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CLASS – 9

MATHEMATICS

Chapter – 10

Heron's Formula

Part – 2

Exercise 10.1 (Question 1 - 3)

Vikas Saini

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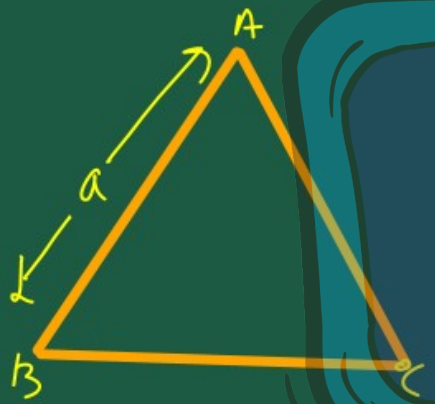

1. A traffic signal board, indicating 'SCHOOL AHEAD', is an equilateral triangle with side 'a'. Find the area of the signal board, using Heron's formula. If its perimeter is 180 cm, what will be the area of the signal board?

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A·T·Q

ΔABC is Sign board.

in which

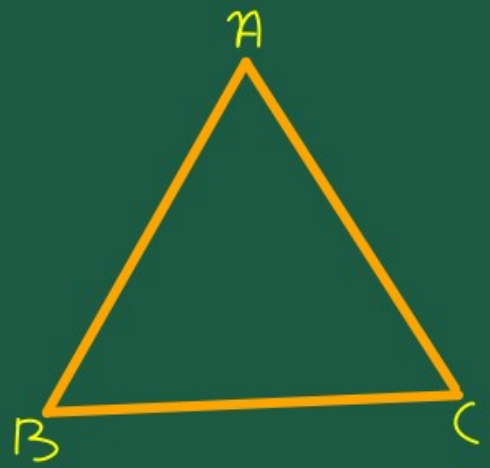
$AB = BC = AC = a$ [Given]

Perimeter of ΔABC $= AB + BC + AC$

$= a + a + a$

$= 3 \times a = 3a$

$P = 3a$ — (1)



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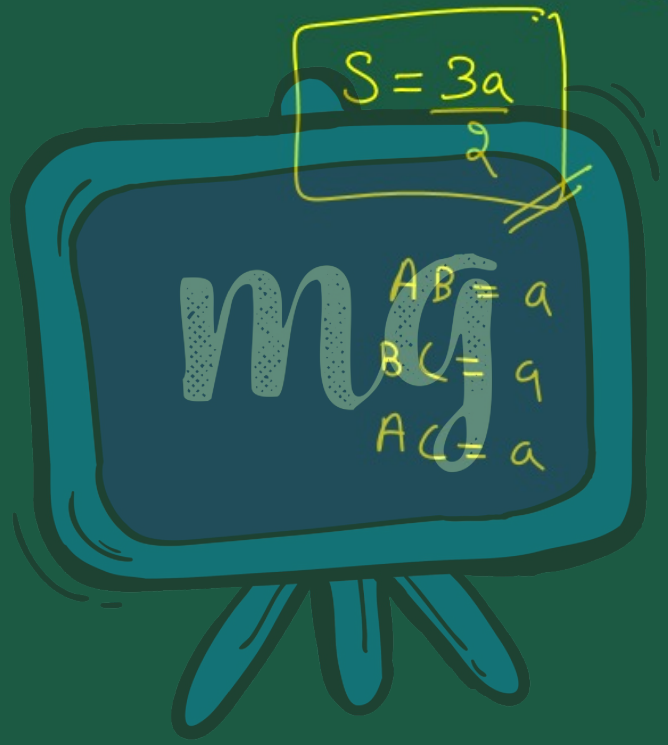
Semi-Perimeter of $\triangle ABC = \frac{P}{2} = \frac{3a}{2}$



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Now, by Heron's formula

$$\frac{3a}{2} - \frac{a}{1}$$

$$\frac{3a - 2a}{2} = \frac{a}{2}$$

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

$$= \sqrt{\frac{3a}{2} \times \left[\frac{3a}{2} - a\right] \times \left[\frac{3a}{2} - a\right] \times \left[\frac{3a}{2} - a\right]}$$

