CHAPTER 12

Heron's Formula

TRY YOURSELF

SOLUTIONS

1. Let the sides of the triangle be $3x$, $5x$ and $7x$.
We are given that
Perimeter of the triangle = 300 m
$\Rightarrow$ $3x + 5x + 7x = 300 \Rightarrow 15x = 300 \Rightarrow x = 20$
$\therefore$ The lengths of the three sides are 3 × 20 m, 5 × 20 m and 7 × 20 m *i.e.*, 60 m, 100 m, 140 m.

$\therefore$ Semi-perimeter, $s = \frac{300}{2}\text{ m} = 150\text{ m}$

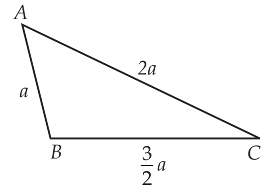
Area of the triangle
$= \sqrt{150 \times (150-60) \times (150-100) \times (150-140)}$
$= \sqrt{150 \times 90 \times 50 \times 10} = \sqrt{15 \times 9 \times 5 \times 10000}$
$= 15 \times 100 \times \sqrt{3} = 1500\sqrt{3}\text{ m}^2$

2. Let each side of the triangle be a.
$\therefore$ Perimeter = $3a$ = 60 cm $\Rightarrow$ a = 20 cm
$\therefore$ Semi-perimeter, $s = \frac{60}{2} = 30\text{ cm}$
Area of triangle $= \sqrt{s(s-a)(s-a)(s-a)}$
$= \sqrt{30(30-20)(30-20)(30-20)}$
$= \sqrt{30 \times 10 \times 10 \times 10} = 100\sqrt{3}\text{ cm}^2$

3. Sides of triangle are a = 15 cm, b = 15 cm and c = 12 cm
$\therefore$ Semi-perimeter, $s = \frac{a+b+c}{2} = \frac{15+15+12}{2} = 21\text{ cm}$
$\therefore$ Area of triangle = $\sqrt{s(s-a)(s-b)(s-c)}$
$= \sqrt{21(21-15)(21-15)(21-12)}$
$= \sqrt{21 \times 6 \times 6 \times 9} = 18\sqrt{21}\text{ cm}^2$

4. Let $AB = c$ = 60 m, $BC = a$ = 56 m and $AC = b$ = 52 m.
$\therefore$ Semi-perimeter, $s = \frac{a+b+c}{2}$
$= \frac{60+56+52}{2} = \frac{168}{2} = 84\text{ m}$
Area of triangular park $= \sqrt{s(s-a)(s-b)(s-c)}$
$= \sqrt{84(84-56)(84-52)(84-60)}$
$= \sqrt{84 \times 28 \times 32 \times 24} = \sqrt{12 \times 7 \times 12 \times 2 \times 7 \times 4 \times 16 \times 2}$
$= 12 \times 7 \times 4 \times 4 = 1344\text{ m}^2$
Also, area of park $= \frac{1}{2} \times BC \times AP$
$\Rightarrow$ $1344 = \frac{1}{2} \times 56 \times AP \Rightarrow AP = \frac{1344}{28} = 48\text{ m.}$
$\therefore$ The distance between the lamp posts at A and P is 48 m.

5. Let AB be the shortest side.
$\therefore$ $AB = a$ units, $BC = \frac{3}{2}a$ units and $AC = 2a$ units
$\therefore$ Semi-perimeter, $s = \frac{AB+BC+CA}{2}$
$= \frac{a + \frac{3}{2}a + 2a}{2} = \frac{9}{4}a$ units



Now, $s-(AB) = \frac{9}{4}a - a = \frac{5}{4}a$
$s-(BC) = \frac{9}{4}a - \frac{3}{2}a = \frac{3}{4}a$
$s-(CA) = \frac{9}{4}a - 2a = \frac{1}{4}a$
$\therefore$ Area of $\Delta ABC = \sqrt{\frac{9}{4}a \times \frac{5}{4}a \times \frac{3}{4}a \times \frac{1}{4}a}$
$= \sqrt{\frac{9 \times 3 \times 5}{4 \times 4 \times 4 \times 4}a^4} = \frac{3\sqrt{15}}{4 \times 4}a^2$
$= \frac{3\sqrt{15}}{16}a^2$ sq. units

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