

Section & Mid-point formula.

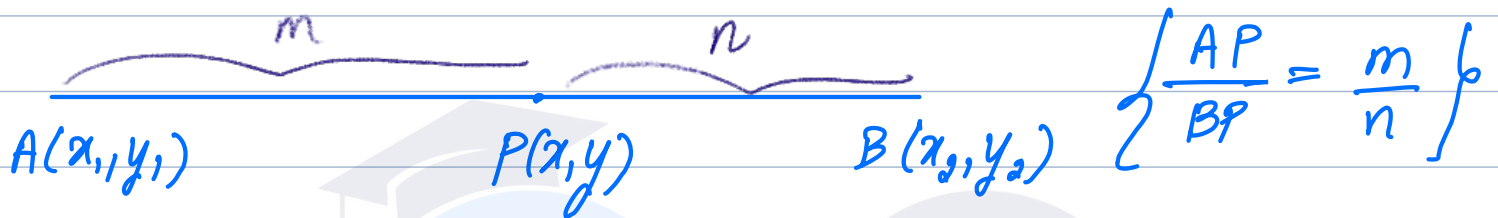
Lecture-I

Total no. of lectures
= 2.

1) Section formula.

If the point $P(x, y)$ divides the line joining the points $A(x_1, y_1)$ & $B(x_2, y_2)$ then

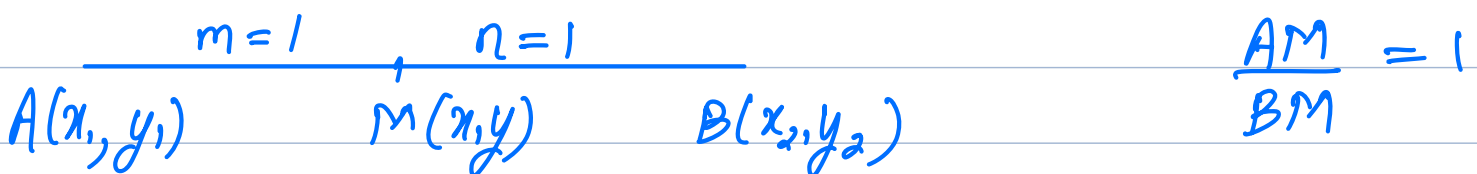
$$x = \frac{mx_2 + nx_1}{m+n} \quad \& \quad y = \frac{my_2 + ny_1}{m+n}$$



2) Mid-point formula.

If $M(x, y)$ is the mid-point of the line segment joining the points $A(x_1, y_1)$ & $B(x_2, y_2)$ then

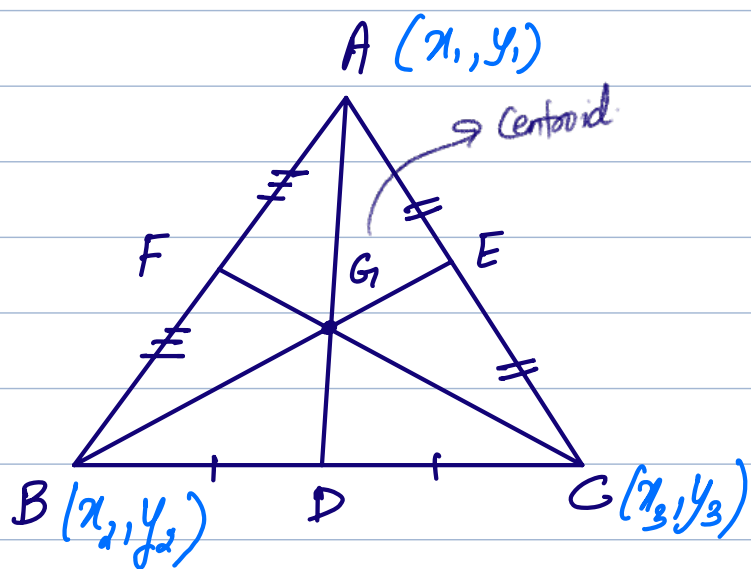
$$x = \frac{x_1 + x_2}{2} \quad \& \quad y = \frac{y_1 + y_2}{2}$$



3) Centroid of a Triangle.