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

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

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

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

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

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

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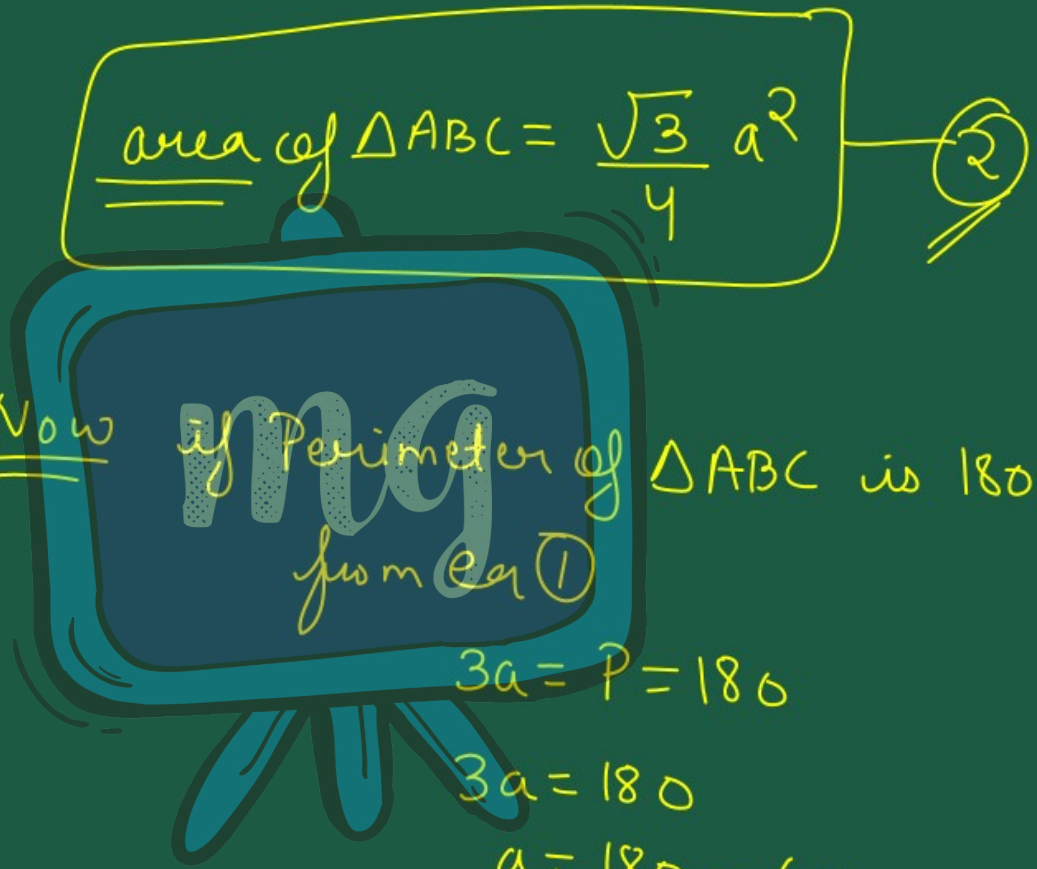

area of $\Delta ABC = \frac{\sqrt{3}}{4} a^2$ — (2)

Now if Perimeter of ΔABC is 180 cm

from eq (1)

