

# CLASS 9 · HOTS · OLYMPIAD PREPARATION · SHORT NOTES

## Chapter 6: HOTS: Perimeter and Area (Class 9)

Topic-wise short notes with solved examples

Higher order thinking questions on perimeter and area for Class 9: Heron's formula, quadrilaterals split into triangles, rhombuses and wires bent into new shapes, each with a full solution.

### 1 Solved HOTS questions

- Tools: Heron's formula  $\text{Area} = \sqrt{s(s-a)(s-b)(s-c)}$  with  $s = \frac{a+b+c}{2}$ ; equilateral triangle of side  $a$ : area  $\frac{\sqrt{3}}{4}a^2$ ; rhombus: area  $= \frac{1}{2}d_1d_2$ , and the diagonals bisect each other at right angles. Split a quadrilateral into triangles. When a wire is bent into another shape, the **perimeter** stays the same.

**Example 1.1** Find the area of a triangle with sides 17 cm, 25 cm and 26 cm.

SOLUTION

$$s = \frac{17 + 25 + 26}{2} = 34.$$

$$\text{Area} = \sqrt{34 \times 17 \times 9 \times 8} = \sqrt{41616}.$$

$$204^2 = 41616.$$

**204 square cm**

**Example 1.2** In quadrilateral ABCD,  $\angle B = 90^\circ$ ,  $AB = 3$  cm,  $BC = 4$  cm,  $CD = 12$  cm and  $DA = 13$  cm. Find its area.

SOLUTION

$$AC = \sqrt{9 + 16} = 5 \text{ cm. Area of triangle ABC} = \frac{1}{2} \times 3 \times 4 = 6.$$

In triangle ACD:  $5^2 + 12^2 = 25 + 144 = 169 = 13^2$ , so the angle at C is  $90^\circ$  and the area is  $\frac{1}{2} \times 5 \times 12 = 30$ .

$$\text{Total area} = 6 + 30.$$

**36 square cm**

**Example 1.3** The perimeter of an equilateral triangle is 60 cm. Find its area.

SOLUTION

$$\text{Side} = 20 \text{ cm. Area} = \frac{\sqrt{3}}{4} \times 20^2 = 100\sqrt{3}.$$

**$100\sqrt{3}$  square cm, about 173.2 square cm**

**Example 1.4** A wire in the form of a square of side 22 cm is bent into a circle. Find the area of the circle (take  $\pi = \frac{22}{7}$ ).

SOLUTION

The length of the wire is  $4 \times 22 = 88$  cm, so  $2\pi r = 88$  and  $r = 14$  cm.

$$\text{Area} = \frac{22}{7} \times 14 \times 14 = 616.$$

**616 square cm**

**Example 1.5** The perimeter of a rhombus is 52 cm and one diagonal is 24 cm. Find the other diagonal and the area.

SOLUTION

Side = 13 cm. Half of the given diagonal is 12 cm.

Half of the other diagonal =  $\sqrt{13^2 - 12^2} = 5$  cm, so the other diagonal is 10 cm.

$$\text{Area} = \frac{1}{2} \times 24 \times 10 = 120.$$

**10 cm and 120 square cm**