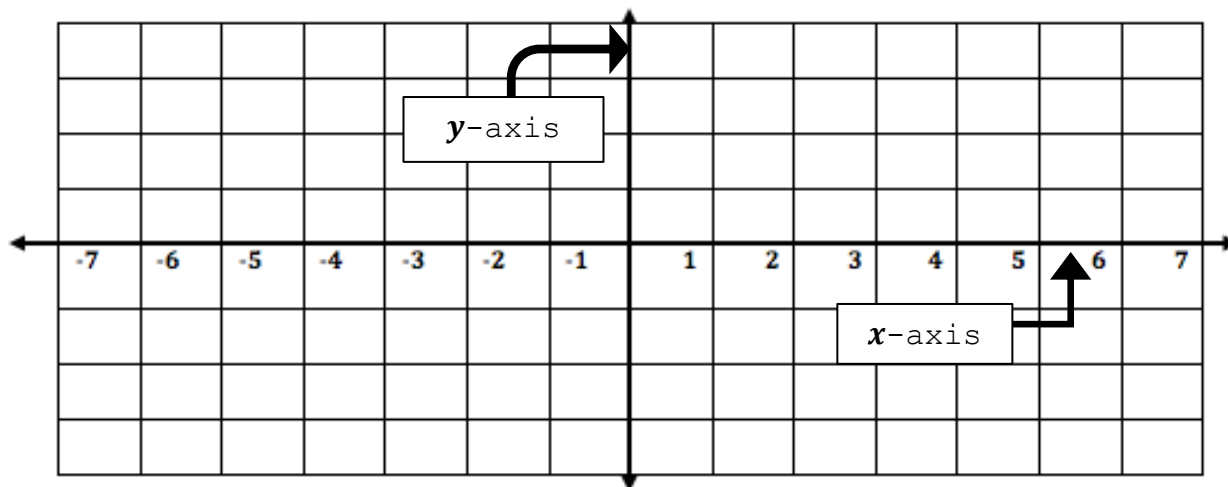
$$x + 3 = 5$$

The solution to this **single** variable equation is $x = 2$.

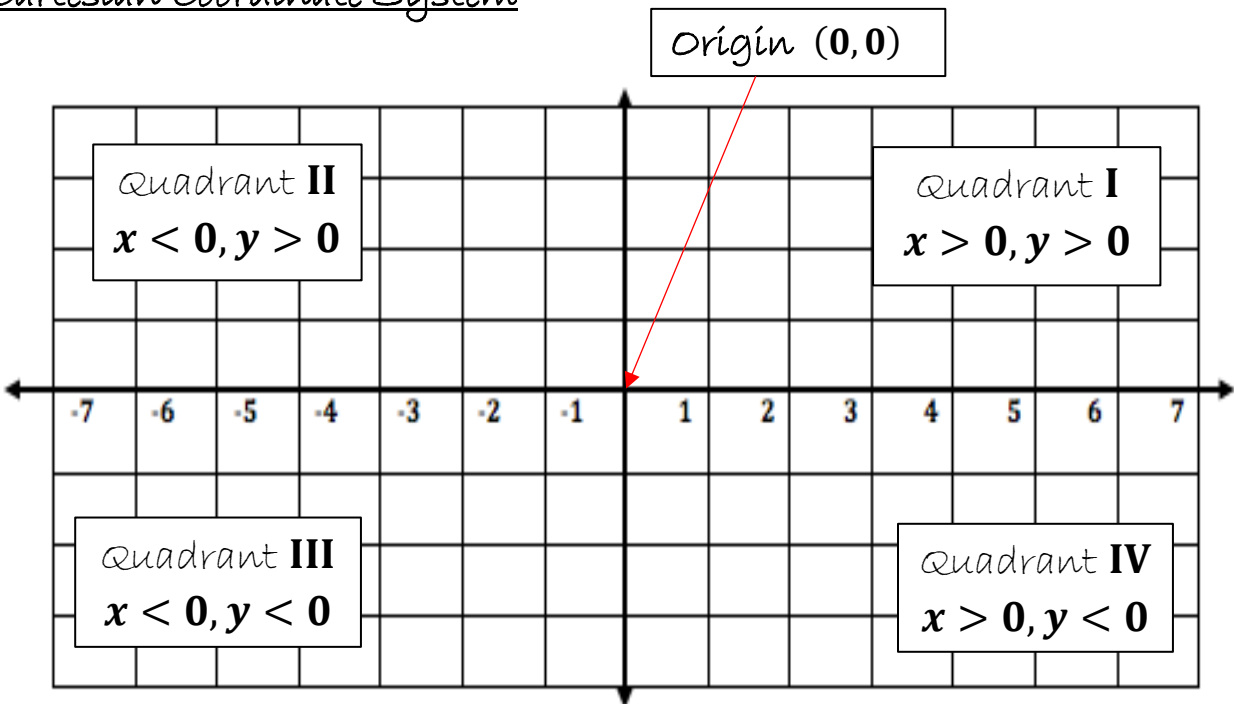
We can plot this solution on a number line:



Since **linear** equations have **two** variables, we require **two** number lines to plot solution points.



