

**Rational Numbers and the Coordinate Plane** Guided Notes **Math 6****Rational Numbers**

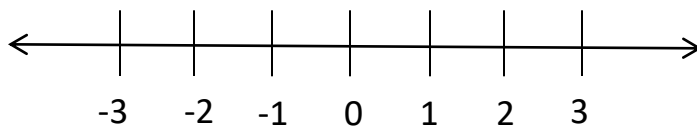
**Rational numbers** are numbers that can be written in the form of:

$$\frac{p}{q} \text{ where } p \text{ and } q \text{ are integers and } q \text{ is not zero}$$

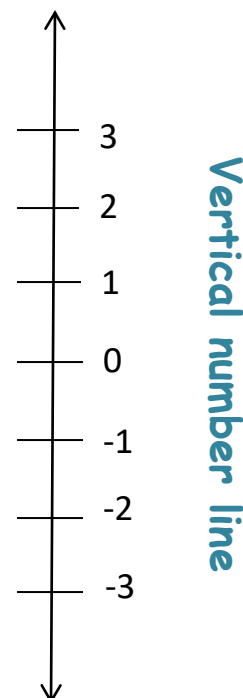
Similar to integers, rational numbers can be plotted or graphed on the **coordinate plane**. What is a coordinate plane?

**The Coordinate Plane**

The coordinate plane is composed of **two number lines**, one of which is **vertical** and the other one is **horizontal**.



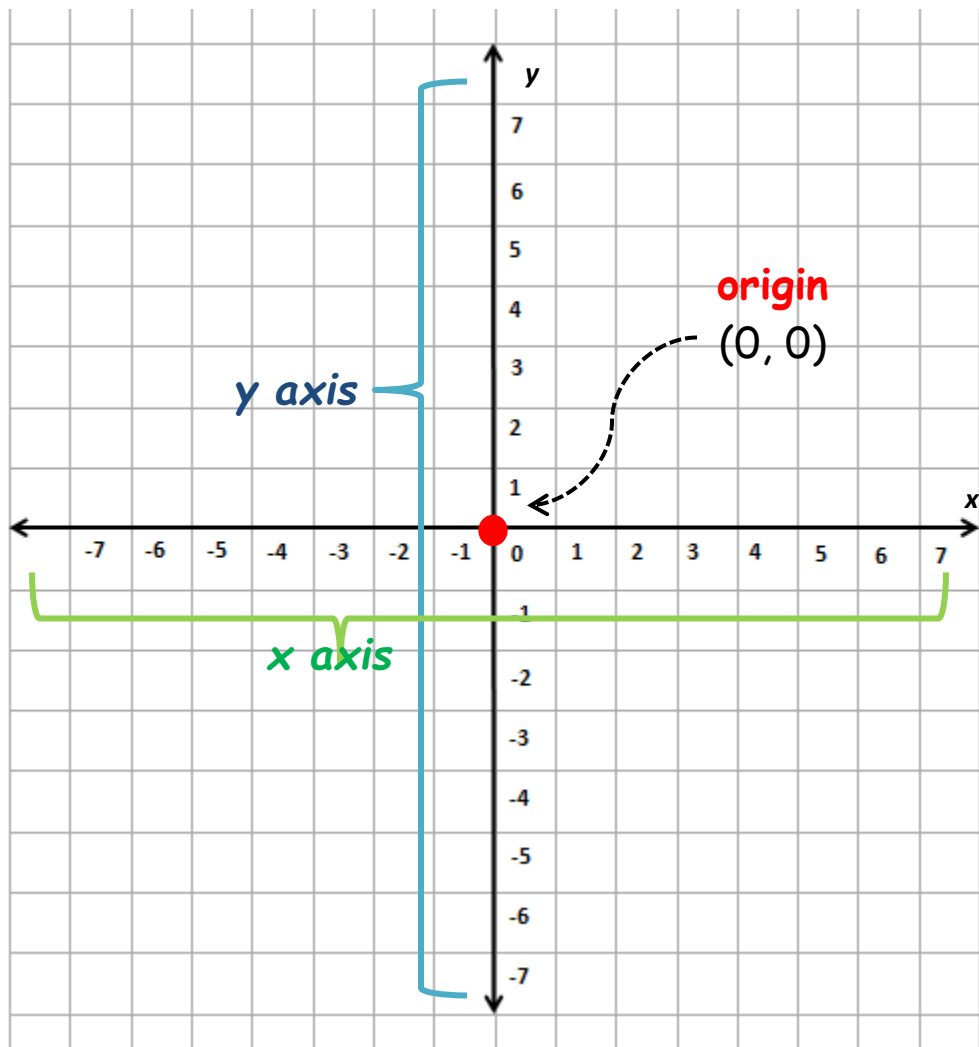
**Horizontal number line**



**Vertical number line**

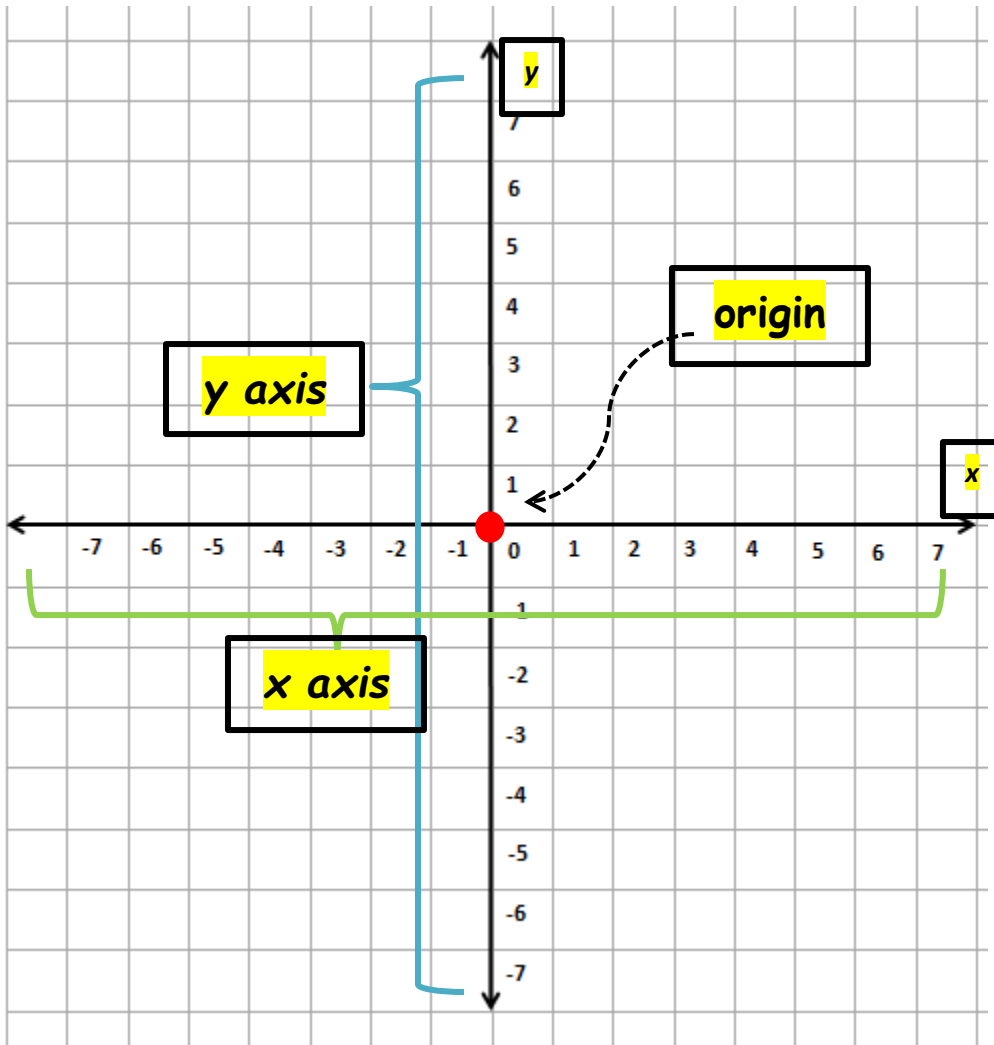
**Rational Numbers and the Coordinate Plane** Guided Notes **Math 6**

