# Lesson 5: The Coordinate Plane

The **coordinate plane** is a system of two number lines. The **x-axis** is the horizontal number line in a coordinate plane. The **y-axis** is the vertical number line in a coordinate plane.

The location of a point on the coordinate plane can be described by its distance along both number lines. An **ordered pair** is a pair of numbers (x, y) used to locate a point on a coordinate plane. The **x-coordinate** is the first number in an ordered pair. The **x-coordinate** describes the distance left or right from 0 on the x-axis. The **y-coordinate** is the second number in an ordered pair. The **y-coordinate** describes the distance up or down from 0 on the y-axis.

▷ Example

Identify the location of the points on the coordinate plane.
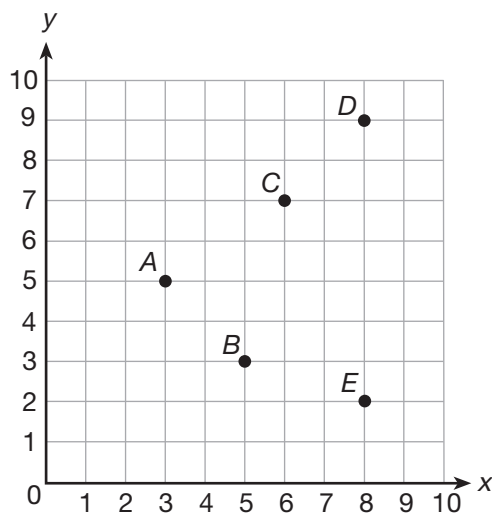
To locate point *A*, count along the x-axis. The x-coordinate of point *A* is 3. Then count up the y-axis. The y-coordinate of point *A* is 5. Point *A* is located at (3, 5).

To locate the remaining points, do the same for each point.
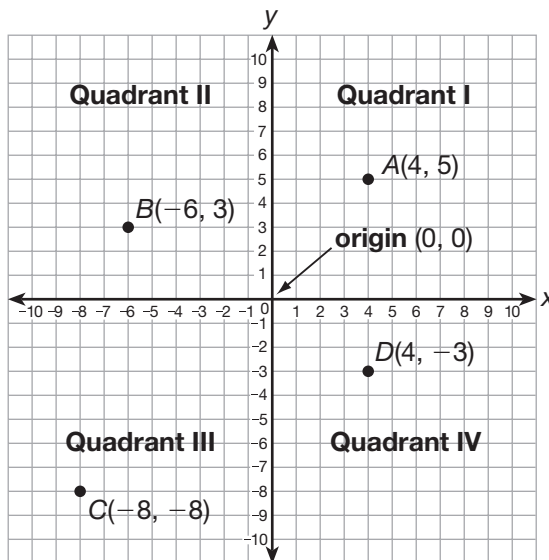
Point *B* is located at (5, 3).

Point *C* is located at (6, 7).

Point *D* is located at (8, 9).

Point *E* is located at (8, 2).

The coordinates of the point where the number lines intersect are (0, 0). This point is called the **origin.** However, the number lines in a coordinate plane can extend below and to the left of 0. Positive *x*-coordinates are to the right of the origin, and negative *x*-coordinates are to the left of the origin. Positive *y*-coordinates are above the origin, and negative *y*-coordinates are below the origin.

When the axes are extended in both directions, they divide the coordinate plane into four parts, also known as **quadrants.**

▷ **Example**

Identify the location of the points on the coordinate plane.

Point *A* is located in Quadrant I. All the points in Quadrant I have two positive numbers in their ordered pair, (*x, y*). Point *A* is located at (4, 5).

Points in Quadrants II, III, and IV follow these general patterns; Quadrant II: ($-x, y$); Quadrant III: ($-x, -y$); Quadrant IV: ($x, -y$). You can use these patterns to check if your points have the right coordinates.

