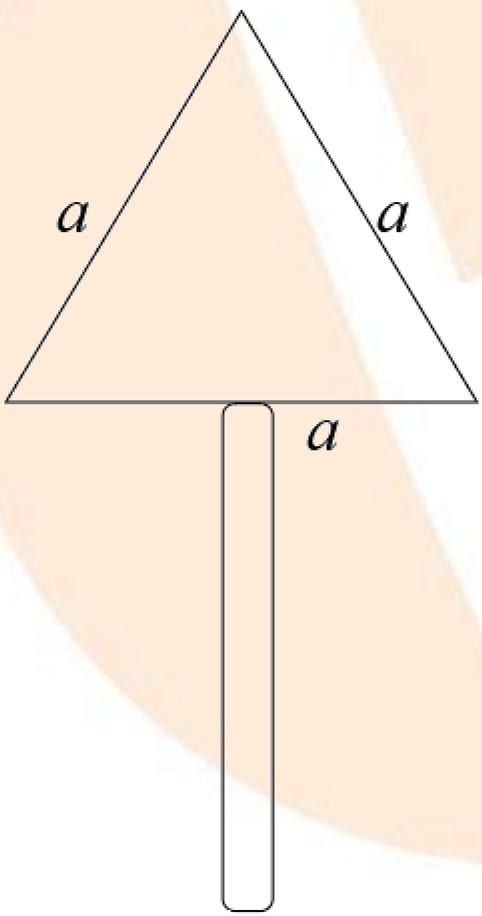
NCERT Solutions for Class 9 Maths

Chapter 10 – Heron's Formula

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?



Ans:

Length of the side of traffic signal board $=a$

Perimeter of traffic signal board which is an equilateral triangle $=3\times a$

We know that,

$2s =$ Perimeter of the triangle,

So, $2s = 3a$

$\Rightarrow s = \frac{3}{2}a$

Area of triangle can be evaluated by Heron's formula:

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

Where

a , b and c are the sides of the triangle.

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

Substituting $s = \frac{3}{2}a$ in Heron's formula, we get:

Area of given triangle:

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

$$A = \frac{\sqrt{3}}{2}a^2 \quad ......(1)$$

Perimeter of traffic signal board:

$P = 180 \text{ cm}$

Hence, side of traffic signal board

$$a = \left(\frac{180}{3}\right)$$

$a = 60$ ......(2)

Substituting Equation (2) in Equation (1), we get:

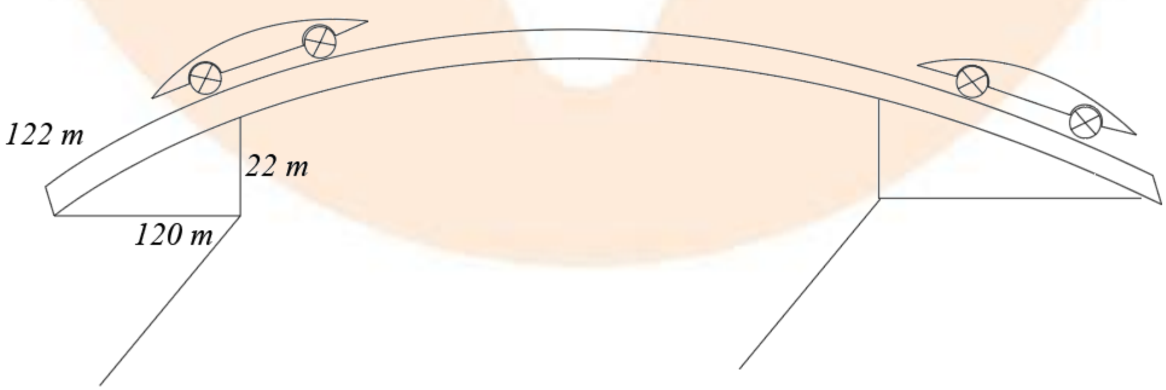
Area of traffic signal board is $A = \frac{\sqrt{3}}{2}(60cm)^2$

$$\Rightarrow A = \left(\frac{3600}{4}\sqrt{3}\right)cm^2$$

$$\Rightarrow A = 900\sqrt{3}cm^2$$

Hence, the area of the signal board is $900\sqrt{3}\ \text{cm}^2$.

2. The triangular side walls of a flyover have been used for advertisements. The sides of the walls are $122m, 22m,$ and 120m. The advertisements yield earnings 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: The length of the sides of the triangle are (say a, b and c)

$a = 122$ m

$b = 22$ m

$c = 120$ m

Perimeter of triangle = sum of the length of all sides

Perimeter of triangle is:

$P = 122 + 22 + 120$

$P = 264$ m

We know that,

$2s =$ Perimeter of the triangle,

$2s = 264$ m

$s = 132$ m

Area of triangle can be evaluated by Heron's formula:

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

Where,

a, b and c are the sides of the triangle

$s = \dfrac{a+b+c}{2}$

So, in this question,

$s = \dfrac{122+22+140}{2}$

$s = 132$ m

Substituting values of s a, b, c in Heron's formula, we get:

Area of given triangle $= \left[\sqrt{132(132-122)(132-22)(132-120)}\right] m^2$

$= \left[\sqrt{132(10)(110)(12)}\right] m^2 = 1320 m^2$

It is given that:

Rent of $1m^2$ area per year is:

$R = Rs.\ 5000/\mathrm{m}^2$

So,

Rent of $1m^2$ area per month will be:

$R = Rs. \dfrac{5000}{12} / m^2$

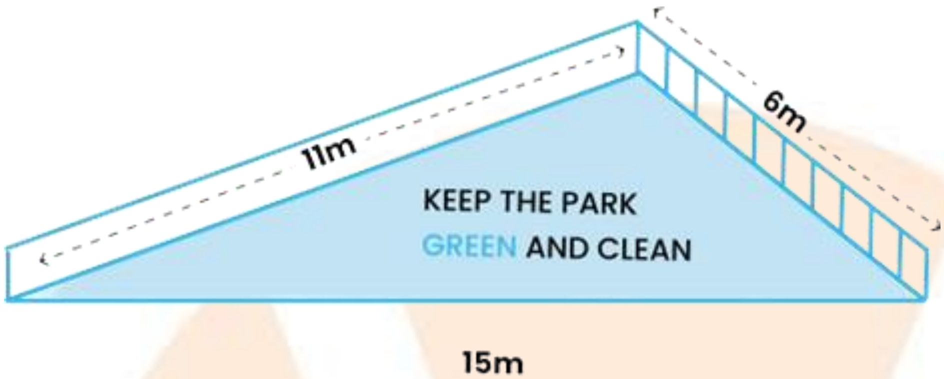
Rent of $1320m^2$ area for 3 months:

$R = \left(\dfrac{5000}{12} \times 3 \times 1320\right) / m^2$

$\Rightarrow R = Rs. 1650000$

Therefore, the total cost rent that company must pay is Rs. 1650000.

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". If the sides of the wall are 15 m, 11 m and 6 m, find the area painted in colour.



Ans: It is given that the sides of the wall are 15 m, 11 m and 6 m.

So, the semi perimeter of triangular wall (s) = (15+11+6)/2 m = 16 m

Using Heron's formula,

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

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

$$A=\sqrt{800}m^2$$

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

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

Ans: Let the length of the third side of the triangle be x.

Perimeter of the given triangle:

$$P=42cm$$

Let the sides of the triangle be a, b and c.

$$a=18cm$$

$b = 10cm$

$c = xcm$

Perimeter of the triangle = sum of all sides

$18 + 10 + x = 42$

$\Rightarrow 28 + x = 42$

$\Rightarrow x = 14$

Area of triangle can be evaluated by Heron's formula:

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

Where,

a, b and c are the sides of the triangle.

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

$$\Rightarrow s = \frac{18+10+14}{2}$$

$\Rightarrow s = 21cm$

Substituting values of s a, b, c in Heron's formula, we get:

Area of given triangle:

$A = \left[\sqrt{21(21-18)(21-10)(21-14)}\right]$

$\Rightarrow A = \left[\sqrt{21(3)(11)(7)}\right]$

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

Hence, the area of the given triangle is $21\sqrt{11}\ cm^2$.

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

Ans: Let the common ratio between the sides of the given triangle be x.

Therefore, the side of the triangle will be 12x, 17x, and 25x.

It is given that,

Perimeter of this triangle $= 540cm$

Perimeter = sum of the length of all sides

$12x + 17x + 25x = 540$

$\Rightarrow 54x = 540$

$\Rightarrow x = 10$

Sides of the triangle will be:

$12 \times 10 = 120cm$

$17 \times 10 = 170cm$

$25 \times 10 = 250cm$

Area of triangle can be evaluated by Heron's formula:

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

Where,

a, b and c are the sides of the triangle.

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

$$\Rightarrow s=\frac{120+170+250}{2}$$

$$\Rightarrow s=270cm$$

Area of given triangle:

$$A=\left[\sqrt{270(270-120)(270-170)(270-250)}\right]$$

$$\Rightarrow A=\left[\sqrt{270(150)(100)(20)}\right]$$

$$\Rightarrow A=9000cm^2$$

Therefore, the area of this triangle is $9000cm^2$.

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

Ans: Let the third side of this triangle be x.

Measure of equal sides is 12cm as the given triangle is an isosceles triangle.

It is given that,

Perimeter of triangle, $P=30cm$

Perimeter of triangle = Sum of the sides

$$12+12+x=30$$

$$\Rightarrow x=6cm$$

Area of triangle can be evaluated by Heron's formula:

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

Where,

a, b and c are the sides of the triangle.

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

$\Rightarrow s = \frac{12+12+6}{2}$

$\Rightarrow s = 15cm$

Substituting values of s a, b, c in Heron's formula we get: $A = \left[\sqrt{15(15-12)(15-12)(15-6)}\right]$

$\Rightarrow A = \left[\sqrt{15(3)(3)(9)}\right]$

$\Rightarrow A = 9\sqrt{15}cm^2$

Hence, the area of the given isosceles triangle is $9\sqrt{15}cm^2$.