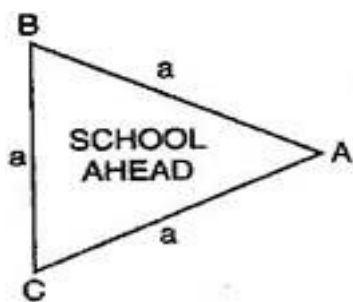


CBSE Class 9 Mathematics
NCERT Solutions
CHAPTER 12
Heron's Formula(Ex. 12.1)

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?



Ans. Let the Traffic signal board is $\triangle ABC$.

According to question, Semi-perimeter of $\triangle ABC$ (s) = $\frac{a+a+a}{2} = \frac{3a}{2}$

Using Heron's Formula, Area of triangle ABC = $\sqrt{s(s-a)(s-b)(s-c)}$

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

$$= \sqrt{\frac{3a}{2} \times \frac{a}{2} \times \frac{a}{2} \times \frac{a}{2}} = \sqrt{3 \left(\frac{a}{2} \right)^4}$$

$$= \frac{\sqrt{3}a^2}{4} \text{ square units}$$

Now, Perimeter of this triangle = 180 cm

$$\Rightarrow 3 \times \text{Side of triangle } (a) = 180 \text{ cm}$$

$$\Rightarrow \text{Side of triangle } (a) = \frac{180}{3} = 60 \text{ cm}$$

$$\Rightarrow \text{Semi-perimeter of this triangle} = \frac{180}{2} = 90 \text{ cm}$$

$$\text{Using Heron's Formula, Area of this triangle} = \sqrt{s(s-a)(s-b)(s-c)}$$

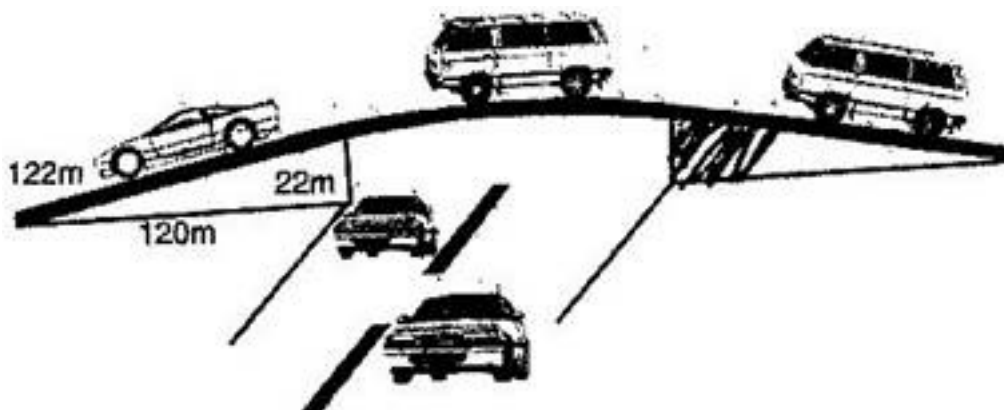
$$= \sqrt{90(90-60)(90-60)(90-60)}$$

$$= \sqrt{90 \times 30 \times 30 \times 30}$$

$$= 30 \times 30 \sqrt{3}$$

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

2. The triangular side walls of a flyover has been used for advertisements. The sides of the walls are 122 m, 22 m and 120 m (see figure). The advertisement 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?



Ans. Given: $a = 122 \text{ m}$, $b = 22 \text{ m}$ and $c = 120 \text{ m}$

$$\text{Semi-perimeter of triangle } (s) = \frac{122+22+120}{2} = \frac{264}{2} = 132 \text{ m}$$

Using Heron's Formula,

$$\begin{aligned}
 \text{Area of triangle} &= \sqrt{s(s-a)(s-b)(s-c)} \\
 &= \sqrt{132(132-122)(132-22)(132-120)} \\
 &= \sqrt{132 \times 10 \times 110 \times 12} \\
 &= \sqrt{11 \times 12 \times 10 \times 10 \times 11 \times 12} \\
 &= 10 \times 11 \times 12 \\
 &= 1320 \text{ m}^2
 \end{aligned}$$