$3a = P = 180$

$3a = 180$

$a = \frac{180}{3} = 60$

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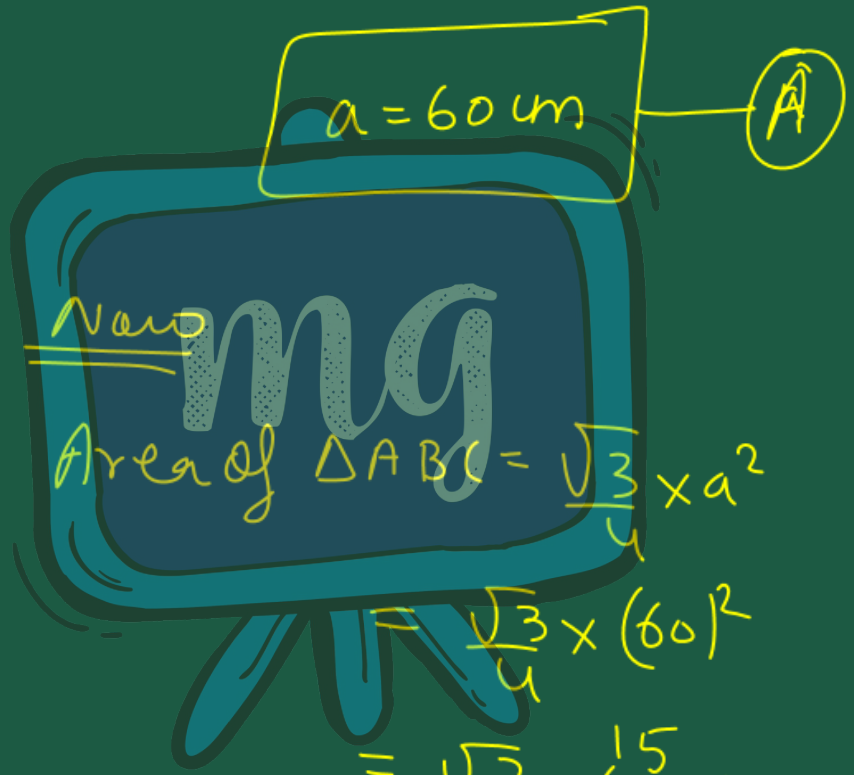

Now,

Area of $\Delta ABC = \frac{\sqrt{3}}{4} \times a^2$ [from eq (2)]

$= \frac{\sqrt{3}}{4} \times (60)^2$

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

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

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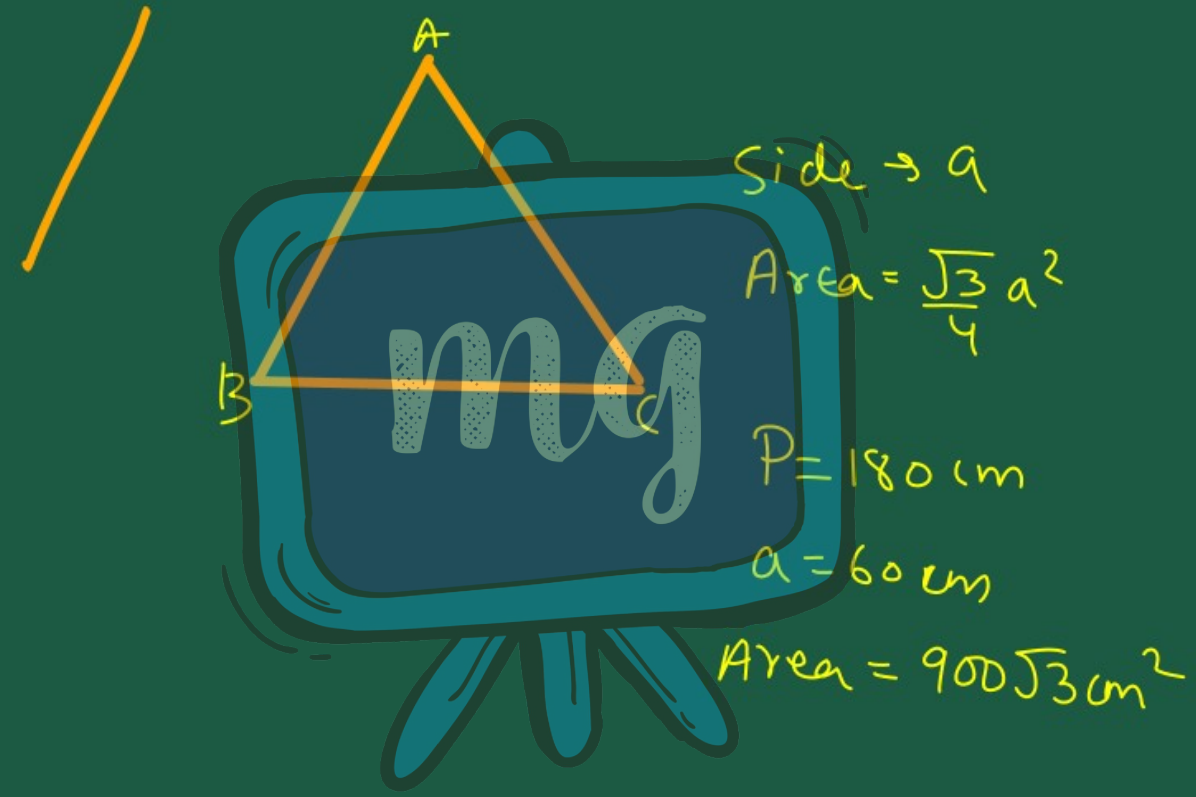

