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MATHS H/W

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 180cm, what will be the area of the signal board?

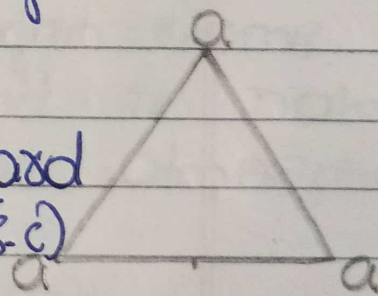
→ Each side of the triangle = a
Perimeter of the triangle = 3a
 $\therefore s = \frac{3a}{2}$

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

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

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

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



Hence, area of the signal board = $\frac{a^2 \sqrt{3}}{4}$ Sq units

Now, Perimeter = 180 cm

Each side of the triangle = $\frac{180}{3}$ cm
= 60 cm

Area of the triangle = $\frac{(60)^2 \times \sqrt{3}}{4}$
cm² = $900\sqrt{3}$ cm²

- ② The triangular side walls of a flower bed have been used for advertisements. The sides of the walls are 122 m, 120 m and 22 m (see fig) the advertisements yield an earning of Rs 5000 per m² per year. A company hired one of its walls for 3 months. How much rent did it pay?

→ Here, we first find the area of the triangular side walls
a = 122 m, b = 120 m and c = 22 m

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

$$\text{Area of the triangular side wall} = \frac{\sqrt{s(s-a)(s-b)(s-c)}}{2}$$

$$= \frac{\sqrt{132(132-122)(132-120)(132-22)}}{2}$$

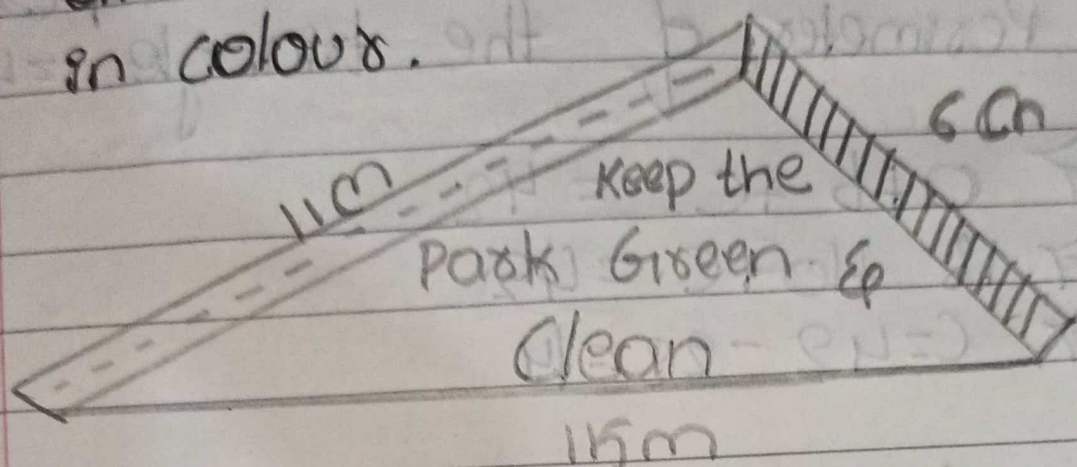
$$= \frac{\sqrt{132 \times 10 \times 12 \times 110}}{2} \text{ m}^2 = 1320 \text{ m}^2$$

$$\therefore \text{Rent of } 1 \text{ m}^2 \text{ of the wall for 1 year} = \text{Rs } \frac{5000}{12}$$

$$\therefore \text{Rent of the complete wall (1320 m}^2\text{) for 3 months} = \text{Rs } \frac{5000}{12} \times 1320 \times 3 = \text{Rs } 16,50,000$$

- ③ There is a slide in a park. One of its side walls has been painted in same colour with a message "Keep the Park Green and Clean" (see fig) If the sides of the wall are 15m, 11m

and 6m. Find the area painted in colour.



$\Rightarrow$ Here $a = 15\text{m}$, $b = 11\text{m}$, $c = 6\text{m}$
 $\therefore s = \frac{a+b+c}{2} = \frac{15+11+6}{2} = 16\text{m}$

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



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

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

⇒ Here $a = 18\text{cm}$, $b = 10\text{cm}$, $c = ?$
Perimeter of the triangle $= 42\text{cm}$

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

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

$$\Rightarrow c = 42 - 28 = 14$$

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

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

$$= \sqrt{21(21-18)(21-10)(21-14)} \text{ cm}^2$$

$$= \sqrt{21 \times 3 \times 11 \times 7} \text{ cm}^2 = \sqrt{7 \times 3 \times 3 \times 11 \times 7} \text{ cm}^2$$

$$= 7 \times 3 \sqrt{11} \text{ cm}^2 = 21\sqrt{11} \text{ cm}^2$$

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

→ Let the sides of the triangle be $12x$ cm, $17x$ cm and $25x$ cm

$$\text{Perimeter of the triangle} = 540\text{cm}$$

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



$$= x = \frac{540}{54} = 10$$

$\therefore$ Sides of the triangle are (12×10) cm (17×10) cm and (25×10) cm
i.e., 120 cm, 170 cm and 250 cm

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

$$\text{Area of the triangle} = \sqrt{s(s-a)(s-b)(s-c)}$$
$$= \sqrt{270(270-120)(270-170)(270-250)}$$

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

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

$\rightarrow$ Here $a=b=12$ cm

$$\text{Also, } a+b+c = 30 = 12+12+c = 30$$

$$c = 30 - 24 = 6$$

$$\therefore s = \frac{a+b+c}{2} = \frac{30}{2} \text{ cm} = 15 \text{ cm}$$

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

$$= \sqrt{15(15-12)(15-12)(15-6)} \text{ cm}^2$$

$$= \sqrt{15 \times 3 \times 3 \times 9} \text{ cm}^2$$

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