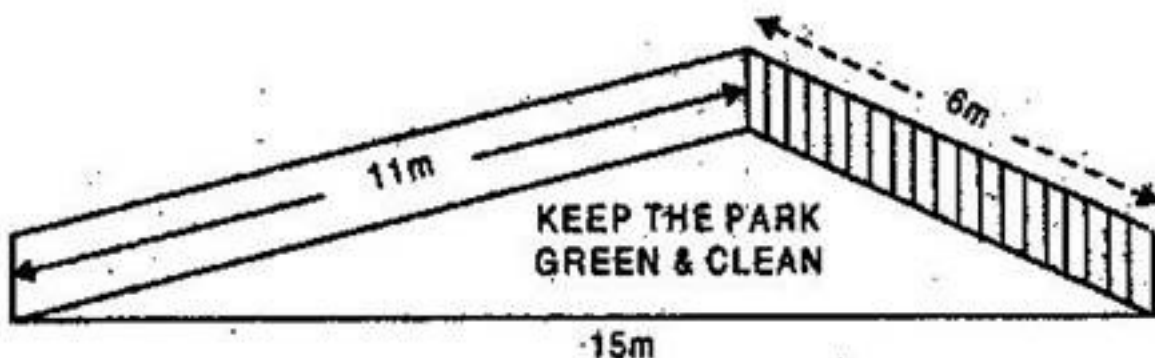
\therefore Rent for advertisement on wall for 1 year = Rs. 5000 per m^2

$$\therefore \text{Rent for advertisement on wall for 3 months for } 1320 \text{ m}^2 = \frac{5000}{12} \times 3 \times 1320$$

$$= \text{Rs. } 1650000$$

Hence rent paid by company = Rs. 16,50,000

3. There is 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.



Ans. Since, sides of coloured triangular wall are 15 m, 11 m and 6 m.

$$\therefore \text{Semi-perimeter of coloured triangular wall} = \frac{15+11+6}{2} = \frac{32}{2} = 16 \text{ m}$$

Now, Using Heron's formula,

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

$$= \sqrt{16(16-15)(16-11)(16-6)}$$

$$= \sqrt{16 \times 1 \times 5 \times 10} = 20\sqrt{2} \text{ m}^2$$

$$\text{Hence area painted in blue colour} = 20\sqrt{2} \text{ m}^2$$

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

Ans. Given: $a = 18$ cm, $b = 10$ cm.

Since Perimeter = 42 cm

$$\Rightarrow a + b + c = 42$$

$$\Rightarrow 18 + 10 + c = 42$$

$$\Rightarrow c = 42 - 28 = 14 \text{ cm}$$

$$\therefore \text{Semi-perimeter of triangle} = \frac{18+10+14}{2} = \frac{42}{2} = 21 \text{ cm}$$

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

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

$$= \sqrt{21 \times 3 \times 11 \times 7} = \sqrt{7 \times 3 \times 3 \times 11 \times 7}$$

$$= 21\sqrt{11} = 21 \times 3.3 = 69.3 \text{ cm}^2$$

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

Ans. Let the sides of the triangle be $12x$, $17x$ and $25x$.

Therefore, $12x + 17x + 15x = 540$

$$\Rightarrow 54x = 540$$

$$\Rightarrow x = 10$$

\therefore The sides are 120 cm, 170 cm and 250 cm.

$$\text{Semi-perimeter of triangle } (s) = \frac{120 + 170 + 250}{2} = 270 \text{ cm}$$

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

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

$$= \sqrt{270 \times 150 \times 100 \times 20} = 9000 \text{ cm}^2$$

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

Ans. Given: $a = 12$ cm, $b = 12$ cm

Since Perimeter = 30 cm

$$\Rightarrow a + b + c = 30$$

$$\Rightarrow 12 + 12 + c = 30$$

$$\Rightarrow c = 30 - 24 = 6 \text{ cm}$$

$$\therefore \text{Semi-perimeter of triangle} = \frac{12 + 12 + 6}{2} = 15 \text{ cm}$$

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

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

$$= \sqrt{15 \times 3 \times 3 \times 9} = \sqrt{5 \times 3 \times 3 \times 3 \times 3 \times 3}$$

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