These number lines make a perpendicular intersection and meet at a common point called the **origin**, with **coordinates (0, 0)**. The **horizontal number line** is called the **x-axis** and the **vertical number line** is called the **y-axis**.



# Rational Numbers and the Coordinate Plane Guided Notes **Math 6**

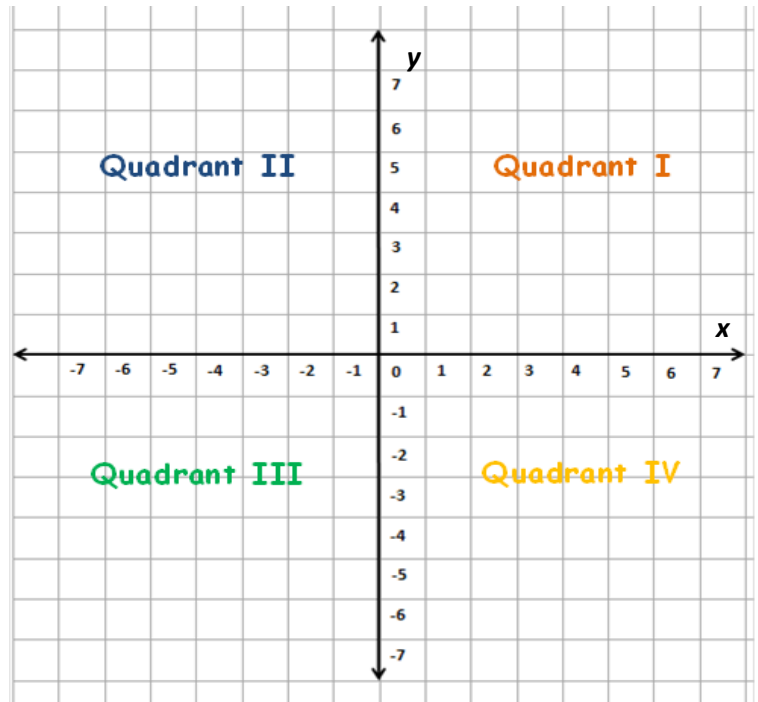
**Sample Problem 1:** Label the parts of the coordinate plane and fill out any missing values.



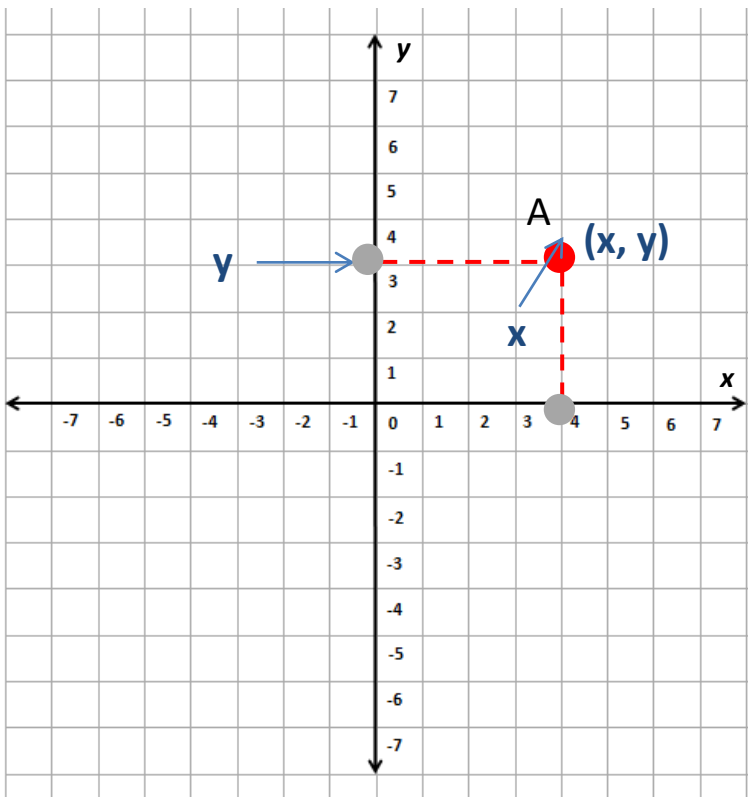
# Rational Numbers and the Coordinate Plane Guided Notes **Math 6**

## The Quadrants

When the horizontal number line (**x-axis**) and the vertical number line (**y-axis**) meet at the origin with point **(0, 0)**, four regions called **quadrants** are formed. These quadrants are labeled with Roman numerals I - IV in a counterclockwise manner.

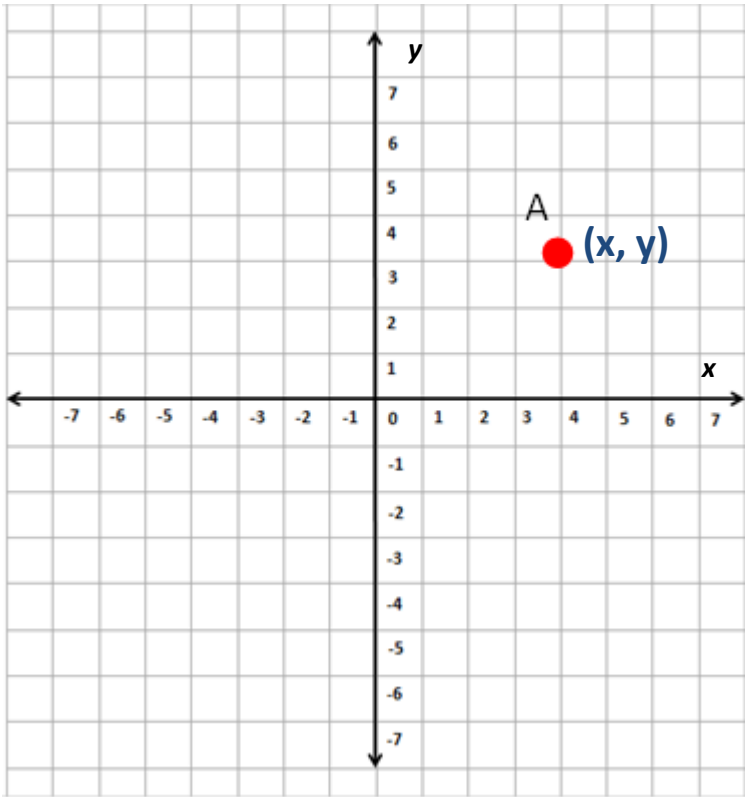


## Points in the Coordinate Plane



The coordinate plane is made up of infinitely many points. Take a look at **point A**.

