Co-Ordinate Geometry Ex 14.3 Q16

Answer :

Let A (4, 3); B (6, 4); C (5, 6) and D (3, 5) be the vertices of a quadrilateral. We have to prove that the quadrilateral ABCD is a square.

So we should find the lengths of sides of quadrilateral ABCD.

$$\begin{aligned}AB &= \sqrt{(6-4)^2+(4-3)^2}\\ &= \sqrt{4+1}\\ &= \sqrt{5}\end{aligned}$$

$$\begin{aligned}BC &= \sqrt{(6-5)^2+(4-6)^2}\\ &= \sqrt{1+4}\\ &= \sqrt{5}\end{aligned}$$

$$\begin{aligned}CD &= \sqrt{(3-5)^2+(5-6)^2}\\ &= \sqrt{4+1}\\ &= \sqrt{5}\end{aligned}$$

$$\begin{aligned}AD &= \sqrt{(3-4)^2+(5-3)^2}\\ &= \sqrt{1+4}\\ &= \sqrt{5}\end{aligned}$$

All the sides of quadrilateral are equal.

So now we will check the lengths of the diagonals.

$$\begin{aligned}AC &= \sqrt{(5-4)^2+(6-3)^2}\\ &= \sqrt{1+9}\\ &= \sqrt{10}\end{aligned}$$

$$\begin{aligned}BD &= \sqrt{(6-3)^2+(4-5)^2}\\ &= \sqrt{9+1}\\ &= \sqrt{10}\end{aligned}$$

All the sides as well as the diagonals are equal. Hence ABCD is a square.

Co-Ordinate Geometry Ex 14.3 Q17

Answer :

Let A (−4,−1); B (−2,−4); C (4, 0) and D (2, 3) be the vertices of a quadrilateral. We have to prove that the quadrilateral ABCD is a rectangle.

So we should find the lengths of opposite sides of quadrilateral ABCD.

$$\begin{aligned}AB &= \sqrt{(-2+4)^2+(-4+1)^2}\\ &= \sqrt{4+9}\\ &= \sqrt{13}\end{aligned}$$

$$\begin{aligned}CD &= \sqrt{(4-2)^2+(0-3)^2}\\ &= \sqrt{4+9}\\ &= \sqrt{13}\end{aligned}$$

Opposite sides are equal. So now we will check the lengths of the diagonals.

$$\begin{aligned}AC &= \sqrt{(4+4)^2+(0+1)^2}\\ &= \sqrt{64+1}\\ &= \sqrt{65}\end{aligned}$$

$$\begin{aligned}BD &= \sqrt{(2+2)^2+(3+4)^2}\\ &= \sqrt{16+49}\\ &= \sqrt{65}\end{aligned}$$

Opposite sides are equal as well as the diagonals are equal. Hence ABCD is a rectangle.

Co-Ordinate Geometry Ex 14.3 Q18

Answer :

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

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

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,

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

Now equate the individual terms to get,

$$x=0$$
$$y=1$$

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

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

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

Now equate the individual terms to get,

$$x=3$$
$$y=0$$

So co-ordinates of Q is (3, 0)

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

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

Now equate the individual terms to get,

$$x=2$$
$$y=2$$

So co-ordinates of Q is (2, 2)

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

$$\begin{aligned}AQ&=\sqrt{(-1-3)^2+(3-0)^2}\\&=\sqrt{16+9}\\&=\boxed{5}\end{aligned}$$

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

$$\begin{aligned}BR&=\sqrt{(1-2)^2+(-1-2)^2}\\&=\sqrt{1+9}\\&=\boxed{\sqrt{10}}\end{aligned}$$

Similarly length of median from C to the side AB is

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

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