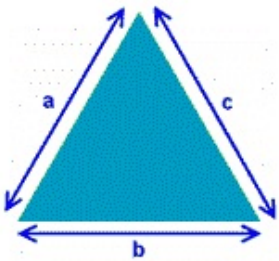
NCERT Class 9 Solutions: Heron's Formula (Chapter 12) Exercise 12.1 Part 1

Heron's Triangle & Formulas



$$\textbf{semiperimeter } s = \frac{(a+b+c)}{2}$$

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

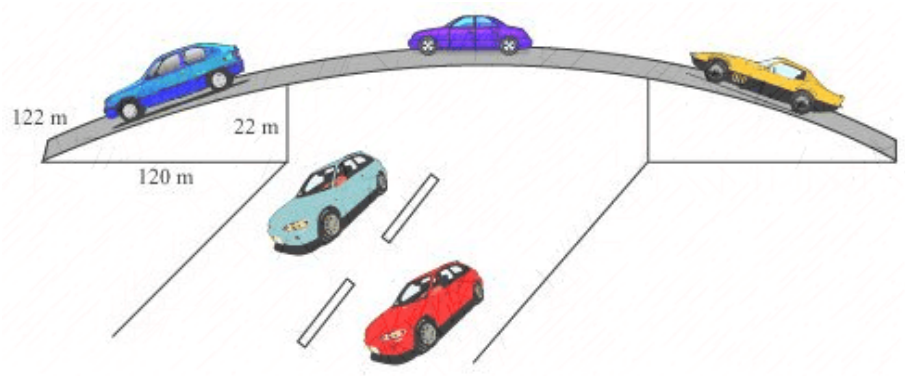
Q-1 A traffic signal board, indicating 'SCHOOL AHEAD' , is an equilateral triangle with side 'a' . Find the area of the signal board, using Heron's formula. If its perimeter is 180 cm, what will be the area of the signal board?

Solution:

- Length of equilateral triangle $= a$
- Perimeter of the signal board $= 3a = 180\,cm \Rightarrow 3a = 180\,cm \Rightarrow a = 60\,cm$
- Semi perimeter of the signal board (s) $= \frac{3a}{2}\left(\because s = \frac{\text{perimeter}}{2}\right)$

- Using heron's formula
- Area of the signal board
  - $\sqrt{s(s-a)(s-b)(s-c)}$
  - $\sqrt{\left(\frac{3a}{2}\right)\left(\frac{3a}{2}-a\right)\left(\frac{3a}{2}-a\right)\left(\frac{3a}{2}-a\right)}$
  - $\sqrt{\frac{3a}{2}\times\frac{a}{2}\times\frac{a}{2}\times\frac{a}{2}}$
  - $\frac{\sqrt{3a^4}}{16}$
  - $\frac{\sqrt{3a^2}}{4}$
  - $\frac{\sqrt{3}}{4}\times 60cm\times 60cm = 900\sqrt{3}cm^2\ (\because a = 60cm)$

Q-2 The triangular side walls of a flyover have been used for advertisements. The sides of the walls are $122m, 22m \text{and} 120m$ (see Fig) . The advertisements yield on earning of ₹$5000\ per\ m2$ per year. A company hired one of its walls for 3 months. How much rent did it pay?



Solution:

Given, the sides of the triangle are $122m, 22m \text{and} 120m.$

- Perimeter of the triangle is $122 + 22 + 120 = 264m$ ($\because$ Perimeter $= a + b + c$)
- Semi perimeter of triangle (s) $= \frac{264}{2} = 132m$ ($\because$ semiperimeter $= \frac{a+b+c}{2}$)
- Using heron's formula,
- Area of the advertisement

- $\sqrt{s(s-a)(s-b)(s-c)}$
- $\sqrt{132(132-122)(132-22)(132-120)\,m^2}$
- $\sqrt{132\times10\times110\times12m^2}$
- $\sqrt{1742400}m^2$
- $1320m^2$

Rate of advertising rent per year = $₹5000\ perm^2$

Therefore, Rent of one wall for 3 months = $₹\frac{1320\times5000\times3}{12} = ₹1650000$

Q-3 There is a slide in a park. One of its side walls has been painted in some color with a message "KEEP THE PARK GREEN AND CLEAN" (see Fig) . If the sides of the wall are $15m, 11m \text{and} 6m,$ finding the area painted in colour.

Solution:

- Sides of the triangular wall are $15m, 11m \text{and} 6m.$
- Semi perimeter of triangular wall (s) $= \frac{15+11+6}{2}m = 16m$
- Using heron's formula, area of the message
  - $\sqrt{s(s-a)(s-b)(s-c)}$
  - $\sqrt{16(16-15)(16-11)(16-6)\,m2}$
  - $\sqrt{16\times1\times5\times10m^2}$
  - $\left(\sqrt{800m^2}\right)$
  - $20\sqrt{2m^2}$

Q-4 Find the area of a triangle two sides of which are $18\text{cm and} 10cm$ and the perimeter is $42cm.$

Solution:

- Two sides of the triangle $= 18\text{cm and} 10cm$
- Perimeter of the triangle $= 42cm$

- Third side of triangle $= 42 - (18 + 10)\,cm = 14cm$ (
  $\because$ perameter $= a + b + c = 42 = 18 + 10 + c \Rightarrow c\,(\text{third side}) = 42 - 18 - 10$)
- Semi perimeter of triangle $= \frac{42}{2} = 21cm \left(s = \frac{a+b+c}{2} \right)$
- Using heron's formula,
- Area of the triangle
  - $\sqrt{s\,(s-a)\,(s-b)\,(s-c)}$
  - $\sqrt{21\,(21-18)\,(21-10)\,(21-14)\,cm^2}$
  - $\sqrt{21 \times 3 \times 11 \times 7m^2}$
  - $\sqrt{4851}$
  - $21\sqrt{11}cm^2$