Co-Ordinate Geometry Ex 14.3 Q19

Answer :

Let ABCD be a parallelogram in which the co-ordinates of the vertices are $A(a+b, a-b)$; $B(2a+b, 2a-b)$ and $C(a-b, a+b)$. We have to find the co-ordinates of the forth vertex.

Let the forth vertex be $D(x, y)$

Since ABCD is a parallelogram, the diagonals bisect each other. Therefore the mid-point of the diagonals of the parallelogram will coincide.

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,

$$P(x, y) = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

The mid-point of the diagonals of the parallelogram will coincide.

So,

$$\text{Co-ordinate of mid-point of AC} = \text{Co-ordinate of mid-point of BD}$$

Therefore,

$$\left(\frac{a+b+a-b}{2}, \frac{a-b+a+b}{2}\right) = \left(\frac{2a+b+x}{2}, \frac{2a-b+y}{2}\right)$$

$$(a, a) = \left(\frac{2a+b+x}{2}, \frac{2a-b+y}{2}\right)$$

Now equate the individual terms to get the unknown value. So,

$x = -b$

$y = b$

So the forth vertex is $\boxed{D(-b, b)}$

Co-Ordinate Geometry Ex 14.3 Q20

Answer :

We have a parallelogram ABCD in which A (3, 2) and B (−1, 0) and the co-ordinate of the intersection of diagonals is M (2,−5).

We have to find the co-ordinates of vertices C and D.

So let the co-ordinates be $C(x_1, y_1)$ and $D(x_2, y_2)$

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,

$$P(x, y) = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

The mid-point of the diagonals of the parallelogram will coincide.

So,

$$\text{Co-ordinate of mid-point of AC} = \text{Co-ordinate of M}$$

Therefore,

$$\left(\frac{3+x_1}{2}, \frac{2+y_1}{2}\right) = (2, -5)$$

Co-Ordinate Geometry Ex 14.3 Q21

Now equate the individual terms to get the unknown value. So,

$$x = 1$$

$$y = -12$$

So the co-ordinate of vertex C is (1,−12)

Similarly,

Co-ordinate of mid-point of BD = Co-ordinate of M

Therefore,

$$\left(\frac{-1+x_2}{2}, \frac{0+y_2}{2}\right) = (2, -5)$$

Now equate the individual terms to get the unknown value. So,

$$x = 5$$

$$y = -10$$

So the co-ordinate of vertex C is (5,−10)

Equating the individual components we get,

$$x_A + x_C = 10$$

$$y_A + y_C = 14$$

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

$$x_A + x_B + x_B + x_C + x_A + x_C = 6 + 8 + 10$$

$$2(x_A + x_B + x_C) = 24$$

$$x_A + x_B + x_C = 12$$

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

$$x_A + x_B + x_C = 12$$

$$x_A + 8 = 12$$

$$x_A = 4$$

Therefore,

$$x_A + x_C = 10$$

$$x_C = 10 - 4$$

$$x_C = 6$$

And

$$x_A + x_B = 6$$

$$x_B = 6 - 4$$

$$x_B = 2$$

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

$$y_A + y_B + y_B + y_C + y_A + y_C = 8 + 12 + 14$$

$$2(y_A + y_B + y_C) = 34$$

$$y_A + y_B + y_C = 17$$

Substituting $y_B + y_C = 12$ in the above equation we have,

$$\begin{aligned} y_A + y_B + y_C &= 17 \\ y_A + 12 &= 17 \\ y_A &= 5 \end{aligned}$$

Therefore,

$$\begin{aligned} y_A + y_C &= 14 \\ y_C &= 14 - 5 \\ y_C &= 9 \end{aligned}$$

And

$$\begin{aligned} y_A + y_B &= 8 \\ y_B &= 8 - 5 \\ y_B &= 3 \end{aligned}$$

Therefore the co-ordinates of the three vertices of the triangle are $\boxed{\begin{array}{l} A(4,5) \\ B(2,3) \\ C(6,9) \end{array}}$.

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