Side → a

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

$P = 180\ cm$

$a = 60\ cm$

$\text{Area} = 900\sqrt{3}\ cm^2$

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2. The triangular side walls of a flyover have been used for advertisements. The sides of the walls are 122 m, 22 m and 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?

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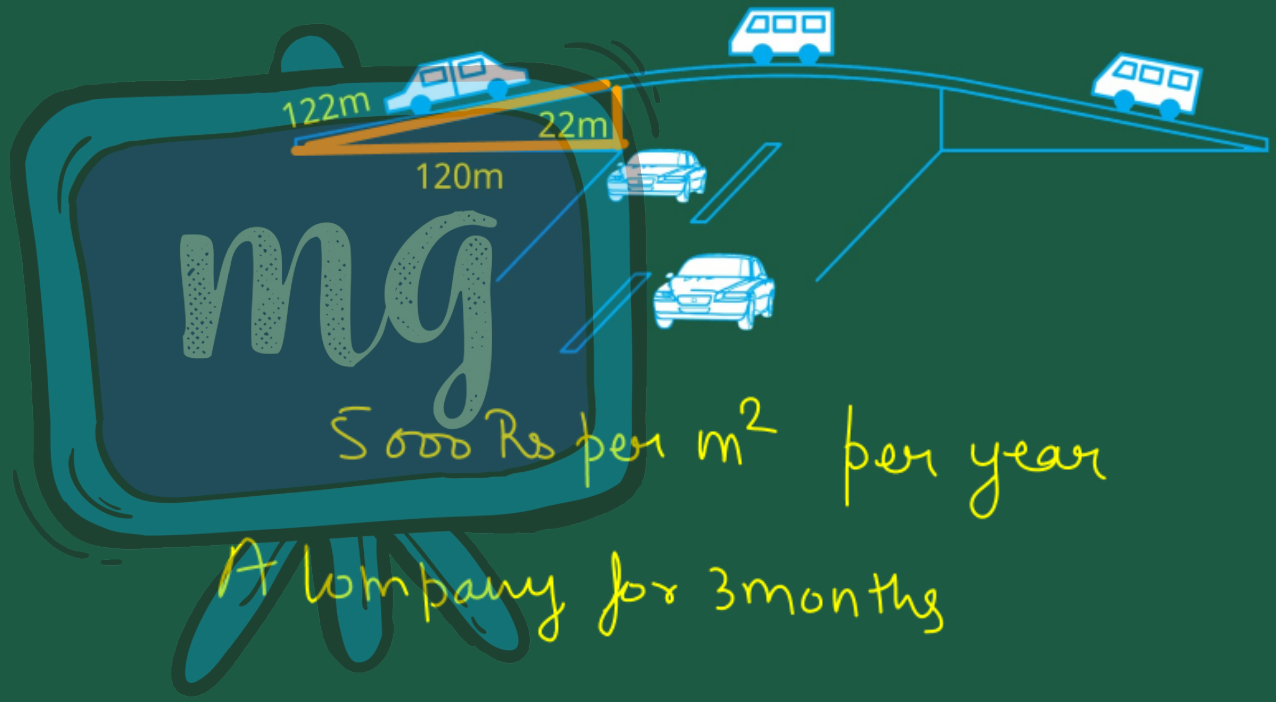