Drawing a line perpendicular from the given point to the **x axis** and another line perpendicular to the **y axis** determines the location of the point in the coordinate plane.

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To avoid confusion, we locate point **A** by giving the number **x** first, then the number **y**. This will form the ordered pair or coordinates **(x, y)**. This pair of numbers corresponds to point **A**.

The **first number x** is called the **x coordinate** or the **abscissa**, while the **second number y** is the **second coordinate** or the **ordinate**.

**(x, y)**

**(first coordinate, second coordinate)**

**(x coordinate, y coordinate)**

**(abscissa, ordinate)**

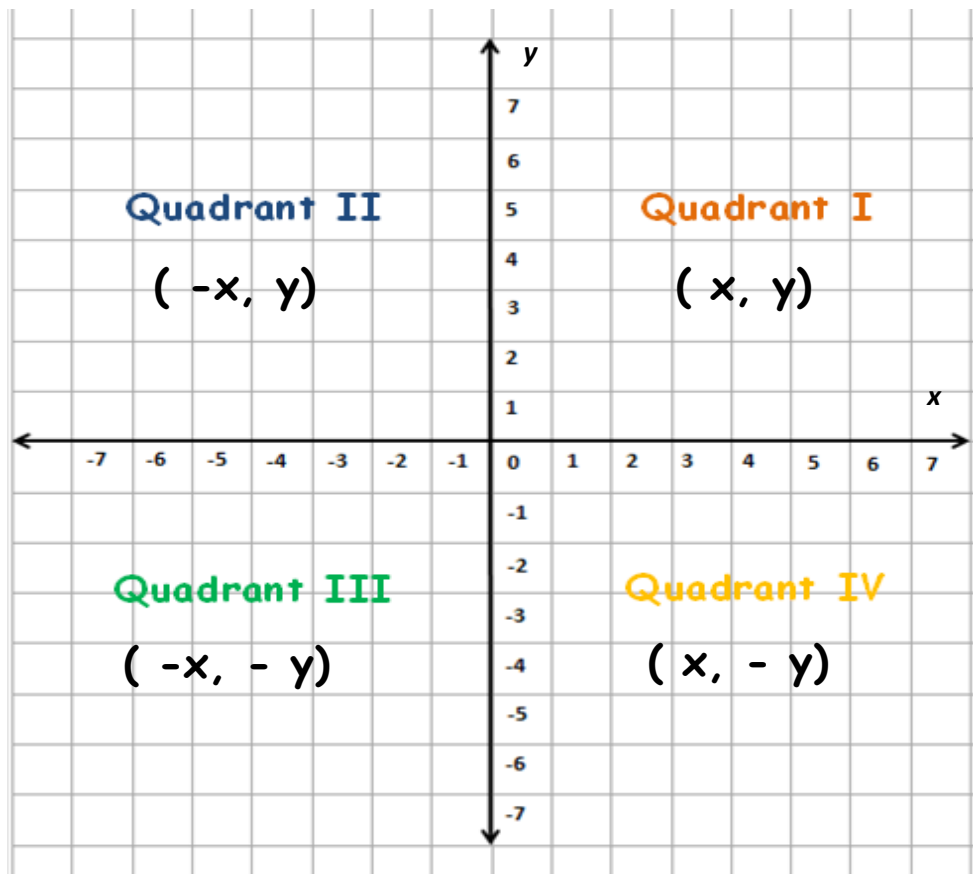
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**Sample Problem 2:** Complete the table by giving the x coordinate and y coordinate of the given points.

	Points in the Coordinate Plane	x coordinate	y coordinate
1.	A (-1, 9)	-1	9
2.	B (11, 8)	11	8
3.	C ( $\frac{1}{4}$ , 5)	$\frac{1}{4}$	5
4.	D (20, $-\frac{9}{4}$ )	20	$-\frac{9}{4}$
5.	E (-6, 6)	-6	6
6.	F (-9, -10)	-9	-10
7.	G (0, 0)	0	0
8.	H (-25, 0)	-25	0

**Rational Numbers and the Coordinate Plane** Guided Notes **Math 6****Describing the Points in each Quadrant**

The coordinates in each quadrant of the coordinate plane varies. Take a look at the illustration below:

**In Quadrant I:**

The **x coordinate** and the **y coordinate** are both **positive**.

**In Quadrant II:**

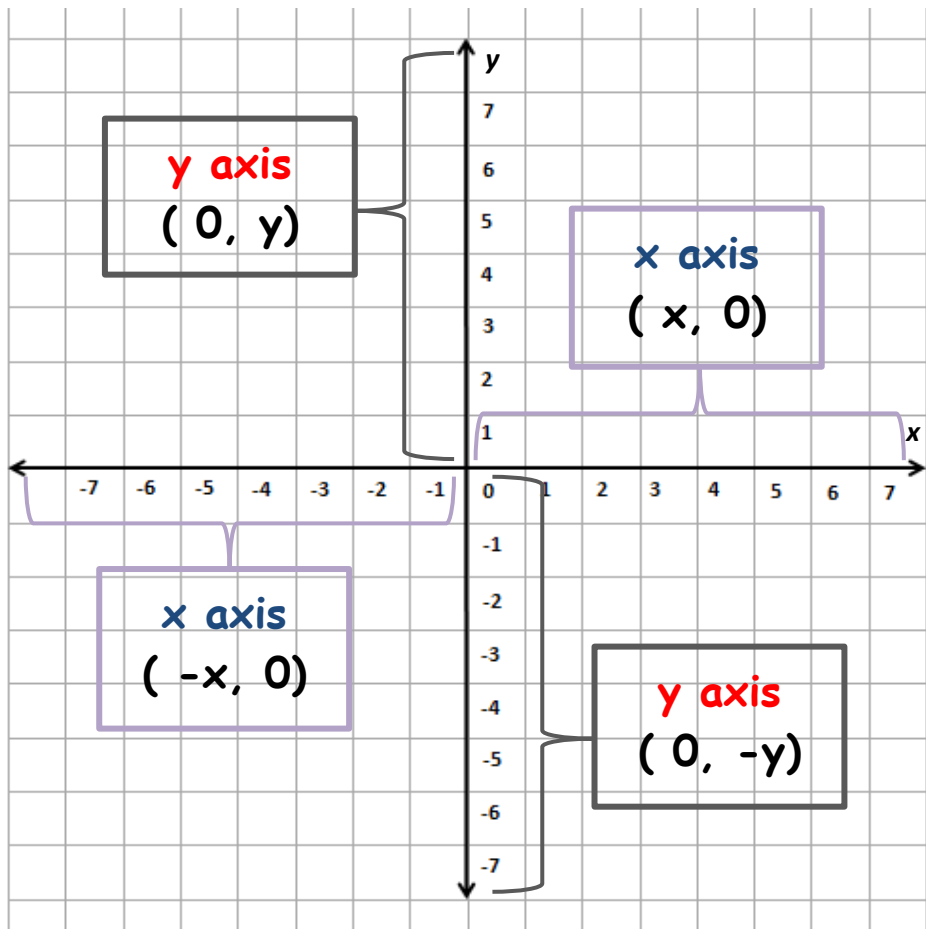
The **x coordinate** is **negative** and the **y coordinate** is **positive**.

