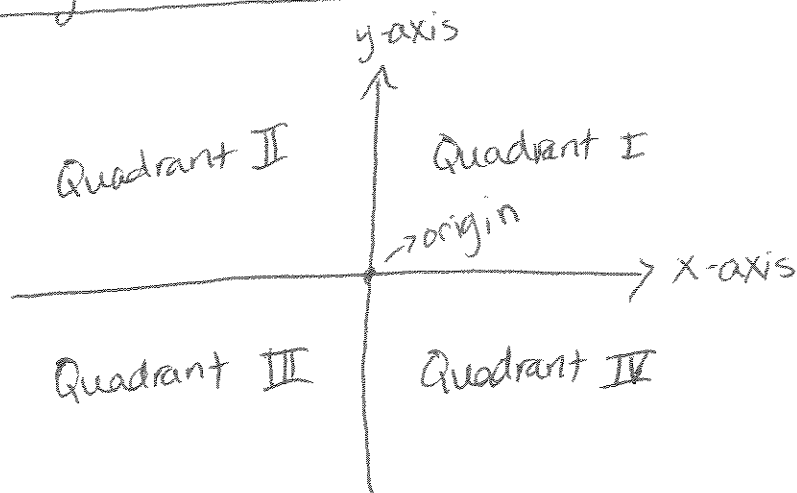


1.1 → Rectangular Coordinate System

①

↳ In one dimension, we represent a point graphically, by plotting it on the real number line. In two dimensions, we plot it on the rectangular coordinate system or Cartesian plane.

Rectangular Coordinate System



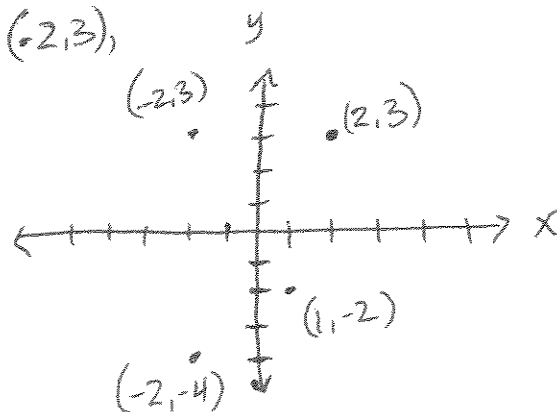
↳ We plot points as an ordered pair.

↳ The first number is the x distance. The second is the y distance.

Ex $(2, 3)$, $(-2, 3)$,

$(1, -2)$,

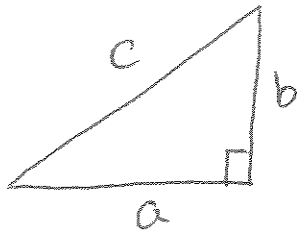
$(-2, -4)$



↳ How can we find the distance between 2 points? ②

↳ use the Quadratic Formula

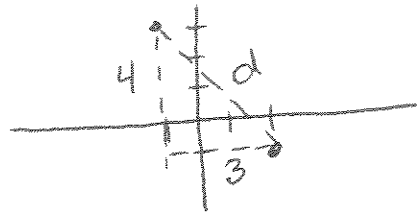
Recall



$$a^2 + b^2 = c^2$$

EX: Find distance between $(-1, 3)$ and $(2, -1)$

↳ Draw a triangle



$$d^2 = 4^2 + 3^2$$

$$\Rightarrow d^2 = 16 + 9$$

$$\Rightarrow d^2 = 25$$

$$\Rightarrow d = \pm \sqrt{25}$$

$$\Rightarrow d = 5 \quad \rightarrow \text{distances are positive}$$

↳ In general, the distance between 2 points (x_1, y_1) and (x_2, y_2) is

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

↳ you can memorize this, but it's probably easier to just use triangles.

↳ what if we drew a line between 2 points, say $(-5, -3)$ and $(9, 3)$ and wanted to find the point, called the midpoint, halfway between the two other points?

↳ the x-coordinate of the midpoint is halfway between the x-coordinates of the end points.

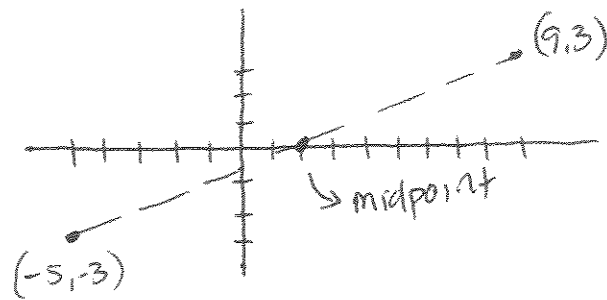
↳ y-coordinate of the midpoint is halfway between y coordinates of end points. ③

↳ The average of 2 numbers is halfway between the 2 numbers.

x-coordinate of midpoint: $\frac{-5+9}{2} = \frac{4}{2} = 2$ → average of endpoint x-values

y-coordinate of midpoint: $\frac{-3+3}{2} = \frac{0}{2} = 0$ → average of endpoint y-values.

Midpoint is (2,0)

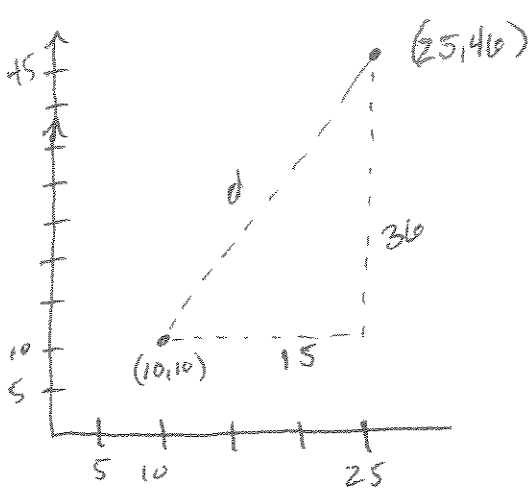


↳ for 2 general points (x_1, y_1) and (x_2, y_2) , midpoint is

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

avg x value & avg y value

EX A quarterback throws a pass from the 10 yard line, 10 yards from the sideline. The receiver catches the pass on the 46 yard line, 25 yards from the same sideline. How long was the pass?



$$d^2 = 15^2 + 36^2$$

$$d^2 = 225 + 1296$$

$$d^2 = 1521$$

$$d = 39 \text{ yards}$$

→ Where should the defender stand to pick off the pass halfway between the QB and the receiver?

↳ find midpoint

$$\left(\frac{10+25}{2}, \frac{10+46}{2} \right) = \left(\frac{35}{2}, \frac{56}{2} \right)$$

$$= (17.5, 28)$$

On the 28 yard line, 17.5 yards from the sideline