Point *B* is in Quadrant II: (-6, 3)

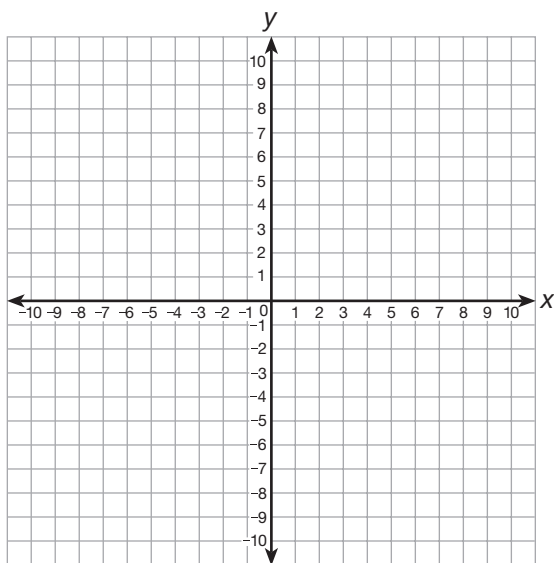Point *C* is in Quadrant III: ($-8, -8$)

Point *D* is in Quadrant IV: (4, -3)

You can use the coordinate plane to plot points. The ordered pairs for the points can include any rational numbers.
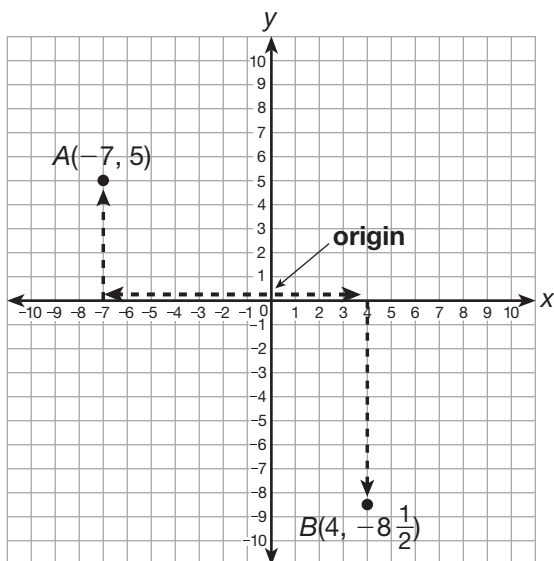
▷ Example

Plot the following points on the coordinate plane.

$A\,(-7, 5)$ $B\,(4,\ -8\tfrac{1}{2})$

To plot point *A,* you need to go 7 units to the left of the origin along the *x*-axis. Then you need to go 5 units up along the *y*-axis.

To plot point *B,* you need to go 4 units to the right of the origin along the *x*-axis. Then you need to go $8\tfrac{1}{2}$ units down along the *y*-axis. That will be halfway between the -8 and -9 markers along the *y*-axis.

If the ordered pairs of two points are different by a negative symbol, the points are reflections over an axis. If the ordered pairs of the points are different by two negative symbols, the points are reflections over both axes.
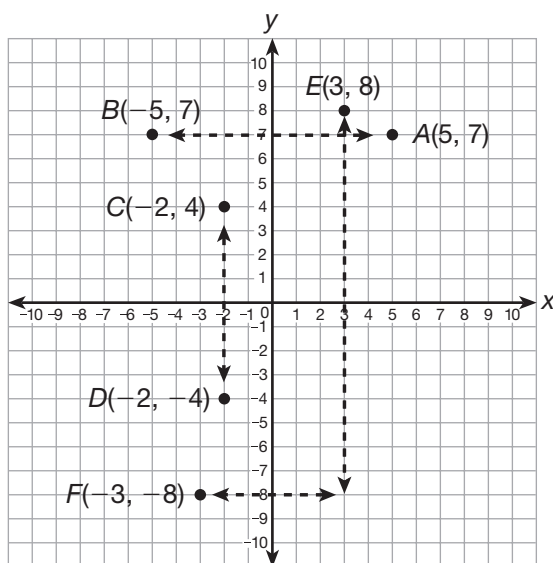
▷ **Example**

Plot the following three pairs of points on a coordinate plane. Then compare their relationships with the axes.

A (5, 7) and B (−5, 7)
C (−2, 4) and D (−2, −4)
E (3, 8) and F (−3, −8)

Points A and B are different because of a negative symbol in the x-coordinate. They are a reflection of each other across the y-axis.

Points C and D are different because of a negative symbol in the y-coordinate. They are a reflection of each other across the x-axis.

Points E and F are different because of a negative symbol in both the x- and the y-coordinates. They are a reflection of each other across the y-axis and the x-axis.