**In Quadrant III:**

The **x coordinate** and the **y coordinate** are both **negative**.

**In Quadrant IV:**

The **x coordinate** is **positive** and the **y coordinate** is **negative**.

**Describing the Points on the Axes****In the x axis:**

The **x coordinate to the right of 0 is positive** and the **y coordinate is 0**.

The **x coordinate to the left of 0 is negative** and the **y coordinate is 0**.

**In the y axis:**

The **y coordinate above 0 is positive** and the **x coordinate is 0**.

The **y coordinate below 0 is negative** and the **x coordinate is 0**.



**Rational Numbers and the Coordinate Plane** Guided Notes **Math 6**

**Example:** Tell where the following points are located in the coordinate plane.

1.  $M(4, 7)$

Point  $M$  is located in **Quadrant I** because both the  $x$  and  $y$  coordinates are positive.

2.  $A(-1, 5)$

Point  $A$  is located in **Quadrant II** because the  $x$  coordinate is negative and the  $y$  coordinate is positive.

3.  $T(-6, -2)$

Point  $T$  is located in **Quadrant III** because the  $x$  coordinate and the  $y$  coordinate are both negative.

4.  $H(5, -7)$

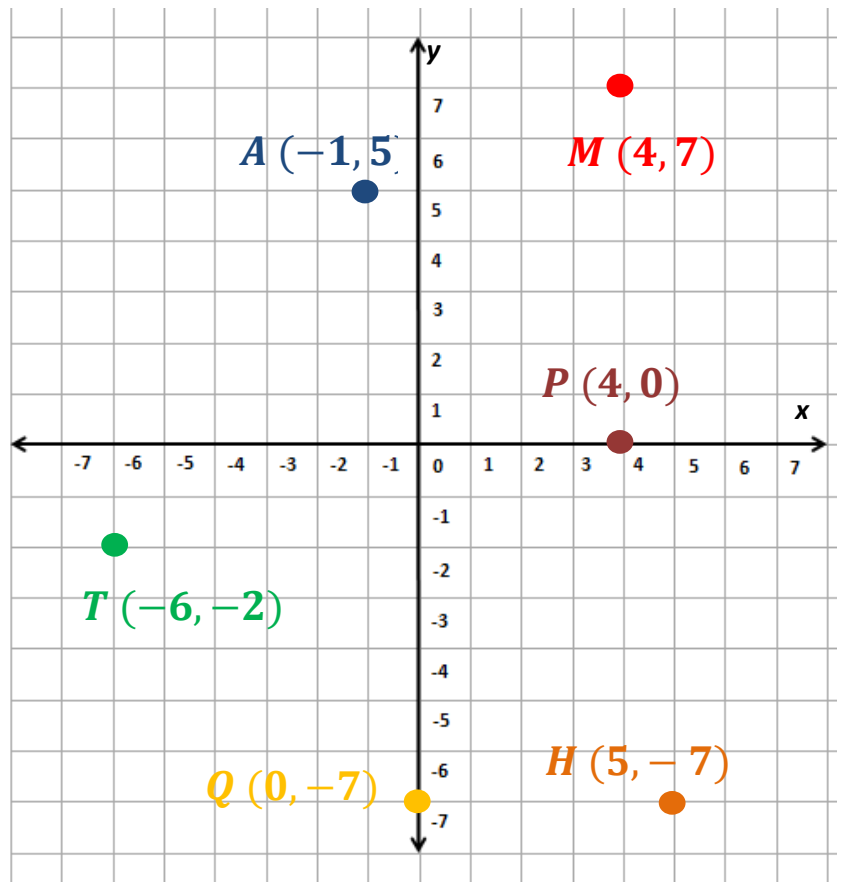
Point  $H$  is located in **Quadrant IV** because the  $x$  coordinate is positive and the  $y$  coordinate is negative.

5.  $P(4, 0)$

Point  $P$  is on the  **$x$  axis** because the  $y$  coordinate is 0.

6.  $Q(0, -7)$

Point  $Q$  is on the  **$y$  axis** because the  $x$  coordinate is 0.



**Rational Numbers and the Coordinate Plane** Guided Notes **Math 6**

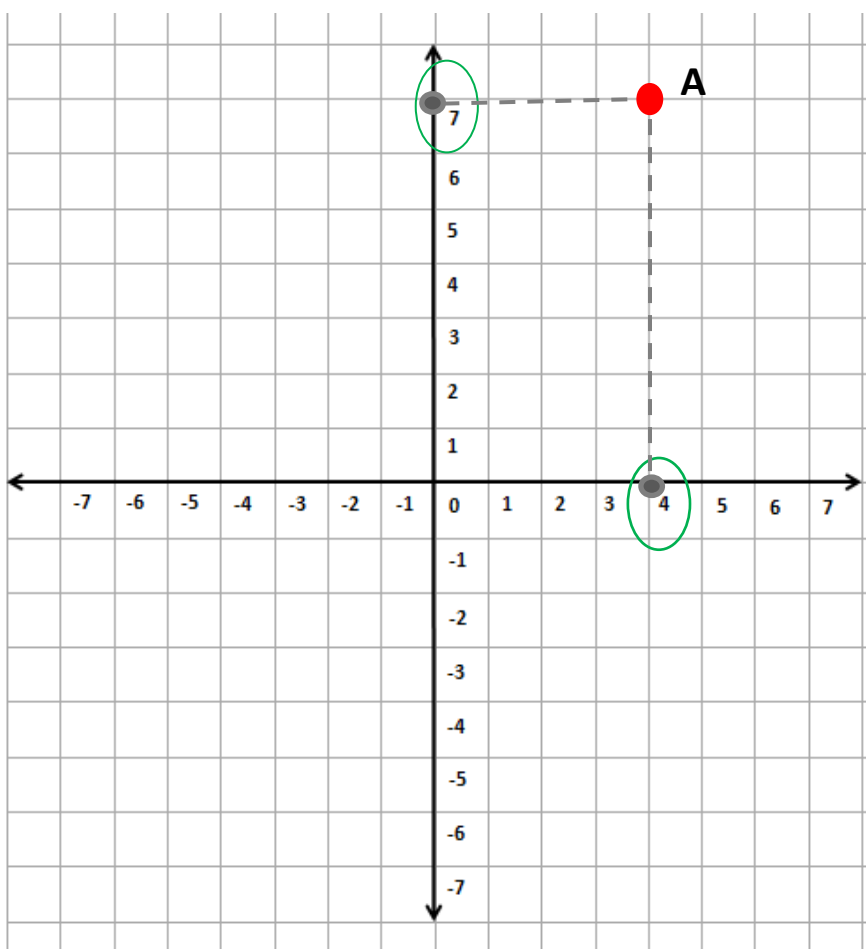
**Sample Problem 3:** Determine the location of the given points on the coordinate plane.