Intersection point of all medians.

$$G \left(\frac{x_1 + x_2 + x_3}{3}, \frac{y_1 + y_2 + y_3}{3} \right)$$



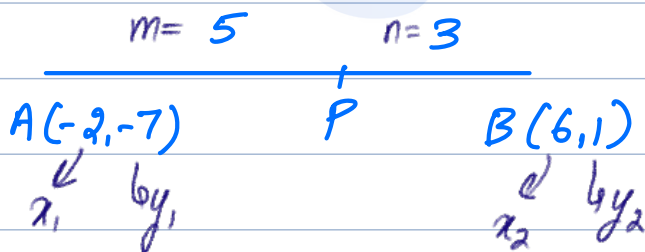
Note: Centroid divides medians in the ratio 2:1.

$$AG:GD = 2:1, \quad BG:GE = 2:1, \quad CG:GF = 2:1$$

Illustration.

1) Find the co-ordinates of point P which divides the line segment joining $A(-2, -7)$ & $B(6, 1)$ in the ratio 5:3.

Solⁿ: $\therefore x = \frac{mx_2 + nx_1}{m+n}$ & $y = \frac{my_2 + ny_1}{m+n}$



$$\therefore x = \frac{5(6) + 3(-2)}{5+3} = \frac{24}{8} = 3.$$

$$\& y = \frac{5(1) + 3(-7)}{5+3} = \frac{-16}{8} = -2.$$

Required co-ordinates of P is $(3, -2)$.

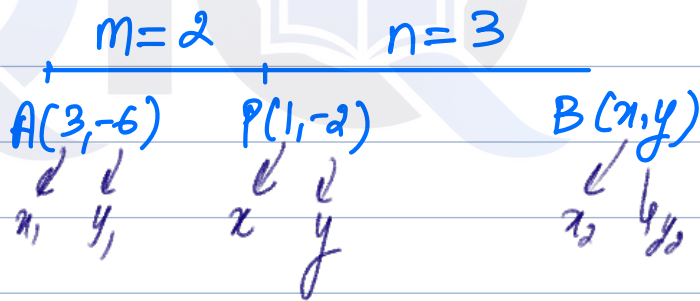
2) Find the co-ordinates of point P which divides the line segment joining $A(8, 9)$ & $B(-7, 4)$ in the ratio 2:3.

Sol: $\therefore x = \frac{mx_2 + nx_1}{m+n}$ & $y = \frac{my_2 + ny_1}{m+n} \Rightarrow x = \frac{2(-7) + 3(8)}{2+3} = 2$
 & $y = \frac{2(4) + 3(9)}{2+3} = 7$

$P(2, 7)$ Ans.

3) $P(1, -2)$ is point on the line segment $A(3, -6)$ & $B(x, y)$ such that $AP:PB$ is equal to 2:3. Find the coordinates of B.

Sol:



$\therefore x = \frac{mx_2 + nx_1}{m+n}$ & $y = \frac{my_2 + ny_1}{m+n}$

$\therefore 1 = \frac{2(x) + 3(3)}{2+3} \Rightarrow 1 = \frac{2x+9}{5} \Rightarrow 2x+9 = 5$

$\Rightarrow 2x = -4$

$\Rightarrow \boxed{x = -2}$

& $-2 = \frac{2(y) + 3(-6)}{2+3} \Rightarrow -10 = 2y - 18 \Rightarrow 2y = 8 \Rightarrow \boxed{y = 4}$

$B(-2, 4)$ Ans.

4) Find the co-ordinates of the points of trisection of the line segment joining the points $A(2,1)$ & $B(5,-8)$.

Sol:

*



$$\begin{array}{c} 1 \qquad 2 \\ \hline A(2,1) \quad P(x,y) \qquad B(5,-8) \end{array} \Rightarrow x = \frac{1(5) + 2(2)}{1+2} = 3$$

$$y = \frac{1(-8) + 2(1)}{1+2} = -2 \quad \text{Ans} \quad \boxed{P(3, -2)}$$



$$\boxed{Q(4, -5)} \quad \underline{\text{Ans}}$$

$$\Rightarrow x = \frac{2(5) + 1(2)}{2+1} = 4$$

$$y = \frac{2(-8) + 1(1)}{2+1} = -5$$

Lecture-11

5) Find the mid-point of the line segment joining the points $A(-4,3)$ & $B(10,-7)$

x_1 y_1 x_2 y_2

Sol:

$$\therefore x = \frac{x_1 + x_2}{2} = \frac{-4 + 10}{2} = 3$$

$$y = \frac{y_1 + y_2}{2} = \frac{3 + (-7)}{2} = -2$$

$M(3, -2)$ Ans

6) In what ratio does the point $(-3, 7)$ divide the join of $A(-5, 11)$ & $B(4, -7)$?

