



Co-Ordinate Geometry Ex 14.3 Q39

Answer :

We have two points A $(-2, -2)$ and B $(2, -4)$. Let P be any point which divide AB as,

$$AP = \frac{3}{7} AB$$

Since,

$$AB = (AP + BP)$$

So,

$$7AP = 3AB$$

$$7AP = 3(AP + BP)$$

$$4AP = 3BP$$

$$\frac{AP}{BP} = \frac{3}{4}$$

Now according to the section formula if any point P divides a line segment joining A (x_1, y_1) and

B (x_2, y_2) in the ratio m: n internally then,

$$P(x, y) = \left(\frac{nx_1 + mx_2}{m+n}, \frac{ny_1 + my_2}{m+n} \right)$$

Therefore P divides AB in the ratio 3: 4. So,

$$\begin{aligned} P(x, y) &= \left(\frac{3(2) + 4(-2)}{3+4}, \frac{3(-4) + 4(-2)}{3+4} \right) \\ &= \left(-\frac{2}{7}, -\frac{20}{7} \right) \end{aligned}$$

Co-Ordinate Geometry Ex 14.3 Q40

Answer :

The co-ordinates of the midpoint (x_m, y_m) between two points (x_1, y_1) and (x_2, y_2) is given by,

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

Here we are supposed to find the points which divide the line joining A $(-2, 2)$ and B $(2, 8)$ into 4 equal parts.

We shall first find the midpoint M (x, y) of these two points since this point will divide the line into two equal parts.

$$(x_m, y_m) = \left(\left(\frac{-2+2}{2} \right), \left(\frac{2+8}{2} \right) \right)$$

$$(x_m, y_m) = (0, 5)$$

So the point M $(0, 5)$ splits this line into two equal parts.

Now, we need to find the midpoint of A $(-2, 2)$ and M $(0, 5)$ separately and the midpoint of B $(2, 8)$ and M $(0, 5)$. These two points along with M $(0, 5)$ split the line joining the original two points into four equal parts.

Let $M_1(e, d)$ be the midpoint of A $(-2, 2)$ and M $(0, 5)$.

$$(e, d) = \left(\left(\frac{-2+0}{2} \right), \left(\frac{2+5}{2} \right) \right)$$

$$(e, d) = \left(-1, \frac{7}{2} \right)$$

Now let $M_2(g, h)$ be the midpoint of B $(2, 8)$ and M $(0, 5)$.

$$(g, h) = \left(\left(\frac{2+0}{2} \right), \left(\frac{8+5}{2} \right) \right)$$

$$(g, h) = \left(1, \frac{13}{2} \right)$$

Hence the co-ordinates of the points which divide the line joining the two given points are

$$\left(-1, \frac{7}{2} \right), (0, 5) \text{ and } \left(1, \frac{13}{2} \right).$$

Co-Ordinate Geometry Ex 14.3 Q41

Answer :

We have triangle $\triangle ABC$ in which the co-ordinates of the vertices are A (4, 2); B (6, 5) and C (1, 4)

(i) It is given that median from vertex A meets BC at D. So, D is the mid-point of side BC.

In general to find the mid-point $P(x, y)$ of two points $A(x_1, y_1)$ and $B(x_2, y_2)$ we use section formula as,

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

Therefore mid-point D of side BC can be written as,

$$D(x, y) = \left(\frac{6+1}{2}, \frac{5+4}{2} \right)$$

Now equate the individual terms to get,

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

$$y = \frac{9}{2}$$

So co-ordinates of D is $\left(\frac{7}{2}, \frac{9}{2} \right)$

(ii) We have to find the co-ordinates of a point P which divides AD in the ratio 2: 1 internally.

Now according to the section formula if any point P divides a line segment joining $A(x_1, y_1)$ and

$B(x_2, y_2)$ in the ratio m: n internally then,

$$P(x, y) = \left(\frac{nx_1 + mx_2}{m+n}, \frac{ny_1 + my_2}{m+n} \right)$$

P divides AD in the ratio 2: 1. So,

$$\begin{aligned} P(x, y) &= \left(\frac{2\left(\frac{7}{2}\right) + 4(1)}{1+2}, \frac{2\left(\frac{9}{2}\right) + 1(2)}{1+2} \right) \\ &= \left(\frac{11}{3}, \frac{11}{3} \right) \end{aligned}$$

(iii) We need to find the mid-point of sides AB and AC. Let the mid-points be F and E for the sides AB and AC respectively.

Therefore mid-point F of side AB can be written as,

$$F(x, y) = \left(\frac{6+4}{2}, \frac{5+2}{2} \right)$$

So co-ordinates of F is $\left(5, \frac{7}{2} \right)$

Similarly mid-point E of side AC can be written as,

$$E(x, y) = \left(\frac{1+4}{2}, \frac{4+2}{2} \right)$$

So co-ordinates of E is $\left(\frac{5}{2}, 3 \right)$

Q divides BE in the ratio 2: 1. So,

$$\begin{aligned} Q(x, y) &= \left(\frac{2\left(\frac{5}{2}\right) + 6(1)}{1+2}, \frac{2(3) + 1(5)}{1+2} \right) \\ &= \left(\frac{11}{3}, \frac{11}{3} \right) \end{aligned}$$

Similarly, R divides CF in the ratio 2: 1. So,

$$\begin{aligned} R(x, y) &= \left(\frac{2(5) + 1(1)}{1+2}, \frac{2\left(\frac{7}{2}\right) + 1(4)}{1+2} \right) \\ &= \left(\frac{11}{3}, \frac{11}{3} \right) \end{aligned}$$

(iv) We observe that the point P, Q and R coincides with the centroid. This also shows that centroid divides the median in the ratio 2: 1.

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