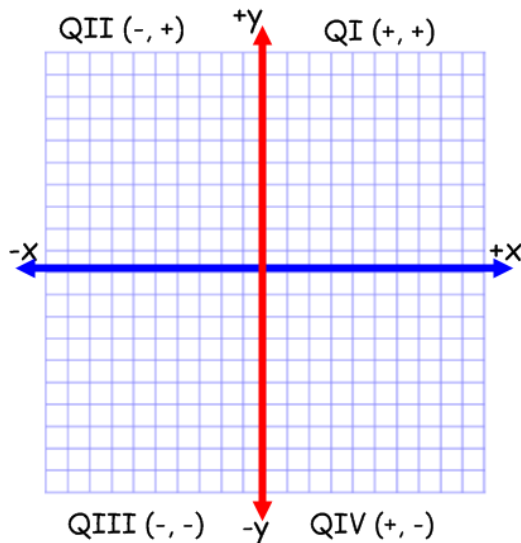


Graphing

Number Line



Rectangular Coordinate System



The rectangular coordinate system (also called the Cartesian Coordinate System) consists of the **x-axis** (horizontal) & the **y-axis** (vertical), which are two number lines intersecting at the zeros. The origin is where the 2 axes cross (0, 0). We have two number lines intersecting at the origin.

These 2 axes determine the xy-plane, divided into 4 **quadrants**. Each point on the plane can be described by an **ordered pair**, (x, y). The first coordinate is the **x-coordinate** (x-value) & the second coordinate is the **y-coordinate** (y-value).

To plot points (ordered pairs)

- 1) Start at the origin
- 2) Move the number of units for the **x-coordinate**, the first value.
 - a. If the number is positive move to the right
 - b. If the number is negative move to the left
- 3) From the **x-coordinate** move the number of units for the **y-value**, the 2nd value.
 - a. If the number is positive move up
 - b. If the number is negative move down
- 4) Place a dot at this location.
 - a. If an ordered pair has a y-coordinate of 0, its graph lies on the x-axis.
 - b. If an ordered pair has an x-coordinate of 0, its graph lies on the y-axis.

Plotting points can be used to graph data or equations. When plotting data, we can sometimes see a pattern, called a correlation between the x and y values. This is related to variation covered in the text but not this course.

Midpoint Formula for the point halfway between the points (x_1, y_1) and (x_2, y_2) :

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right).$$

Example 1: Find the midpoint of the line segment with endpoints $(5, 8)$ and $(9, 12)$

$$\left(\frac{5+9}{2}, \frac{8+12}{2} \right) \rightarrow \left(\frac{14}{2}, \frac{20}{2} \right) \rightarrow (7, 10)$$

Example 2: Find the midpoint of the line segment with endpoints $(-14, 5)$ and $(3, -27)$

$$\left(\frac{(-14)+3}{2}, \frac{5+(-27)}{2} \right) \rightarrow \left(\frac{-11}{2}, \frac{-22}{2} \right) \rightarrow (-5.5, -11)$$

Distance Formula: If $P_1(x_1, y_1)$ & $P_2(x_2, y_2)$ are 2 points in the plane, then the distance, d , between the two points is given by: $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Example: Find the distance between the points $P_1 = (5, 8)$ and $P_2 = (9, 12)$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$d = \sqrt{(9 - 5)^2 + (12 - 8)^2}$$

$$d = \sqrt{(4)^2 + (4)^2}$$

$$d = \sqrt{16 + 16}$$

$$d = \sqrt{32} \rightarrow \sqrt{16 * 2}$$

$$d = 4\sqrt{2}$$