Cartesian Coordinate System

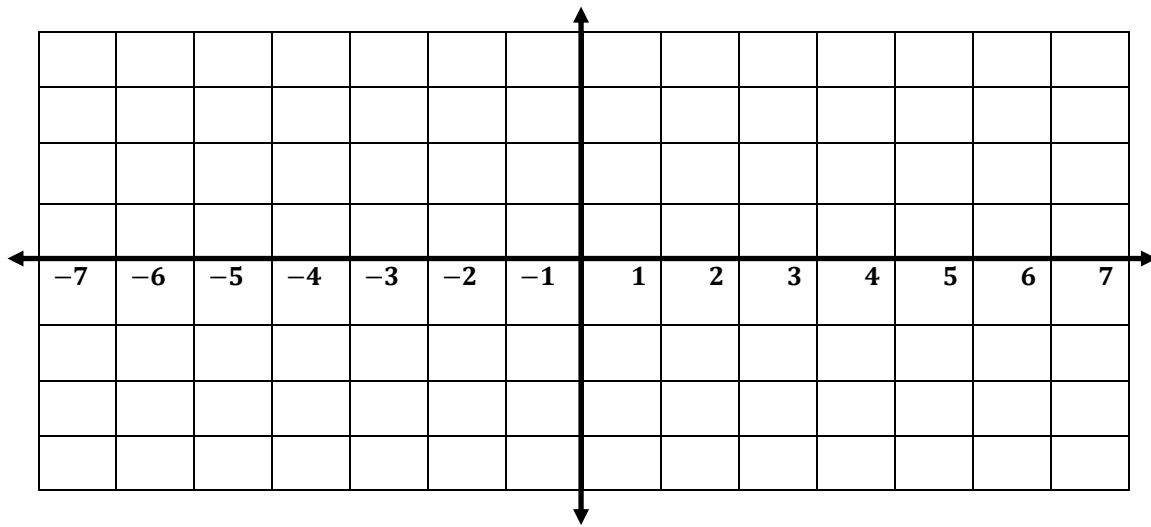


This coordinate system is known as the **Cartesian coordinate system**.

The point **(0, 0)** is called the **origin** and denotes the solution **$x = 0$** when **$y = 0$** .

The Cartesian coordinate system is made up of **4 quadrants** labeled above.

Example 2:



Plot the following points on the graph above:

- a.) $(3, 2)$
- b.) $(-2, 1)$
- c.) $(6, -2)$
- d.) $(-4, -3)$
- e.) $(0, 0)$

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Practice Problems

1. Find at least **3** solutions to the linear equation

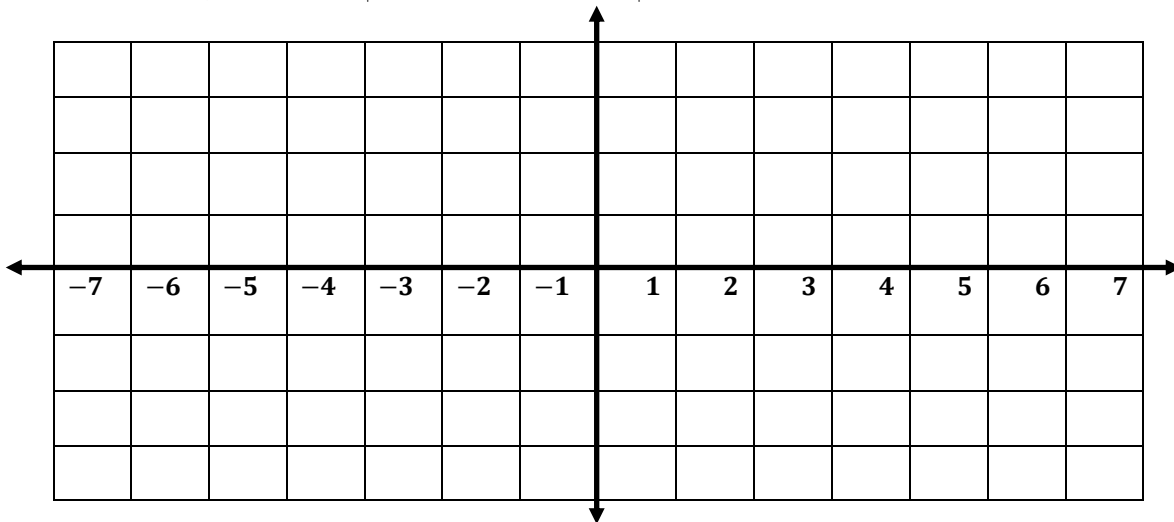
$$x + 2y = 7$$

x	y

2. Does the point $(-3, 2)$ satisfy the equation $2x + y = 1$?

3. Does the point $(-8, 2)$ satisfy the equation $x = -4y$?

4. Plot the following points on the graph below:



a.) $(-1, 1)$

b.) $(4, 3)$

c.) $(7, -2)$

d.) $(-4, -2)$