Soln: Let $P(-3, 7)$ divides AB in the ratio $K:1$

$$\begin{array}{ccc} m=K & & n=1 \\ \hline A(-5, 11) & P(-3, 7) & B(4, -7) \end{array}$$

$$\therefore x = \frac{mx_2 + nx_1}{m+n} \quad \therefore -3 = \frac{K(4) + 1(-5)}{K+1}$$

$$\Rightarrow -3K - 3 = 4K - 5 \Rightarrow 5 - 3 = 4K + 3K$$

$$\Rightarrow 7K = 2 \Rightarrow K = \frac{2}{7}$$

$$\Rightarrow \text{Required ratio} = \frac{2}{7} : 1 = \underline{2:7} \text{ Ans}$$

7) Given a line segment AB joining the points $A(-4, 6)$ & $B(8, -3)$

Find i) the ratio in which AB is divided by y-axis.

ii) the coordinates of point of intersection.

iii) the length of AB .

i)

Soln: Let P divides AB in the ratio $K:1$.

$$\begin{array}{ccc} m=K & & n=1 \\ \hline A(-4, 6) & P(0, y) & B(8, -3) \\ \begin{array}{l} x_1 \\ y_1 \end{array} & \begin{array}{l} x \\ y \end{array} & \begin{array}{l} x_2 \\ y_2 \end{array} \end{array}$$

$$\therefore x = \frac{mx_2 + nx_1}{m+n} \quad \therefore 0 = \frac{K(8) + 1(-4)}{K+1}$$

$$\Rightarrow 0 = 8K - 4 \Rightarrow$$

$$\boxed{K = \frac{1}{2}}$$

$$\Rightarrow \text{Required ratio} = \frac{1}{2} : 1 \text{ or } \underline{1:2} \text{ Ans}$$

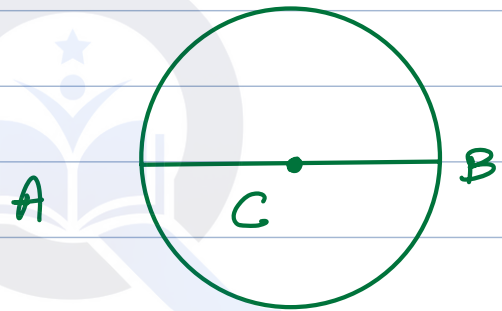
$$\text{ii) } y = \frac{my_2 + ny_1}{m+n} = \frac{1(-3) + 2(6)}{1+2} \quad \begin{matrix} m \swarrow 1:2 \\ n \searrow \end{matrix}$$

$$\boxed{y=3} \rightarrow \boxed{P(0,3)} \quad \underline{\text{Ans}}$$

$$\begin{aligned} \text{iii) } AB &= \sqrt{(8+4)^2 + (-3-6)^2} = \sqrt{144+81} \\ &= \sqrt{225} = 15 \text{ units.} \end{aligned}$$

Note:

Centre is the mid-point of the diameter.

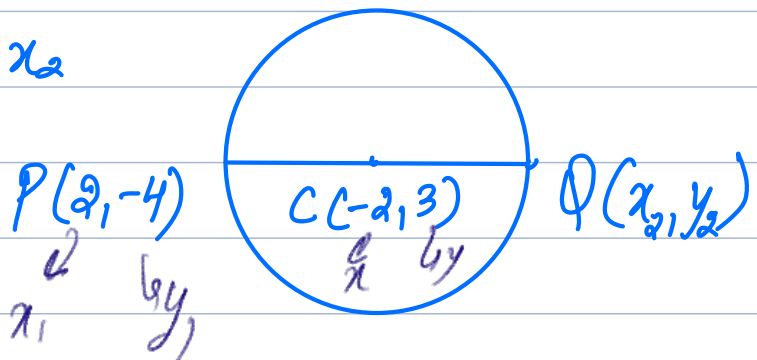


8). The centre of a circle is $C(-2,3)$ & one end of a diameter PQ is $P(2,-4)$. Find co-ordinates of Q .

$$\begin{aligned} \underline{\text{Sol:}} \quad -2 &= \frac{2+x_2}{2} \Rightarrow -4 = 2+x_2 \\ &\Rightarrow x_2 = -6. \end{aligned}$$

$$3 = \frac{-4+y_2}{2} \Rightarrow 6 = -4+y_2$$

$$\Rightarrow y_2 = 10$$



$$Q(-6,10) \quad \underline{\text{Ans}}$$

9) ABC is a triangle & $G(4,3)$ is its centroid. If $A(1,3)$, $B(4,b)$ & $C(a,1)$ be the vertices, find the value of a & b & hence find the length of side BC.