Point	Location
1. $A(-1, 1)$	Solution: Quadrant II
2. $B(-9, -4)$	Solution: Quadrant III
3. $C(0, -12)$	Solution: y axis
4. $E(0, 0)$	Solution: Origin
5. $F\left(\frac{1}{3}, -\frac{2}{3}\right)$	Solution: Quadrant IV

Point	Location
6. $G(-16, -2)$	Solution: Quadrant III
7. $H(6, -18)$	Solution: Quadrant IV
8. $I(9, 0)$	Solution: x axis
9. $J(22, 23)$	Solution: Quadrant I
10. $K\left(-\frac{3}{4}, \frac{5}{2}\right)$	Solution: Quadrant II

**Rational Numbers and the Coordinate Plane** Guided Notes **Math 6****Naming Points on the Coordinate Plane**

We follow specific rules in naming points in the coordinate plane. Remember that each point on the coordinate plane is determined by two rational numbers of the form  $(x, y)$ , where  $x$  is the first coordinate and  $y$  is the second coordinate. So, we'll name it using the numbers on the  $x$  axis first, followed by the number on the  $y$  axis. Take a look at the points on the coordinate plane. What are the coordinates of the given points?



Let's start with **point A**.

The  $x$ -coordinate of **point A** describes the point's position in relation to the  $x$ -axis. Drawing a line from the point to the  $x$ -axis, the  $x$ -coordinate of **point A** is **4**.

The  $y$ -coordinate of **point A** describes the point's position in relation to the  $y$ -axis. Drawing a line from the point to the  $y$ -axis, the  $y$ -coordinate of **point A** is **7**.

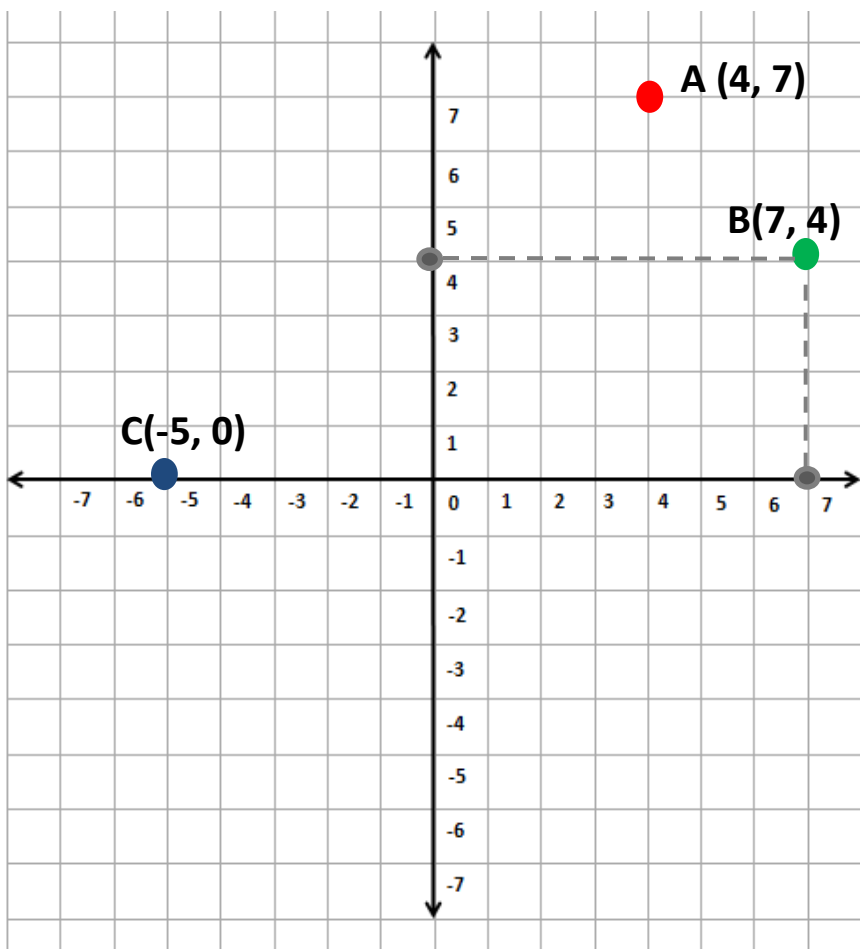
Since the **point A** is in Quadrant I, the coordinates of **point A** are both positive:  **$(4, 7)$** .

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Now, name the coordinates of **point B**.

The x-coordinate of **point B** describes the point's position in relation to the x-axis. Drawing a line from the point to the x-axis, the x-coordinate of **point B** is **7**.

The y-coordinate of **point B** describes the point's position in relation to the y-axis. Drawing a line from the point to the y-axis, the y-coordinate of **point B** is **4**.



Since the **point B** is in Quadrant I, the coordinates of **point B** are both positive: **(7, 4)**.

Name the coordinates of **point C**.

Here **point C** is 5 units from the y-axis and since **point C** is on the x-axis to the left of 0, the x-coordinate is -5.

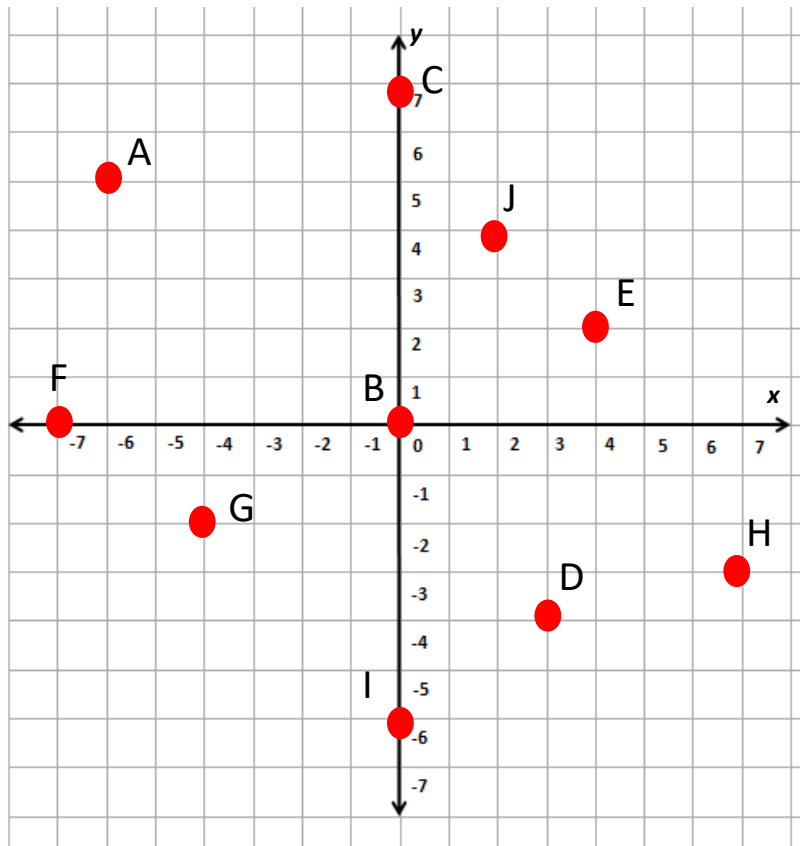
It follows that the distance of **point C** from the x-axis is 0 units; therefore the y-coordinate is 0.

Thus, the coordinates of **point C** is: **(-5, 0)**.

