



Co-Ordinate Geometry Ex 14.2 Q40

Answer :

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

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

In a rhombus all the sides are equal in length. And the area 'A' of a rhombus is given as

$$A = \frac{1}{2} (\text{Product of both diagonals})$$

Here the four points are $A(3, 0)$, $B(4, 5)$, $C(-1, 4)$ and $D(-2, -1)$.

First let us check if all the four sides are equal.

$$\begin{aligned} AB &= \sqrt{(3-4)^2 + (0-5)^2} \\ &= \sqrt{(-1)^2 + (-5)^2} \\ &= \sqrt{1+25} \end{aligned}$$

$$AB = \sqrt{26}$$

$$\begin{aligned} BC &= \sqrt{(4+1)^2 + (5-4)^2} \\ &= \sqrt{(5)^2 + (1)^2} \\ &= \sqrt{25+1} \end{aligned}$$

$$BC = \sqrt{26}$$

$$\begin{aligned} CD &= \sqrt{(-1+2)^2 + (4+1)^2} \\ &= \sqrt{(1)^2 + (5)^2} \\ &= \sqrt{1+25} \end{aligned}$$

$$CD = \sqrt{26}$$

Here, we see that all the sides are equal, so it has to be a rhombus.

Hence we have proved that the quadrilateral formed by the given four vertices is a **rhombus**.

Now let us find out the lengths of the diagonals of the rhombus.

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

$$AC = 4\sqrt{2}$$

$$\begin{aligned} BD &= \sqrt{(4+2)^2 + (5+1)^2} \\ &= \sqrt{(6)^2 + (6)^2} \\ &= \sqrt{36+36} \end{aligned}$$

$$BD = 6\sqrt{2}$$

Now using these values in the formula for the area of a rhombus we have,

$$\begin{aligned} A &= \frac{(6\sqrt{2})(4\sqrt{2})}{2} \\ &= \frac{(6)(4)(2)}{2} \end{aligned}$$

$$A = 24$$

Thus the area of the given rhombus is **24 square units**.

Co-Ordinate Geometry Ex 14.2 Q41

Answer :

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

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

For three points to be collinear the sum of distances between any two pairs of points should be equal to the third pair of points.

The given points are $A(3, 1)$, $B(6, 4)$ and $C(8, 6)$.

Let us find the distances between the possible pairs of points.

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

$$AB = 3\sqrt{2}$$

$$\begin{aligned} AC &= \sqrt{(3-8)^2 + (1-6)^2} \\ &= \sqrt{(-5)^2 + (-5)^2} \\ &= \sqrt{25+25} \end{aligned}$$

$$AC = 5\sqrt{2}$$

$$\begin{aligned} BC &= \sqrt{(6-8)^2 + (4-6)^2} \\ &= \sqrt{(-2)^2 + (-2)^2} \\ &= \sqrt{4+4} \end{aligned}$$

$$BC = 2\sqrt{2}$$

We see that $AB + BC = AC$.

Since sum of distances between two pairs of points equals the distance between the third pair of points the three points must be collinear.

Hence, the three given points are collinear.

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