Exercise 7.2

5. Find the ratio in which the line segment joining A (1, −5) and B (−4, 5) is divided by the x−axis. Also find the coordinates of the point of division.

Ans. Let the coordinates of point of division be (x, 0) and suppose it divides line segment joining A (1, −5) and B (−4, 5) in k:1.

According to Section formula, we get

$$x = \frac{1\times1+(-4)\times k}{k+1} = \frac{1-4k}{k+1} \; and \; 0 = \frac{(-5)\times1+5k}{k+1} \quad \text{... (1)}$$

$$0 = \frac{(-5)\times1+5k}{k+1}$$

$\Rightarrow 5 = 5k$

$\Rightarrow k = 1$

Putting value of k in (1), we get

$$x = \frac{1\times1+(-4)\times1}{1+1} = \frac{1-4}{2} = \frac{-3}{2}$$

Therefore, point $(\frac{-3}{2}$, 0) on x−axis divides line segment joining A (1, −5) and B (−4, 5) in 1:1.

6. If (1, 2), (4, y), (x, 6) and (3, 5) are the vertices of a parallelogram taken in order, find x and y.

Ans. Let A = (1, 2), B = (4, y), C = (x, 6) and D = (3, 5)

We know that diagonals of parallelogram bisect each other. It means that coordinates of midpoint of diagonal AC would be same as coordinates of midpoint of diagonal BD. ... (1)

Using Section formula, the coordinates of midpoint of AC are:

$$\frac{1+x}{2}, \frac{2+6}{2} = \frac{1+x}{2}, 4$$

Using Section formula, the coordinates of

Using Section formula, the coordinates of midpoint of BD are:

$$\frac{4+3}{2}, \frac{5+y}{2} = \frac{7}{2}, \frac{5+y}{2}$$

According to condition (1), we have

$$\frac{1+x}{2} = \frac{7}{2}$$

$\Rightarrow (1 + x) = 7$

$\Rightarrow x = 6$

Again, according to condition (1), we also have

$$4 = \frac{5+y}{2}$$

$\Rightarrow 8 = 5 + y$

$\Rightarrow y = 3$

Therefore, x = 6 and y = 3

7. Find the coordinates of a point A, where AB is the diameter of a circle whose centre is (2, −3) and B is (1, 4).

Ans. We want to find coordinates of point A. AB is the diameter and coordinates of center are (2, −3) and, coordinates of point B are (1, 4).

Let coordinates of point A are (x, y). Using section formula, we get

$$2 = \frac{x+1}{2}$$

$\Rightarrow 4 = x + 1$

$\Rightarrow x = 3$

Using section formula, we get

$$-3 = \frac{4+y}{2}$$

$\Rightarrow -6 = 4 + y$

$\Rightarrow y = -10$

Therefore, Coordinates of point A are (3, −10).

8. If A and B are (−2, −2) and (2, −4) respectively, find the coordinates of P such that $AP = \frac{3}{7}AB$ and P lies on the line segment AB.

Ans. A = (−2, −2) and B = (2, −4)

It is given that $AP = \frac{3}{7}AB$

$$PB = AB - AP = AB - \frac{3}{7}AB = \frac{4}{7}AB$$

So, we have AP: PB = 3: 4

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Let coordinates of P be (x, y)

Using Section formula to find coordinates of P, we get

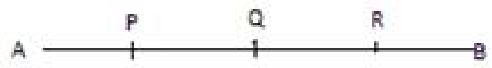
$$x=\frac{(-2)\times 4+2\times 3}{3+4}=\frac{6-8}{7}=\frac{-2}{7}$$

$$y=\frac{(-2)\times 4+(-4)\times 3}{3+4}=\frac{-8-12}{7}=\frac{-20}{7}$$

Therefore, Coordinates of point P are $\left(\frac{-2}{7},\frac{-20}{7}\right)$

9. Find the coordinates of the points which divides the line segment joining A (–2, 2) and B (2, 8) into four equal parts.

Ans. A = (–2, 2) and B = (2, 8)



Let P, Q and R are the points which divide line segment AB into 4 equal parts.

Let coordinates of point $P = (x_1, y_1)$, $Q=(x_2, y_2)$ *and* $R=(x_3, y_3)$

We know AP = PQ = QR = RS.

It means, point P divides line segment AB in 1:3.

Using Section formula to find coordinates of point P, we get

$$x_1=\frac{(-2)\times 3+2\times 1}{1+3}=\frac{-6+2}{4}=\frac{-4}{4}=-1$$

$$y_1=\frac{2\times 3+8\times 1}{1+3}=\frac{6+8}{4}=\frac{14}{4}=\frac{7}{2}$$

Since, AP = PQ = QR = RS.

It means, point Q is the mid-point of AB.

Using Section formula to find coordinates of point Q, we get

$$x_2 = \frac{(-2)\times 1 + 2\times 1}{1+1} = \frac{-2+2}{2} = \frac{0}{2} = 0$$

$$y_2 = \frac{2\times 1 + 8\times 1}{1+1} = \frac{2+8}{2} = \frac{10}{2} = 5$$

Because, AP = PQ = QR = RS.

It means, point R divides line segment AB in 3:1

Using Section formula to find coordinates of point P, we get

$$x_3 = \frac{(-2)\times 1 + 2\times 3}{1+3} = \frac{-2+6}{4} = \frac{4}{4} = 1$$

$$y_3 = \frac{2\times 1 + 8\times 3}{1+3} = \frac{2+24}{4} = \frac{26}{4} = \frac{13}{2}$$

Therefore, P = $(-1, \frac{7}{2})$, Q= $(0, 5)$ and R = $(1, \frac{13}{2})$

10. Find the area of a rhombus if its vertices are (3, 0), (4, 5), (−1, 4) and (−2, −1) taken in order. {Hint: Area of a rhombus = $\frac{1}{2}$ (product of its diagonals)}

Ans. Let A = (3, 0), B = (4, 5), C = (−1, 4) and D = (−2, −1)

Using Distance Formula to find length of diagonal AC, we get

$$AC = \sqrt{[3-(-1)]^2 + (0-4)^2} = \sqrt{4^2 + (-4)^2} = \sqrt{16+16} = \sqrt{32} = 4\sqrt{2}$$

Using Distance Formula to find length of diagonal BD, we get

$$BD = \sqrt{[4-(-2)]^2 + [5-(-1)]^2} = \sqrt{6^2 + 6^2} = \sqrt{36+36} = \sqrt{72} = 6\sqrt{2}$$

∵ Area of rhombus = ½ (product of its diagonals)

$$= \frac{1}{2}\times AC\times BD = \frac{1}{2}\times 4\sqrt{2}\times 6\sqrt{2} = 24 \text{ sq. units}$$

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