# Rational Numbers and the Coordinate Plane Guided Notes **Math 6**

**Sample Problem 4:** Name the following points in the coordinate plane.

- |                |                 |
|----------------|-----------------|
| 1. A $(-6, 5)$ | 6. F $(-7, 0)$  |
| 2. B $(0, 0)$  | 7. G $(-4, -2)$ |
| 3. C $(0, 7)$  | 8. H $(7, -3)$  |
| 4. D $(3, -4)$ | 9. I $(0, -6)$  |
| 5. E $(4, 2)$  | 10. J $(2, 4)$  |



**Rational Numbers and the Coordinate Plane** Guided Notes **Math 6****Plotting of Points on the Coordinate Plane**

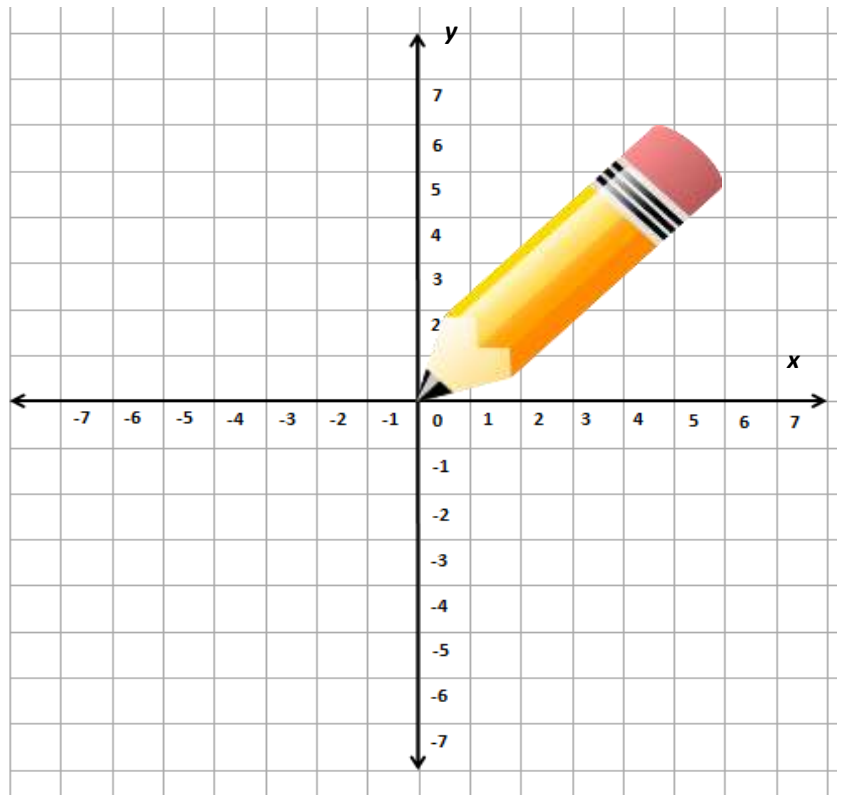
If points on the coordinate plane can be named, points can also be plotted or located in the plane using number pairs also called as their coordinates  $(x, y)$ .

To locate a point in the coordinate plane, take note of the steps in each example.

**1. Plot point A with coordinates  $(3, 4)$ .**

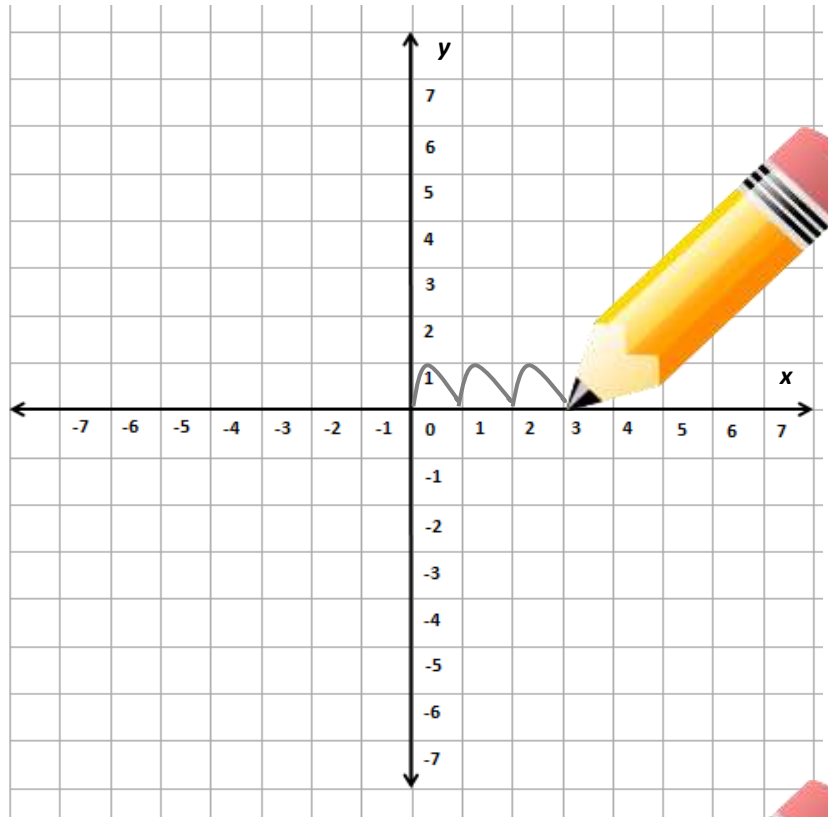
Since the  $x$  coordinate and the  $y$  coordinate are both positive, point A must be located in Quadrant I.

First, position your pen or pencil at the origin with coordinates  $(0, 0)$ .

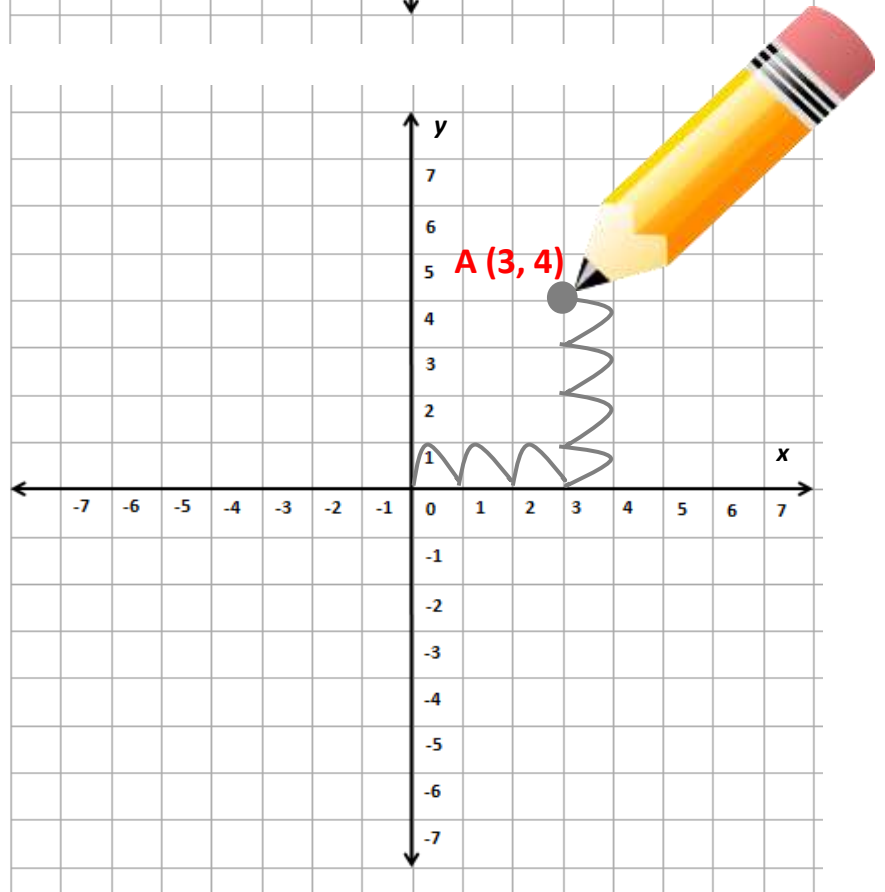


# Rational Numbers and the Coordinate Plane Math 6

From that point, move 3 units to the right of zero, since the *x-coordinate* is positive 3.