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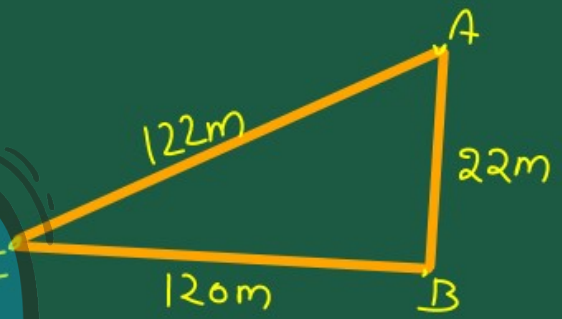
A-T-Q

Δ ABC represents triangular wall in which



AB = 22m
BC = 120m
AC = 122m

Perimeter of ΔABC = AB + BC + AC

= 122 + 120 + 22

= 264 m

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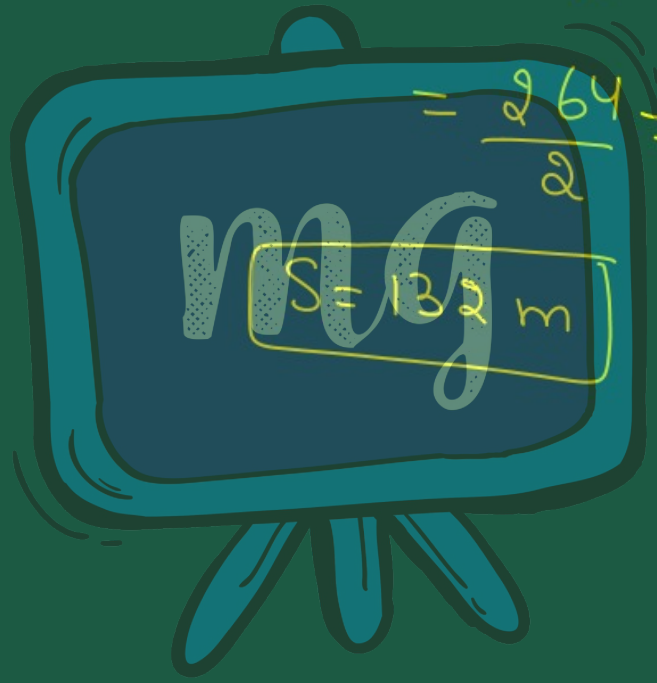
So, Semiperimeter of $\Delta ABC = \frac{P}{2}$

$= \frac{264}{2} = 132$ m



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In $\triangle ABC$

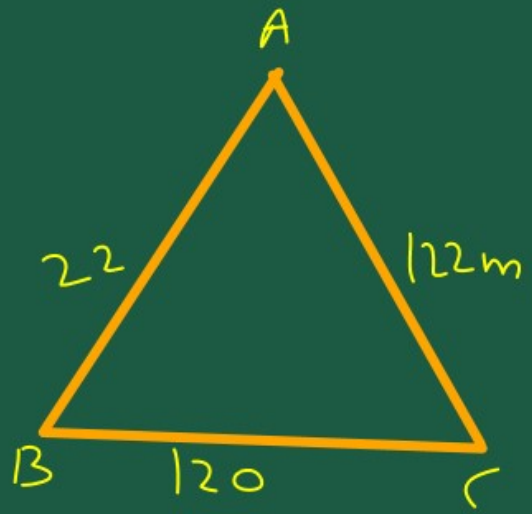
(a) — $AB = 22$ cm

(b) — $BC = 120$

(c) — $AC = 122$ cm

$P = 264$ m

$S = 132$ m



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Now, by using Heron's formula

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

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

$= \sqrt{132 \times 110 \times 12 \times 10}$

$= \sqrt{11 \times 12 \times 11 \times 10 \times 12 \times 10}$

$= \sqrt{11^2 \times (12)^2 \times (10)^2} = 11 \times 12 \times 10$

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Area of $\triangle ABC$ $= \frac{11 \times 12 \times 10}{2}$

