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,

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

Since,

$$\mathrm{AB} = (\mathrm{AP} + \mathrm{BP})$$

So,

$$7\mathrm{AP} = 3\mathrm{AB}$$
$$7\mathrm{AP} = 3(\mathrm{AP} + \mathrm{BP})$$
$$4\mathrm{AP} = 3\mathrm{BP}$$
$$\frac{\mathrm{AP}}{\mathrm{BP}} = \frac{3}{4}$$

Now according to the section formula if any point P divides a line segment joining $\mathrm{A}(x_1, y_1)$ and $\mathrm{B}(x_2, y_2)$ in the ratio m: n internally than,

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

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

$$\mathrm{P}(x, y) = \left(\frac{3(2)+4(-2)}{3+4}, \frac{3(-4)+4(-2)}{3+4}\right)$$
$$= \boxed{\left(-\frac{2}{7}, -\frac{20}{7}\right)}$$

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 $M_2(g, h)$ bet 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

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

Co-Ordinate Geometry Ex 14.3 Q41

Answer :

We have triangle $\Delta\mathrm{ABC}$ 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 $\mathrm{P}(x, y)$ of two points $\mathrm{A}(x_1, y_1)$ and $\mathrm{B}(x_2, y_2)$ we use section formula as,

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

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

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

Now equate the individual terms to get,

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

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

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

(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 $\mathrm{A}(x_1, y_1)$ and $\mathrm{B}(x_2, y_2)$ in the ratio m: n internally than,

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

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

$$\mathrm{P}(x, y) = \left(\frac{2\left(\frac{7}{2}\right) + 4(1)}{1+2}, \frac{2\left(\frac{9}{2}\right) + 1(2)}{1+2}\right)$$

$$= \boxed{\left(\frac{11}{3}, \frac{11}{3}\right)}$$

(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,

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

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

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

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

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

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

$$\mathrm{Q}(x, y) = \left(\frac{2\left(\frac{5}{2}\right) + 6(1)}{1+2}, \frac{2(3) + 1(5)}{1+2}\right)$$

$$= \boxed{\left(\frac{11}{3}, \frac{11}{3}\right)}$$

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

$$\mathrm{R}(x, y) = \left(\frac{2(5) + 1(1)}{1+2}, \frac{2\left(\frac{7}{2}\right) + 1(4)}{1+2}\right)$$

$$= \boxed{\left(\frac{11}{3}, \frac{11}{3}\right)}$$

(iv)We observe that 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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