

Class 10-Mathematics

Instructions for students: The notes provided must be copied to the Maths copy and then do the homework in the same copy.

Chapter 11

Section Formula

Section Formula: Co-ordinates of a point R(x, y) that divides a line segment joining the points P(x₁, y₁) and Q(x₂, y₂) in the ratio m₁:n₁ is given by

$$(x, y) = \left(\frac{m_1x_2+m_2x_1}{m_1+m_2}, \frac{m_1y_2+m_2y_1}{m_1+m_2} \right)$$

Mid point Formula: Co-ordinates of mid point R(x, y) of a line segment joining the points P(x₁, y₁) and Q(x₂, y₂) is given by

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

Centroid of a triangle: Coordinates of centroid of a triangle with vertices (x₁, y₁), (x₂, y₂) and (x₃, y₃) is

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

Exercise 11

5. i) Solution:

Let P(x, y) be the coordinates of the point which divides the line segment AB in the ratio 1:2.

$$A(3,2) \quad B(5,1) \quad \text{Ratio}=1:2$$

$$(x, y) = \left(\frac{m_1x_2+m_2x_1}{m_1+m_2}, \frac{m_1y_2+m_2y_1}{m_1+m_2} \right)$$

$$(x, y) = \left(\frac{1 \times 5 + 2 \times 3}{1+2}, \frac{1 \times 1 + 2 \times 2}{1+2} \right) = \left(\frac{11}{3}, \frac{5}{3} \right)$$

Since $\left(\frac{11}{3}, \frac{5}{3}\right)$ lies on the line $3x - 18y + k = 0$,

$$\begin{aligned} 3 \times \frac{11}{3} - 18 \times \frac{5}{3} + k &= 0 \quad (\text{substituting the values of } x, y) \\ 11 - 30 + k &= 0 \end{aligned}$$

$$k = 19$$

12. Solution:

By distance formula,

Length of line segment joining the points (x_1, y_1) and (x_2, y_2)

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

$$\begin{aligned} \text{i) Length of radius AC} &= \sqrt{(3 - -2)^2 + (-7 - 5)^2} \\ &= \sqrt{5^2 + (-12)^2} \\ &= \sqrt{25 + 144} = \sqrt{169} = 13 \text{ units.} \end{aligned}$$

ii) Let the point B be (a, b)

$$(-2, 5) = \left(\frac{3+a}{2}, \frac{-7+b}{2} \right) \text{ (centre is the midpoint of diameter)}$$

$$\frac{3+a}{2} = -2 \Rightarrow 3+a = -4 \Rightarrow a = -7$$

$$\frac{-7+b}{2} = 5 \Rightarrow -7+b = 10 \Rightarrow b = 17$$

Coordinates of point B $(-7, 17)$

16. Solution:

Let the ratio be $k:1$

$$(x_1, y_1) = (2, 1)$$

$$(x_2, y_2) = (7, 6)$$

$$(x, y) = (5, 4)$$

By section formula,

$$(x, y) = \left(\frac{kx_2 + x_1}{k+1}, \frac{ky_2 + y_1}{k+1} \right)$$

$$(5, 4) = \left(\frac{k \times 7 + 2}{k+1}, \frac{k \times 6 + 1}{k+1} \right)$$

$$\frac{k \times 7 + 2}{k+1} = 5$$

$$7k + 2 = 5k + 5$$

$$2k = 3$$

$$k = \frac{3}{2}$$

$$\text{Ratio} = \frac{3}{2} : 1 \text{ or } 3:2$$

Home Work: Solve **Exercise 11 Questions 1 to 25** in the Maths copy.

Complete the graph works in graph copy.