Exercise - 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 Signal board?

Side of the Signal board = a

Perimeter of the Signal board = 3a = 180

$= 3 \times a = 60 cm$

's' of Signal board = $\frac{3a}{2}$

So, area = $\sqrt{s(s-a)(s-b)(s-c)}$

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

$= \sqrt{\frac{3a}{2} \times \frac{a}{2} \times \frac{a}{2} \times \frac{a}{2}}$

$= \sqrt{\frac{3a^4}{16}}$

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

$= \sqrt{\frac{3}{4}} \times 60 \times 60 = 900\sqrt{3}\ cm^2$

② The triangular side walls of a fly over have been used for advertisements. The sides of the walls are 122 m, 22 m & 120 m. The advertisements yield an earning of ₹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 walls = 15, 11 and 6m
So, 's' of triangular wall = $\frac{15+11+6}{2}$ = 16m

By using Heron's formula,

$= \sqrt{s(s-a)(s-b)(s-c)}$
$= \sqrt{16(16-15)(16-11)(16-6)}$
$= \sqrt{16 \times 1 \times 5 \times 10}$
$= 20\sqrt{2}\ m^2$

(4) Find the area of a triangle two sides of which are 18 cm, 10 cm and perimeter is 42 cm?

Let the third side be 'y'
So two sides are 18 cm and 10 cm.
Perimeter = 42 cm
So $y = 42 - 28 = 14$ cm
$y = 14$ cm

So 's' of triangle = $\frac{42}{2} = 21$ cm

Area of triangle = $\sqrt{s(s-a)(s-b)(s-c)}$
$= \sqrt{21(21-18)(21-10)(21-14)}$
$= \sqrt{21 \times 3 \times 11 \times 7}$
$= 21\sqrt{11}\ cm^2$

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

Let the sides of a triangle be $12x$, $17x$ and $25x$
Perimeter of the triangle = 540 cm

So,

$$12x + 17x + 25x = 540 \text{ cm}$$
$$54x = 540 \text{ cm}$$
$$x = 10 \text{ cm}$$
$$12x = 120 \text{ cm}$$
$$17x = 170 \text{ cm}$$
$$25x = 250 \text{ cm}$$

So, 'S' of triangle $= \frac{120 + 170 + 250}{2}$

$$= \frac{540}{2} \ 270 \text{ cm}$$

Area of the 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 30cm and each of equal side is 12cm find the area of triangle?

Let the one side of isosceles triangle be 'z'
Each of equal side of isosceles triangle are 12cm

Perimeter of isosceles triangle = 30cm

So, $12 + 12 + z = 30\,cm$
$24 + z = 30\,cm$
$z = 6\,cm$

So, semi-perimeter of isosceles triangle $= \frac{30}{2} = 15$

$= 15\,cm.$

So area of isosceles triangle
$= \sqrt{s(s-a)(s-b)(s-c)}$
$= \sqrt{15(15-12)(15-12)(15-6)}$
$= \sqrt{15 \times 3 \times 3 \times 9}$
$= 9\sqrt{15}\,cm^2$