Co-ordinate Geometry

(Revision Notes)

Class - 10th

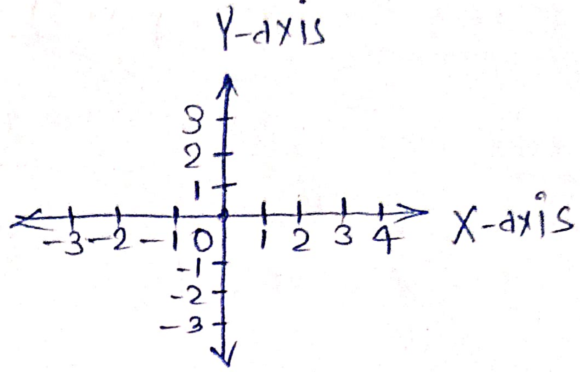
Syllabus

- Concepts of Co-ordinate Geometry
- Distance formula
- Section formula.

Concepts of Co-ordinate Geometry

⇒ Vertical Axis is called Y-axis. Also called ordinate.

⇒ Horizontal Axis is called X-axis. Also called Abscissa.

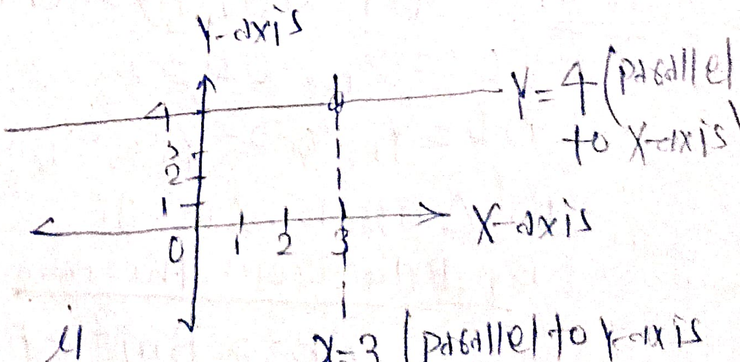


⇒ Intersection point of x-axis and Y-axis is called origin (0,0).

⇒ On the X-axis, Y-co-ordinate is always '0', and on the Y-axis, X-co-ordinate is always '0'.

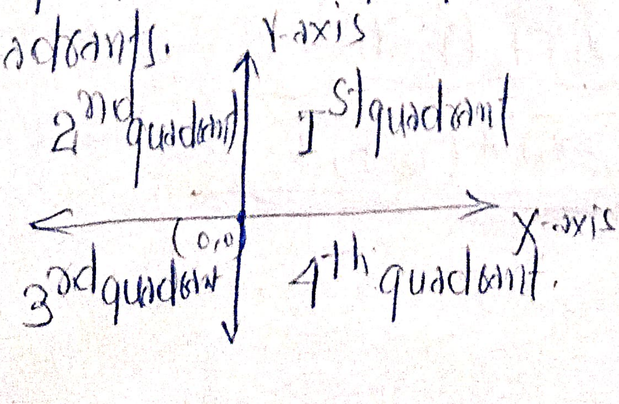
⇒ If x = constant, then line parallel to Y-axis.

⇒ If y = Constant, then line parallel to X-axis.

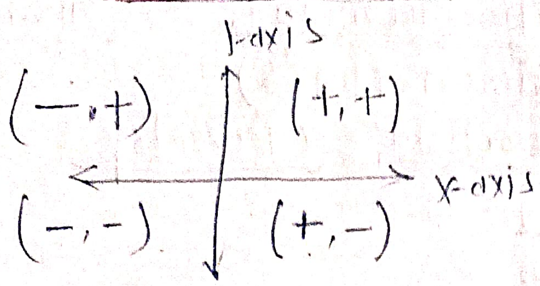


Quadrants

The Intersection of X-axis and Y-axis divides XY-plane into four parts. Each part is called quadrants.

