Q. A traffic signal board, indicating 'School Ahead', is an equilateral triangle with side 'a'. Find the area of signal board, using Heron's formula. If the perimeter is 180cm, what will the area of the school board?

$$s = \frac{a+b+c}{2} = \frac{a+a+a}{2} = \frac{3a}{2}$$

$$\text{Area of } \Delta = \sqrt{s(s-a)(s-b)(s-c)}$$

$$= \sqrt{\frac{3}{a}\left(\frac{3a}{2}-a\right)\left(\frac{3a}{2}-a\right)\left(\frac{3a}{2}-a\right)}$$

$$= \sqrt{3 \cdot \underbrace{\frac{a}{2} \cdot \frac{a}{2}}_{} \cdot \underbrace{\frac{a}{2} \cdot \frac{a}{2}}_{}}$$

$$= \sqrt{3} \cdot \frac{a}{2} \cdot \frac{a}{2} = \frac{\sqrt{3}}{4} a^2$$

ii) 180cm (Perimeter)

$3 \text{ side} = 180$

$\text{side} = \frac{180}{3} = 60\text{cm}$

$$\text{Area of } \Delta = \frac{\sqrt{3}}{4} \times a^2 = \frac{\sqrt{3}}{4} \times 60 \times 60 \text{ cm}^2$$

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

$$= 900\sqrt{3} \text{ cm}^2$$

Exercise: 12.1

Q2. The triangular side walls of a flyover have been used for advertisements. The sides of the walls are 122m, 22m and 120m. The advertisements yield an earning of Rs. 5000 per m^2 per year. A company hired one of its walls for 3 months. How much rent did it pay?

→ Sides of the two triangular walls below the bridge are 122m, 22m and 120m.

$$s = \frac{122m + 22m + 120m}{2} = 132m$$

Area of one triangular wall

$$= \sqrt{132 \times (132-122)(132-22)(132-120)}$$

$$= \sqrt{132 \times 10 \times 110 \times 12}\ m^2 = 1320\ m^2$$

Company hired only one wall for 3 months. Thus, earning from advertisements for 3 months at the rate of Rs. 5000 per m^2 per year.

$$\Rightarrow Rs.\ 5000 \times \frac{3}{12} \times 1320 = Rs.\ 16,50,000$$

Q3. 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". If the sides

of walls are 15m, 11m and 6m, find the area painted in colour.

Ans ⇒ The sides of the triangular wall be 15m, 11m and 6m.

$$s = \frac{15m + 11m + 6m}{2} = 16m$$

Area of the wall

$$\Rightarrow \sqrt{16 \times (16-15) \times (16-11) \times (16-6)}\ m^2$$

$$= \sqrt{16 \times 1 \times 5 \times 10}\ m^2$$

$$= 20\sqrt{2}\ m^2$$

Q4. Find the area of a triangular two sides of which are 18cm, 10cm and the perimeter is 42cm.

$a = 18cm$,

$b = 10cm$

Perimeter = 42cm

We have $a + b + c = 42$

$\Rightarrow c = 14cm$

$$s = \frac{a+b+c}{2} = \frac{42}{2} = 21\ cm$$

Area of $\Delta = \sqrt{s(s-a)(s-b)(s-c)}$

$$= \sqrt{21(21-18)(21-10)(21-14)}$$

$$= \sqrt{21(3)(11)(7)}$$

$$= 3 \times 7 \times \sqrt{11}$$

$$= 21\sqrt{11}\ cm^2$$

Q5. Sides of Δ are in the ratio of 12:17:25 and its perimeter is 540cm. Find its area.

→ Let the sides of triangle be 12k, 17k, 25k

Perimeter = 12k + 17k + 25k = 54k.

⇒ 54k = 540

k = 10

⇒ a = 12 × k = 12 × 10 = 120

⇒ b = 17 × k = 17 × 10 = 170

⇒ c = 25 × k = 25 × 10 = 250

$s = \frac{a+b+c}{2} = \frac{540}{2} = 270$

Area = $\sqrt{s(s-a)(s-b)(s-c)}$

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

= $\sqrt{270(150)(100)(20)}$

= $3 \times 30 \times 5 \times 20 cm^2 = 9000 cm^2$

Q6 An isosceles triangle has perimeter 30cm and each of the equal sides is 12cm. Find the area of triangle.

Ans- a = 12cm

b = 12cm

Perimeter = 30cm

⇒ c = 30 − 24 = 6cm

$s = \frac{30}{2} = 15cm$

Area of Δ = $\sqrt{s(s-a)(s-b)(s-c)}$

= $\sqrt{15(15-12)(15-12)(15-6)}$

$\Rightarrow \sqrt{15 \cdot 3 \cdot 3 \cdot 9} = 9\sqrt{15}\,cm^2$