

Mathematics

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(Chapter – 12) (Heron's Formula)(Exemplar Problems)

(Class – IX)

Exercise 12.3

Question 8:

The sides of a quadrilateral ABCD are 6 cm, 8cm, 12 cm and 14 cm (taken in order) respectively, and the angle between the first two sides is a right angle. Find its area.

Answer 8:

Given ABCD is a quadrilateral having sides AB = 6cm, BC = 8cm, CD = 12cm and DA = 14cm. Now, join AC.

We have, ABC is a right angled triangle at B.

$$\text{Now, } AC^2 = AB^2 + BC^2 \quad \text{[by Pythagoras theorem]}$$

$$= 6^2 + 8^2 = 36 + 64 = 100$$

$$\Rightarrow AC = 10 \text{ cm} \quad \text{[Taking positive square root]}$$

∴ Area of quadrilateral ABCD = Area of ΔABC + Area of ΔACD

$$\text{Now, area of } \Delta ABC = \frac{1}{2} \times AB \times BC \quad \text{[} \because \text{ area of triangle} = \frac{1}{2} (\text{base} \times \text{height})]$$

$$= \frac{1}{2} \times 6 \times 8 = 24 \text{ cm}^2$$

In ΔACD , AC = a = 10cm, CD = b = 12cm and DA = c = 14 cm

$$\text{Now, Semi - perimeter } \Delta ACD, s = \frac{a+b+c}{2} = \frac{10+12+14}{2} = \frac{36}{2} = 18 \text{ cm}$$

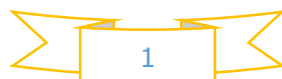
$$\therefore \text{In } \Delta ACD = \sqrt{s(s-a)(s-b)(s-c)} \quad \text{[by Heron's formula]}$$

$$= \sqrt{18(18-10)(18-12)(18-14)}$$

$$= \sqrt{18 \times 8 \times 6 \times 4}$$

$$= \sqrt{(3)^2 \times 2 \times 4 \times 2 \times 3 \times 2 \times 4}$$

$$= 3 \times 4 \times 2 \times \sqrt{3 \times 2} = 24\sqrt{6} \text{ cm}^2$$



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Area of quadrilateral ABCD

= Area of ΔABC + Area of ΔACD

$$= 24 + 24\sqrt{6}$$

$$= 24(1 + \sqrt{6})\text{cm}^2$$

Hence, the area of quadrilateral is $24(1 + \sqrt{6})\text{ cm}^2$.

