



Co-Ordinate Geometry Ex 14.3 Q42

Answer :

We have a rectangle ABCD formed by joining the points A (-1, -1); B (-1, 4); C (5, 4) and D (5, -1).

The mid-points of the sides AB, BC, CD and DA are P, Q, R, S respectively.

We have to find that whether PQRS is a square, rectangle or rhombus.

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,

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

Now equate the individual terms to get,

$$x = -1$$

$$y = \frac{3}{2}$$

So co-ordinates of P is $\left(-1, \frac{3}{2} \right)$

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

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

Now equate the individual terms to get,

$$x = 2$$

$$y = 4$$

So co-ordinates of Q is (2, 4)

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

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

Now equate the individual terms to get,

$$x = 5$$

$$y = \frac{3}{2}$$

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

Similarly mid-point S of side DA can be written as,

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

Now equate the individual terms to get,

$$x = 2$$

$$y = -1$$

So co-ordinates of S is (2, -1)

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

$$\begin{aligned} PQ &= \sqrt{(2+1)^2 + \left(4 - \frac{3}{2}\right)^2} \\ &= \sqrt{9 + \frac{25}{4}} \end{aligned}$$

$$= \frac{\sqrt{61}}{2}$$

$$QR = \sqrt{(2-5)^2 + \left(4 - \frac{3}{2}\right)^2}$$

$$= \sqrt{9 + \frac{25}{4}}$$

$$= \frac{\sqrt{61}}{2}$$

$$RS = \sqrt{(5-2)^2 + \left(\frac{3}{2} + 1\right)^2}$$

$$= \sqrt{9 + \frac{25}{4}}$$

$$= \frac{\sqrt{61}}{2}$$

$$SP = \sqrt{(2+1)^2 + \left(-1 - \frac{3}{2}\right)^2}$$

$$= \sqrt{9 + \frac{25}{4}}$$

$$= \frac{\sqrt{61}}{2}$$

All the sides of quadrilateral are equal.

So now we will check the lengths of the diagonals.

$$\begin{aligned}PR &= \sqrt{(5+1)^2 + \left(\frac{3}{2} - \frac{3}{2}\right)^2} \\&= 6 \\QS &= \sqrt{(2-2)^2 + (4+1)^2} \\&= 5\end{aligned}$$

All the sides are equal but the diagonals are unequal. Hence ABCD is a rhombus.

Co-Ordinate Geometry Ex 14.3 Q43

Answer :

Let A (-3, 2); B (-5,-5); C (2,-3) and D (4, 4) be the vertices of a quadrilateral. We have to prove that the quadrilateral ABCD is a rhombus.

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

$$\begin{aligned}AB &= \sqrt{(-5+3)^2 + (-5-2)^2} \\&= \sqrt{4+49} \\&= \sqrt{53} \\BC &= \sqrt{(2+5)^2 + (-3+5)^2} \\&= \sqrt{4+49} \\&= \sqrt{53} \\CD &= \sqrt{(4-2)^2 + (4+3)^2} \\&= \sqrt{4+49} \\&= \sqrt{53} \\AD &= \sqrt{(4+3)^2 + (4-2)^2} \\&= \sqrt{4+49} \\&= \sqrt{53}\end{aligned}$$

All the sides of quadrilateral are equal. Hence ABCD is a rhombus.

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