



### Co-Ordinate Geometry Ex 14.3 Q8

**Answer :**

The distance  $d$  between two points  $(x_1, y_1)$  and  $(x_2, y_2)$  is given by the formula

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

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, it is given that the three vertices of a triangle are  $A(-1, 3)$ ,  $B(1, -1)$  and  $C(5, 1)$ .

The median of a triangle is the line joining a vertex of a triangle to the mid-point of the side opposite this vertex.

Let ' $D$ ' be the mid-point of the side ' $BC$ '.

Let us now find its co-ordinates.

$$(x_D, y_D) = \left( \left( \frac{1+5}{2} \right), \left( \frac{-1+1}{2} \right) \right)$$

$$(x_D, y_D) = (3, 0)$$

Thus we have the co-ordinates of the point as  $D(3, 0)$ .

Now, let us find the length of the median ' $AD$ '.

$$\begin{aligned} AD &= \sqrt{(-1-3)^2 + (3-0)^2} \\ &= \sqrt{(-4)^2 + (3)^2} \\ &= \sqrt{16+9} \end{aligned}$$

$$AD = 5$$

Thus the length of the median through the vertex ' $A$ ' of the given triangle is **5 units**.

### Co-Ordinate Geometry Ex 14.3 Q9

**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,

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

Let the three vertices of the triangle be  $A(x_A, y_A)$ ,  $B(x_B, y_B)$  and  $C(x_C, y_C)$ .

The three midpoints are given. Let these points be  $M_{AB}(1, 1)$ ,  $M_{BC}(2, -3)$  and  $M_{CA}(3, 4)$ .

Let us now equate these points using the earlier mentioned formula,

$$(1, 1) = \left( \left( \frac{x_A + x_B}{2} \right), \left( \frac{y_A + y_B}{2} \right) \right)$$

Equating the individual components we get,

$$x_A + x_B = 2$$

$$y_A + y_B = 2$$

Using the midpoint of another side we have,

$$(2, -3) = \left( \left( \frac{x_B + x_C}{2} \right), \left( \frac{y_B + y_C}{2} \right) \right)$$

Equating the individual components we get,

$$x_B + x_C = 4$$

$$y_B + y_C = -6$$

Using the midpoint of the last side we have,

$$(3, 4) = \left( \left( \frac{x_A + x_C}{2} \right), \left( \frac{y_A + y_C}{2} \right) \right)$$

Equating the individual components we get,

$$x_B + x_C = 4$$

$$y_B + y_C = -6$$

Using the midpoint of the last side we have,

$$(3, 4) = \left( \left( \frac{x_A + x_C}{2} \right), \left( \frac{y_A + y_C}{2} \right) \right)$$

Equating the individual components we get,

$$x_A + x_C = 6$$

$$y_A + y_C = 8$$

Adding up all the three equations which have variable 'x' alone we have,

$$x_A + x_B + x_B + x_C + x_A + x_C = 2 + 4 + 6$$

$$2(x_A + x_B + x_C) = 12$$

$$x_A + x_B + x_C = 6$$

Substituting  $x_B + x_C = 4$  in the above equation we have,

$$x_A + x_B + x_C = 6$$

$$x_A + 4 = 6$$

$$x_A = 2$$

Therefore,

$$x_A + x_C = 6$$

$$x_C = 6 - 2$$

$$x_C = 4$$

And

$$x_A + x_B = 2$$

$$x_B = 2 - 2$$

$$x_B = 0$$

Adding up all the three equations which have variable 'y' alone we have,

$$y_A + y_B + y_B + y_C + y_A + y_C = 2 - 6 + 8$$

$$2(y_A + y_B + y_C) = 4$$

$$y_A + y_B + y_C = 2$$

Substituting  $y_B + y_C = -6$  in the above equation we have,

$$y_A + y_B + y_C = 2$$

$$y_A - 6 = 2$$

$$y_A = 8$$

Therefore,

$$y_A + y_C = 8$$

$$y_C = 8 - 8$$

$$y_C = 0$$

And

$$y_A + y_B = 2$$

$$y_B = 2 - 8$$

$$y_B = -6$$

Therefore the co-ordinates of the three vertices of the triangle are

$$A(2, 8)$$

$$B(0, -6)$$

$$C(4, 0)$$

**Answer :**

Let a  $\Delta ABC$  in which P and Q are the mid-points of sides AB and AC respectively. The coordinates are: A (1, 1); P (-2, 3) and Q (5, 2).

We have to find the co-ordinates of  $B(x_1, y_1)$  and  $C(x_2, y_2)$ .

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 P of side AB can be written as,

$$P(-2, 3) = \left( \frac{x_1 + 1}{2}, \frac{y_1 + 1}{2} \right)$$

Now equate the individual terms to get,

$$\begin{array}{l} x_1 = -5 \\ y_1 = 5 \end{array}$$

So, co-ordinates of B is (-5, 5)

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

$$Q(5, 2) = \left( \frac{x_2 + 1}{2}, \frac{y_2 + 1}{2} \right)$$

Now equate the individual terms to get,

$$\begin{array}{l} x_2 = 9 \\ y_2 = 3 \end{array}$$

So, co-ordinates of C is (9, 3)

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