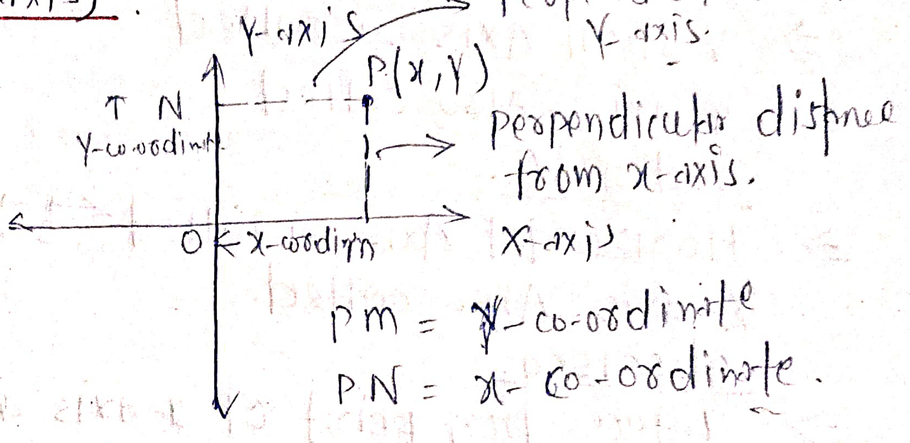


Sign Conventions of co-ordinates



Quadrant	x-co-ordinate	y-coordinate
1st	+	+
2nd	−	+
3rd	−	−
4th	+	−

find perpendicular distance from Axies (x-axis, y-axis).



pm = y-co-ordinate

PN = x-co-ordinate.

Distance formula

The distance between any two points $P(x_1, y_1)$ and $Q(x_2, y_2)$ is given by:

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

<u>Proof:</u> Let $A(x_1, y_1)$ and $B(x_2, y_2)$

$OC = x_1$, $OD = x_2$ $\therefore CD = (x_2 - x_1)$

$MD = y_1$, $BD = y_2$ $\therefore BM = y_2 - y_1$

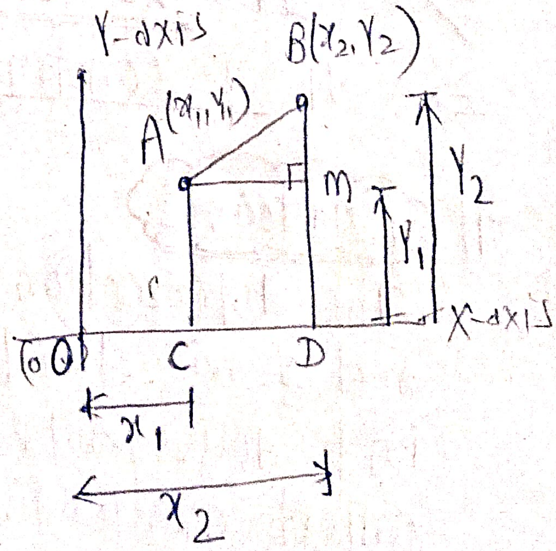
In ΔAMB, $\angle M = 90°$

By Pythagorous theorem

$$AB^2 = BM^2 + AM^2$$

$$\Rightarrow AB^2 = (x_2-x_1)^2 + (y_2-y_1)^2$$

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



Example Question: find the value of x for which the distance between the points $A(x,2)$ and $B(9,8)$ is 10 unit. [CBSE 2019]