And from that point, move 4 units up, since the *y-coordinate* is positive 4.



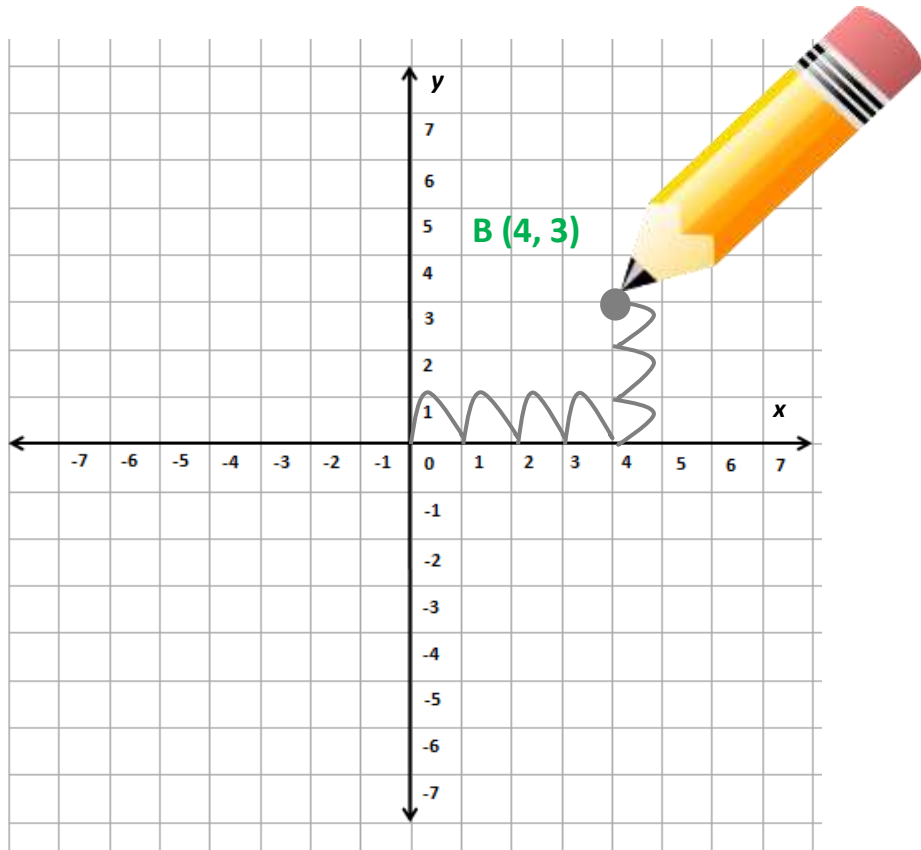
Yay! The point right there is where point *A* with coordinates (3, 4) must be.

**Rational Numbers and the Coordinate Plane** Guided Notes **Math 6****2. Plot point *B* with coordinates ( 4, 3 ).**

Since the *x-coordinate* and the *y-coordinate* are both positive, point *B* must be located in Quadrant I.

First, position your pen or pencil at the origin with coordinates (0, 0).

From that point, move 4 units to the right of zero, since the *x-coordinate* is positive 4.



And from that point, move 3 units up, since the *y-coordinate* is positive 3. The point right there is where point *B* with coordinates (4, 3) must be.

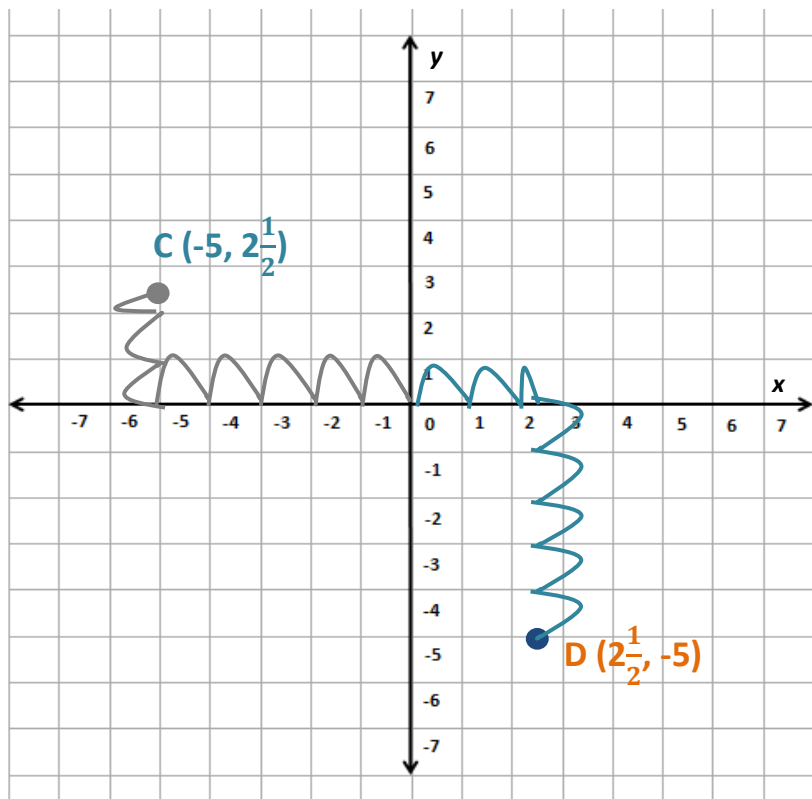


**Rational Numbers and the Coordinate Plane** Guided Notes **Math 6****3. Plot point  $C$  with coordinates  $(-5, 2\frac{1}{2})$ .**

Since the  $x$ -coordinate is negative and the  $y$ -coordinate is positive, point  $C$  must be located in Quadrant II.

From the origin, move 5 units to the left of zero, since the  $x$ -coordinate is negative 5.

And from that point, move  $2\frac{1}{2}$  units up, since the  $y$ -coordinate is positive  $2\frac{1}{2}$ .

**4. On the same coordinate plane; plot point  $D$  with coordinates  $(2\frac{1}{2}, -5)$ .**

Since the  $x$ -coordinate is positive and the  $y$ -coordinate is negative, point  $D$  must be located in Quadrant IV.

From the origin, move  $2\frac{1}{2}$  units to the right of zero, since the  $x$ -coordinate is positive  $2\frac{1}{2}$ .

