



Co-Ordinate Geometry Ex 14.5 Q1

Answer :

We know area of triangle formed by three points (x_1, y_1) , (x_2, y_2) and (x_3, y_3) is given by

$$\Delta = \frac{1}{2} |x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)|$$

(i) The vertices are given as $(6, 3)$, $(-3, 5)$, $(4, -2)$.

$$\begin{aligned}\Delta &= \frac{1}{2} |6(5+2) - 3(-2-3) + 4(3-5)| \\ &= \frac{1}{2} |6 \times 7 - 3 \times (-5) + 4 \times (-2)| \\ &= \frac{1}{2} |42 + 15 - 8| \\ &= \frac{49}{2} \text{ sq units}\end{aligned}$$

(ii) The vertices are given as $(at_1^2, 2at_1)$, $(at_2^2, 2at_2)$, $(at_3^2, 2at_3)$.

$$\begin{aligned}\Delta &= \frac{1}{2} |at_1^2(2at_2 - 2at_3) + at_2^2(2at_3 - 2at_1) + at_3^2(2at_1 - 2at_2)| \\ &= \frac{1}{2} \cdot 2a^2 |(t_1^2 t_2 - t_1^2 t_3) + (t_2^2 t_3 - t_2^2 t_1) + (t_3^2 t_1 - t_3^2 t_2)| \\ &= a^2 |(t_1^2 t_2 - t_2^2 t_1) + (t_2^2 t_3 - t_1^2 t_3) + (t_3^2 t_1 - t_3^2 t_2)| \\ &= a^2 |t_1 t_2 (t_1 - t_2) + t_3 (t_2^2 - t_1^2) + t_3^2 (t_1 - t_2)| \\ &= a^2 |(t_1 - t_2) \{t_1 t_2 - t_3 (t_2 + t_1) + t_3^2\}| \\ &= a^2 |(t_1 - t_2) \{t_1 t_2 - t_3 t_2 - t_3 t_1 + t_3^2\}| \\ &= a^2 |(t_1 - t_2) \{t_2 (t_1 - t_3) - t_3 (-t_3 + t_1)\}| \\ &= a^2 |(t_1 - t_2) (t_1 - t_3) (t_2 - t_3)| \\ \text{or, } \Delta &= a^2 (t_1 - t_2) (t_2 - t_3) (t_3 - t_1) \text{ assuming } t_1 > t_2, t_2 > t_3, t_3 > t_1\end{aligned}$$

(iii)

The vertices are given as $(a, c+a)$, (a, c) , $(-a, c-a)$.

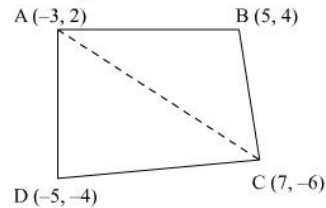
$$\begin{aligned}\Delta &= \frac{1}{2} |a(c-c+a) + a(c-a-c-a) - a(c+a-c)| \\ &= \frac{1}{2} |a(a) + a(-2a) - a(a)| \\ &= \frac{1}{2} |-2a^2| = a^2\end{aligned}$$

Co-Ordinate Geometry Ex 14.5 Q2

Answer :

(i)

Let the vertices of the quadrilateral be A (-3, 2), B (5, 4), C (7, -6), and D (-5, -4). Join AC to form two triangles $\triangle ABC$ and $\triangle ACD$.



$$\text{Area of a triangle} = \frac{1}{2} \{x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)\}$$

$$\begin{aligned} \text{Area of } \triangle ABC &= \frac{1}{2} \{-3(4 + 6) + 5(-6 - 2) + 7(2 - 4)\} \\ &= \frac{1}{2} \{-30 - 40 - 14\} = -42 \end{aligned}$$

$$\therefore \text{Area of } \triangle ABC = 42 \text{ square units}$$

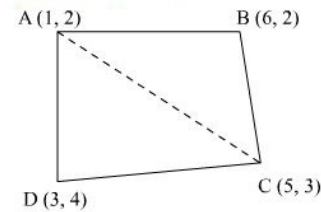
$$\begin{aligned} \text{Area of } \triangle ACD &= \frac{1}{2} \{-3(-6 + 4) + 7(-4 - 2) - 5(2 + 6)\} \\ &= \frac{1}{2} \{6 - 42 - 40\} = -38 \end{aligned}$$

$$\therefore \text{Area of } \triangle ACD = 38 \text{ square units}$$

$$\begin{aligned} \text{Area of } \square ABCD &= \text{Area of } \triangle ABC + \text{Area of } \triangle ACD \\ &= (42 + 38) \text{ square units} = 80 \text{ square units} \end{aligned}$$

(ii)

Let the vertices of the quadrilateral be A (1, 2), B (6, 2), C (5, 3), and D (3, 4). Join AC to form two triangles $\triangle ABC$ and $\triangle ACD$.



$$\text{Area of a triangle} = \frac{1}{2} \{x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)\}$$

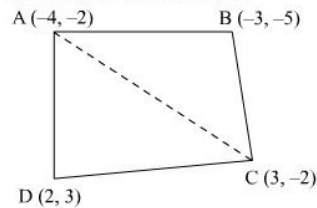
$$\begin{aligned} \text{Area of } \triangle ABC &= \frac{1}{2} \{1(2 - 3) + 6(3 - 2) + 5(2 - 2)\} \\ &= \frac{1}{2} \{-1 + 6\} = \frac{5}{2} \text{ square units} \end{aligned}$$

$$\begin{aligned} \text{Area of } \triangle ACD &= \frac{1}{2} \{1(3 - 4) + 5(4 - 2) + 3(2 - 3)\} \\ &= \frac{1}{2} \{-1 + 10 - 3\} = 3 \text{ square units} \end{aligned}$$

$$\begin{aligned} \text{Area of } \square ABCD &= \text{Area of } \triangle ABC + \text{Area of } \triangle ACD \\ &= \left(\frac{5}{2} + 3\right) \text{ square units} = \frac{11}{2} \text{ square units} \end{aligned}$$

(iii)

Let the vertices of the quadrilateral be A (-4, -2), B (-3, -5), C (3, -2), and D (2, 3). Join AC to form two triangles $\triangle ABC$ and $\triangle ACD$.



$$\text{Area of a triangle} = \frac{1}{2} \{x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)\}$$

$$\text{Area of } \triangle ABC = \frac{1}{2} [(-4)\{(-5) - (-2)\} + (-3)\{(-2) - (-2)\} + 3\{(-2) - (-5)\}]$$

$$= \frac{1}{2}(12 + 0 + 9) = \frac{21}{2} \text{ square units}$$

$$\text{Area of } \triangle ACD = \frac{1}{2} [(-4)\{(-2) - (3)\} + 3\{(3) - (-2)\} + 2\{(-2) - (-2)\}]$$

$$= \frac{1}{2} \{20 + 15 + 0\} = \frac{35}{2} \text{ square units}$$

$$\text{Area of } \square ABCD = \text{Area of } \triangle ABC + \text{Area of } \triangle ACD$$

$$= \left(\frac{21}{2} + \frac{35}{2} \right) \text{ square units} = 28 \text{ square units}$$

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