Solution-

Given point $A(x,2)$ $B(9,8)$

x_1 y_1 x_2 y_2

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

$$\Rightarrow 10 = \sqrt{(9-x)^2+(8-2)^2}$$

$$\Rightarrow 100 = \cancel{\sqrt{}}\, 81+x^2-18x+36 = x^2-18x+117$$

$$\Rightarrow x^2-18x+117-100=0$$

$$\Rightarrow x^2-18x+17=0$$

$$\Rightarrow x^2-17x-x+17=0$$

$$\Rightarrow x(x-17)-1(x-17)=0$$

$$(x-17)(x-1)=0$$

$$x-17=0, \quad x-1=0$$

$\therefore x=17$ Ans $\therefore x=1$ As

Collinearity of points

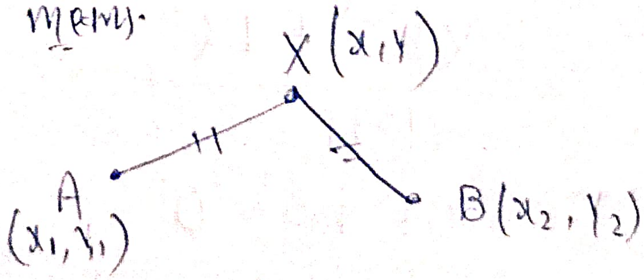
when three or more than three points lies on a same line, then they are called collinear points.

If three points A, B and C are given.

$\boxed{AB+BC=AC}$ or, $\boxed{AC+BC=AB}$ or, $\boxed{AB+AC=BC}$

Equidistant points mems.

$\boxed{XA=XB}$



Example Question

If the point $P(x,y)$ is equidistant from two points $A(5,1)$ and $B(1,5)$, then prove that $x=y$.

Soln:

$$AP = BP$$

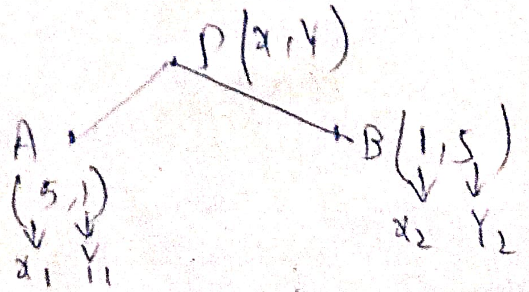
$$(x-5)^2+(y-1)^2 = (x-1)^2+(y-5)^2$$

$$\Rightarrow \cancel{x^2}+25-10x+\cancel{y^2}+1-2y = \cancel{x^2}+1-2x+\cancel{y^2}+25-10y$$

$$-10x-2y+\cancel{26} = -2x-10y+\cancel{26}$$

$$\Rightarrow -10x+2x = -10y+2y$$

$$\cancel{-}8x = \cancel{-}8y$$



$\therefore \boxed{x=y}$ proved

Section formula.

⇓ **Internal division**

$m \quad n$

$A(x_1, y_1) \quad P(x, y) \quad B(x_2, y_2)$

Let $A(x_1, y_1)$ and $B(x_2, y_2)$ are two points and $P(x, y)$ is a point on AB line such that $AP : BP = m : n$ and point $P(x, y)$ divides AB line in the ratio $m : n$.

Hence $P(x, y)$ is –

$$\boxed{x = \frac{mx_2 + nx_1}{m+n}} \qquad \boxed{y = \frac{my_2 + ny_1}{m+n}}$$

Example Question :- find the ratio in which the line segment joining the points $A(6, 3)$ and $B(-2, -5)$ is divided by x-axis. (CBSE 2023 standard).

Let Ratio be $K : 1$

$m = K, \; n = 1$

$K \quad 1$

$A(6, 3) \quad P(x, 0) \quad B(-2, -5)$

$\underset{x_1}{6}, \underset{y_1}{3} \qquad \underset{x_2}{-2}, \underset{y_2}{-5}$

$$y = \frac{my_2 + ny_1}{m+n}$$

$$0 = \frac{K \times (-5) + 1 \times 3}{K+1}$$

$\Rightarrow -5K + 3 = 0$

$\Rightarrow \cancel{-}5K = \cancel{-}3 \qquad \therefore K = \frac{3}{5}$

$\therefore$ Ratio $= 3 : 5$ Ans

Centroid of a triangle

If $A(x_1, y_1)$, $B(x_2, y_2)$ and $C(x_3, y_3)$ are the vertices of a ΔABC, then it's centroid is given by

$$C(x, y) = \left(\frac{x_1+x_2+x_3}{3}, \frac{y_1+y_2+y_3}{3}\right)$$