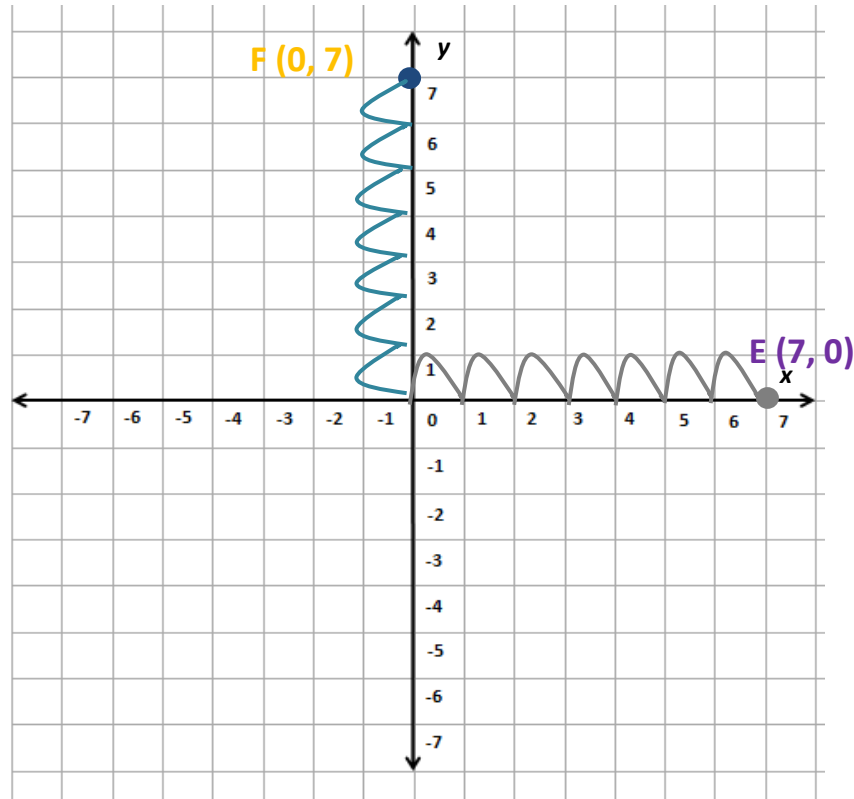
And from that point, move 5 units down, since the  $y$ -coordinate is negative 5.

**Rational Numbers and the Coordinate Plane** Guided Notes **Math 6****5. Plot point  $E$  with coordinates  $(7, 0)$ .**

Since the  $x$ -coordinate is positive and the  $y$ -coordinate is 0, point  $E$  must be located in the  $x$  axis.

From the origin, move 7 units to the right of zero, since the  $x$ -coordinate is positive 7.

The point stays in that position since the  $y$ -coordinate is 0.

**6. On the same coordinate plane; plot point  $F$  with coordinates  $(0, 7)$ .**

Since the  $x$ -coordinate is 0 and the  $y$ -coordinate is positive, point  $F$  must be located in the  $y$ -axis.

From the origin, there should be no right or left movement since the  $x$ -coordinate is 0. Just continue moving 7 units up since the  $y$ -coordinate is positive 7.

**Rational Numbers and the Coordinate Plane** Guided Notes **Math 6**

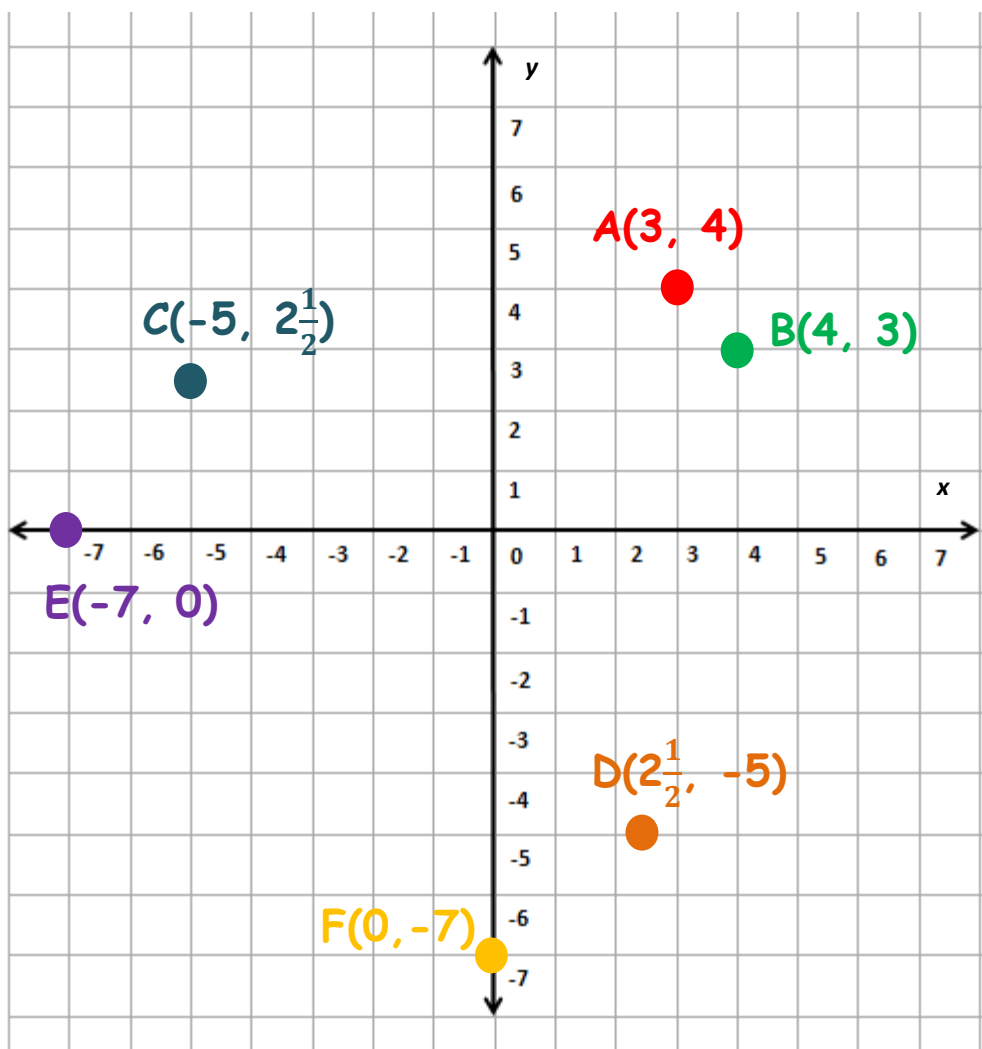
Now using the examples above, compare the location of the points on the coordinate plane. What have you observed?

**A(3, 4)****B(4, 3)****C(-5,  $2\frac{1}{2}$ )****D( $2\frac{1}{2}$ , -5)****E(7, 0)****F(0, 7)**

The order of numbers in the coordinates affects the location of the point on the coordinate plane.

Points **A(3, 4)** and **B(4, 3)** may have the same numbers in the parenthesis but will have different positions on the plane.

The same thing goes for points **C(-5,  $2\frac{1}{2}$ )** and **D( $2\frac{1}{2}$ , -5)**, and **E(7, 0)** and **F(0, 7)**.



# Rational Numbers and the Coordinate Plane Guided Notes **Math 6**

**Sample Problem 5:** Plot the following points on the coordinate plane.

- |               |                         |                |
|---------------|-------------------------|----------------|
| 1. $A(0, 0)$  | 4. $D(6\frac{1}{2}, 3)$ | 7. $G(-5, -3)$ |
| 2. $B(-2, 4)$ | 5. $E(4, 0)$            | 8. $H(5, 3)$   |
| 3. $C(4, -2)$ | 6. $F(0, -4)$           | 9. $I(5, -3)$  |

