Co-Ordinate Geometry Ex 14.3 Q29

Answer :

We have to find the lengths of the medians of a triangle whose co-ordinates of the vertices are A (5, 1); B (1, 5) and C (−3,−1).

So we should find the mid-points of the sides of the triangle.

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 P of side AB can be written as,

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

Now equate the individual terms to get,

$x = 3$

$y = 3$

So co-ordinates of P is (3, 3)

Similarly mid-point Q of side BC can be written as,

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

Now equate the individual terms to get,

$x = -1$

$y = 2$

So co-ordinates of Q is (−1, 2)

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

$$R(x,y)=\left(\frac{5-3}{2},\frac{1-1}{2}\right)$$

Now equate the individual terms to get,

$$x=1$$

$$y=0$$

So co-ordinates of R is (1, 0)

Therefore length of median from A to the side BC is,

$$\begin{aligned}AQ&=\sqrt{(5+1)^2+(1-2)^2}\\&=\sqrt{36+1}\\&=\boxed{\sqrt{37}}\end{aligned}$$

Similarly length of median from B to the side AC is,

$$\begin{aligned}BR&=\sqrt{(1-1)^2+(5-0)^2}\\&=\sqrt{25}\\&=\boxed{5}\end{aligned}$$

Similarly length of median from C to the side AB is

$$\begin{aligned}CP&=\sqrt{(-3-3)^2+(-1-3)^2}\\&=\sqrt{36+16}\\&=\boxed{2\sqrt{13}}\end{aligned}$$

Co-Ordinate Geometry Ex 14.3 Q30

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 $A(-4,0)$ and $B(0,6)$ 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

$$(x_m, y_m)=\left(\left(\frac{-4+0}{2}\right),\left(\frac{0+6}{2}\right)\right)$$

$$(x_m, y_m)=(-2,3)$$

So the point $M(-2,3)$ splits this line into two equal parts.

Now, we need to find the midpoint of $A(-4,0)$ and $M(-2,3)$ separately and the midpoint of $B(0,6)$ and $M(-2,3)$. These two points along with $M(-2,3)$ split the line joining the original two points into four equal parts.

Let $M_1(e,d)$ be the midpoint of $A(-4,0)$ and $M(-2,3)$.

$$(e,d)=\left(\left(\frac{-4-2}{2}\right),\left(\frac{0+3}{2}\right)\right)$$

$$(e,d)=\left(-3,\frac{3}{2}\right)$$

Now let $M_2(g,h)$ bet the midpoint of $B(0,6)$ and $M(-2,3)$.

$$(g,h)=\left(\left(\frac{0-2}{2}\right),\left(\frac{6+3}{2}\right)\right)$$

$$(g,h)=\left(-1,\frac{9}{2}\right)$$

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

$$\boxed{\left(-3,\frac{3}{2}\right),\ (-2,3)\ \text{and}\ \left(-1,\frac{9}{2}\right)}.$$

Co-Ordinate Geometry Ex 14.3 Q31

Answer :

We have two points A (5, 7) and B (3, 9) which form a line segment and similarly C (8, 6) and D (0, 10) form another line segment.

We have to prove that mid-point of AB is also the mid-point of CD.

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 P of line segment AB can be written as,

$$P(x,y)=\left(\frac{5+3}{2},\frac{7+9}{2}\right)$$

Now equate the individual terms to get,

$x=4$

$y=8$

So co-ordinates of P is (4, 8)

Similarly mid-point Q of side CD can be written as,

$$Q(x,y)=\left(\frac{8+0}{2},\frac{6+10}{2}\right)$$

Now equate the individual terms to get,

$x=4$

$y=8$

So co-ordinates of Q is (4, 8)

Hence the point P and Q coincides.

Thus mid-point of AB is also the mid-point of CD.

********** END **********