

### Exercise 10.1

1. A traffic signal board, indicating 'SCHOOL AHEAD', is an equilateral triangle with side ' $a$ '. Find the area of the signal board, using Heron's formula. If its perimeter is 180 cm, what will be the area of the signal board?

**Sol.** Triangle is an equilateral triangle of side  $a$ .

$$\therefore s = \frac{a + a + a}{2} = \frac{3a}{2}.$$

Using Heron's formula, we get

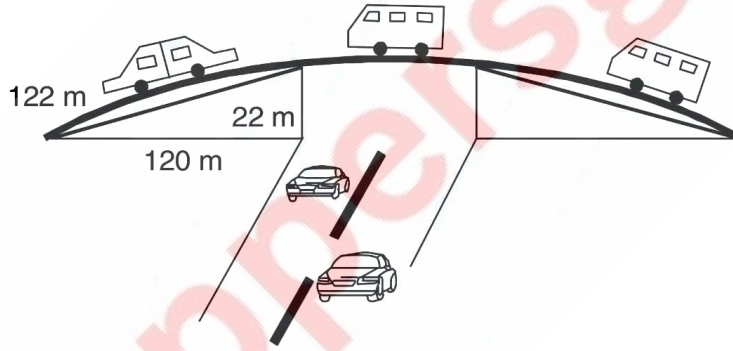
$$\begin{aligned}\text{Area of the triangle} &= \sqrt{\frac{3a}{2} \left( \frac{3a}{2} - a \right) \left( \frac{3a}{2} - a \right) \left( \frac{3a}{2} - a \right)} \\ &= \sqrt{\frac{3a}{2} \times \frac{a}{2} \times \frac{a}{2} \times \frac{a}{2}} = \frac{\sqrt{3}}{4} a^2\end{aligned}$$

If perimeter = 180 cm, then side =  $\frac{180}{3} = 60$  cm.

$\therefore$  Area of the triangle

$$= \frac{\sqrt{3}}{4} \times (60)^2 = 900\sqrt{3} \text{ cm}^2.$$

2. The triangular side walls of a flyover have been used for advertisements. The sides of the walls are 122 m, 22 m and 120 m (see figure). The advertisements yield an earning of ₹ 5000 per  $\text{m}^2$  per year. A company hired one of its walls for 3 months. How much rent did it pay?



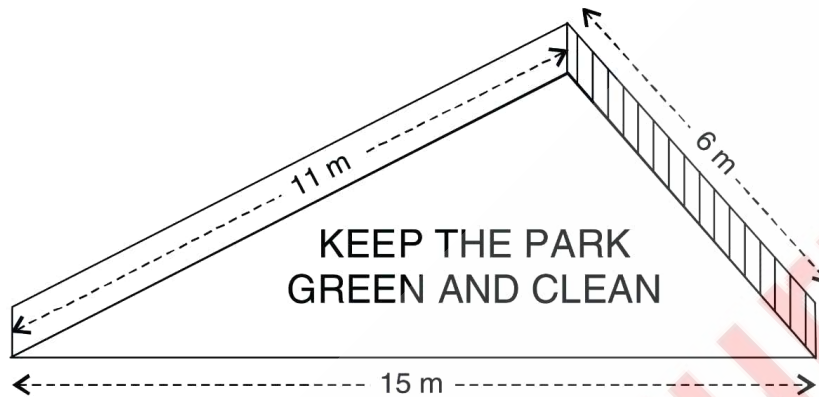
**Sol.** Sides of triangular region for advertisements are 122 m, 120 m, 22 m.

$$\therefore s = \frac{122 + 120 + 22}{2} = \frac{264}{2} = 132 \text{ m.}$$

$$\begin{aligned}\therefore \text{Area} &= \sqrt{(132)(132 - 122)(132 - 120)(132 - 22)} \text{ m}^2 \\ &= \sqrt{132 \times 10 \times 12 \times 110} \text{ m}^2 \\ &= \sqrt{11 \times 12 \times 10 \times 12 \times 11 \times 10} \text{ m}^2 \\ &= 10 \times 11 \times 12 \text{ m}^2 = 1320 \text{ m}^2.\end{aligned}$$

$$\begin{aligned}\text{Rent paid for 3 months} &= ₹ 1320 \times 5000 \times \frac{3}{12} \\ &= ₹ 16,50,000.\end{aligned}$$

3. There is a slide in a park. One of its side walls has been painted in some colour with a message “KEEP THE PARK GREEN AND CLEAN” (see figure). If the sides of the wall are 15 m, 11 m and 6 m, find the area painted in colour.



**Sol.** As the sides of the wall are 15 m, 11 m and 6 m.

$$\therefore s = \frac{15 + 11 + 6}{2} = \frac{32}{2} = 16 \text{ m.}$$

$$\begin{aligned} \therefore \text{Area} &= \sqrt{16(16 - 15)(16 - 11)(16 - 6)} \\ &= \sqrt{16 \times 1 \times 5 \times 10} = \sqrt{800} = 20\sqrt{2} \text{ m}^2. \end{aligned}$$

4. Find the area of a triangle two sides of which are 18 cm and 10 cm and the perimeter is 42 cm.

**Sol.** Perimeter = 42 cm. Third side =  $(42 - 18 - 10) \text{ cm} = 14 \text{ cm}$ .

$$\therefore s = \frac{42}{2} = 21 \text{ cm}$$

$$\begin{aligned} \therefore \text{Area} &= \sqrt{21(21 - 18)(21 - 10)(21 - 14)} \text{ cm}^2 \\ &= \sqrt{21 \times 3 \times 11 \times 7} \text{ cm}^2 = 21\sqrt{11} \text{ cm}^2. \end{aligned}$$

5. Sides of a triangle are in the ratio of 12 : 17 : 25 and its perimeter is 540 cm. Find its area.

**Sol.** Let the sides be  $12x$ ,  $17x$  and  $25x$ .

$$\text{We have } 12x + 17x + 25x = 540$$

$$\Rightarrow 54x = 540 \Rightarrow x = 10.$$

Therefore, sides are 120 cm, 170 cm and 250 cm.

Also, semiperimeter,  $s = \frac{540}{2} = 270$  cm

Applying Heron's formula, we obtain

Area of the triangle

$$= \sqrt{270(270 - 120)(270 - 170)(270 - 250)}$$

$$= \sqrt{270 \times 150 \times 100 \times 20}$$

$$= \sqrt{9 \times 30 \times 30 \times 5 \times 100 \times 2 \times 10}$$

$$= 3 \times 30 \times 10 \times 10 = 9000 \text{ cm}^2.$$

- 6.** *An isosceles triangle has perimeter 30 cm and each of the equal sides is 12 cm. Find the area of the triangle.*

**Sol.** Each equal side of the isosceles triangle is 12 cm.

$$\therefore \text{Third side} = (30 - 12 - 12) \text{ cm} = 6 \text{ cm.}$$

So, sides of triangle are 12 cm, 12 cm and 6 cm.

$$\therefore s = \frac{12 + 12 + 6}{2} = 15$$

$$\text{Now, area} = \sqrt{15(15 - 12)(15 - 12)(15 - 6)}$$

$$= \sqrt{15 \times 3 \times 3 \times 9} = 9\sqrt{15} \text{ cm}^2.$$

