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.

$$\begin{aligned} AB &= \sqrt{(3-4)^2 + (0-5)^2} \\ &= \sqrt{(-1)^2 + (-5)^2} \\ &= \sqrt{1+25} \\ AB &= \sqrt{26} \\ BC &= \sqrt{(4+1)^2 + (5-4)^2} \\ &= \sqrt{(5)^2 + (1)^2} \\ &= \sqrt{25+1} \\ BC &= \sqrt{26} \\ CD &= \sqrt{(-1+2)^2 + (4+1)^2} \\ &= \sqrt{(1)^2 + (5)^2} \\ &= \sqrt{1+25} \\ CD &= \sqrt{26} \end{aligned}$$

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 $\boxed{\text{rhombus}}$.

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

$$\begin{aligned} AC &= \sqrt{(3+1)^2 + (0-4)^2} \\ &= \sqrt{(4)^2 + (-4)^2} \\ &= \sqrt{16+16} \\ AC &= 4\sqrt{2} \\ BD &= \sqrt{(4+2)^2 + (5+1)^2} \\ &= \sqrt{(6)^2 + (6)^2} \\ &= \sqrt{36+36} \\ BD &= 6\sqrt{2} \end{aligned}$$

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

$$\begin{aligned} A &= \frac{(6\sqrt{2})(4\sqrt{2})}{2} \\ &= \frac{(6)(4)(2)}{2} \\ A &= 24 \end{aligned}$$

Thus the area of the given rhombus is $\boxed{24 \text{ square units}}$.

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.

$$AB = \sqrt{(3-6)^2 + (1-4)^2}$$
$$= \sqrt{(-3)^2 + (-3)^2}$$
$$= \sqrt{9+9}$$
$$AB = 3\sqrt{2}$$
$$AC = \sqrt{(3-8)^2 + (1-6)^2}$$
$$= \sqrt{(-5)^2 + (-5)^2}$$
$$= \sqrt{25+25}$$
$$AC = 5\sqrt{2}$$
$$BC = \sqrt{(6-8)^2 + (4-6)^2}$$
$$= \sqrt{(-2)^2 + (-2)^2}$$
$$= \sqrt{4+4}$$
$$BC = 2\sqrt{2}$$

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 $\boxed{\text{collinear}}$.

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