$= 132 \times 10$

Area of $\triangle ABC$ $= 1320\ m^2$

Now

Advertisment yield is 5000 Rs per m^2 per year

The Rent for Area $1320\ m^2$ = Per year (12 months) $= 5000 \times 1320$

The Rent for one month $= \frac{5000 \times 1320}{12}$

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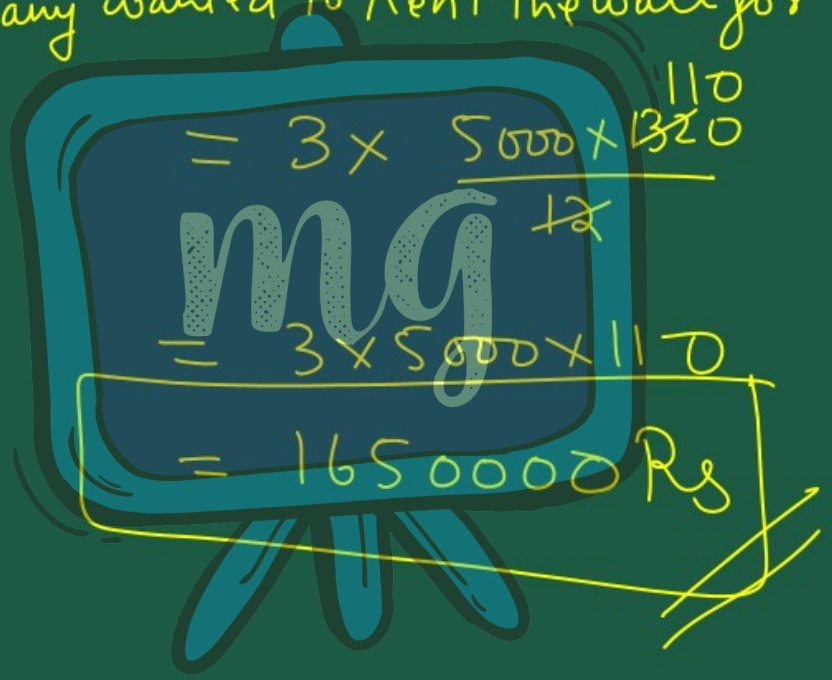
but

Company wanted to Rent the wall for 3 months



$$= 3 \times \frac{5000 \times \cancel{1320}^{110}}{\cancel{12}}$$

$$= 3 \times 5000 \times 110$$

$$\boxed{= 1650000 \text{ Rs}}$$

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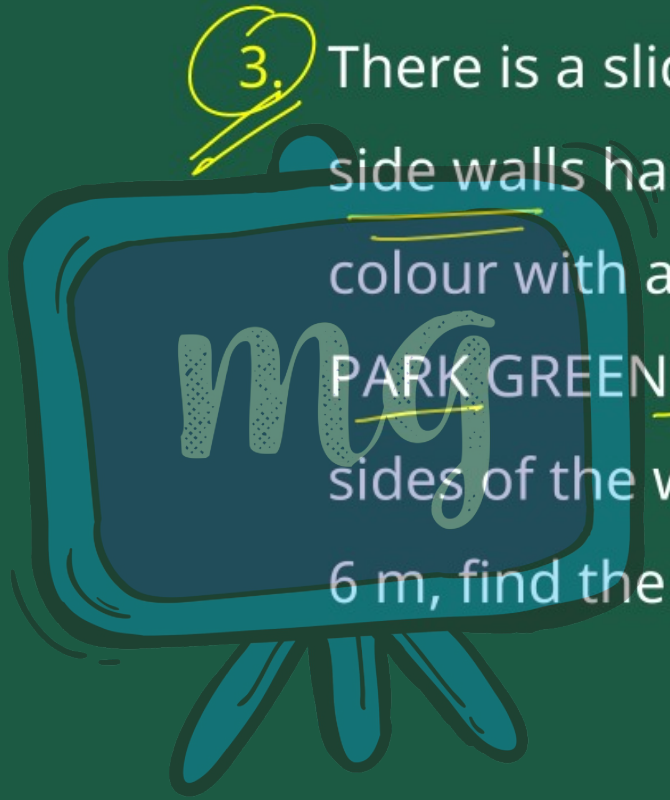

3. There is a slide in a park. One of its side walls has been painted in some colour with a message “KEEP THE PARK GREEN AND CLEAN”. If the sides of the wall are 15 m, 11 m and 6 m, find the area painted in colour.

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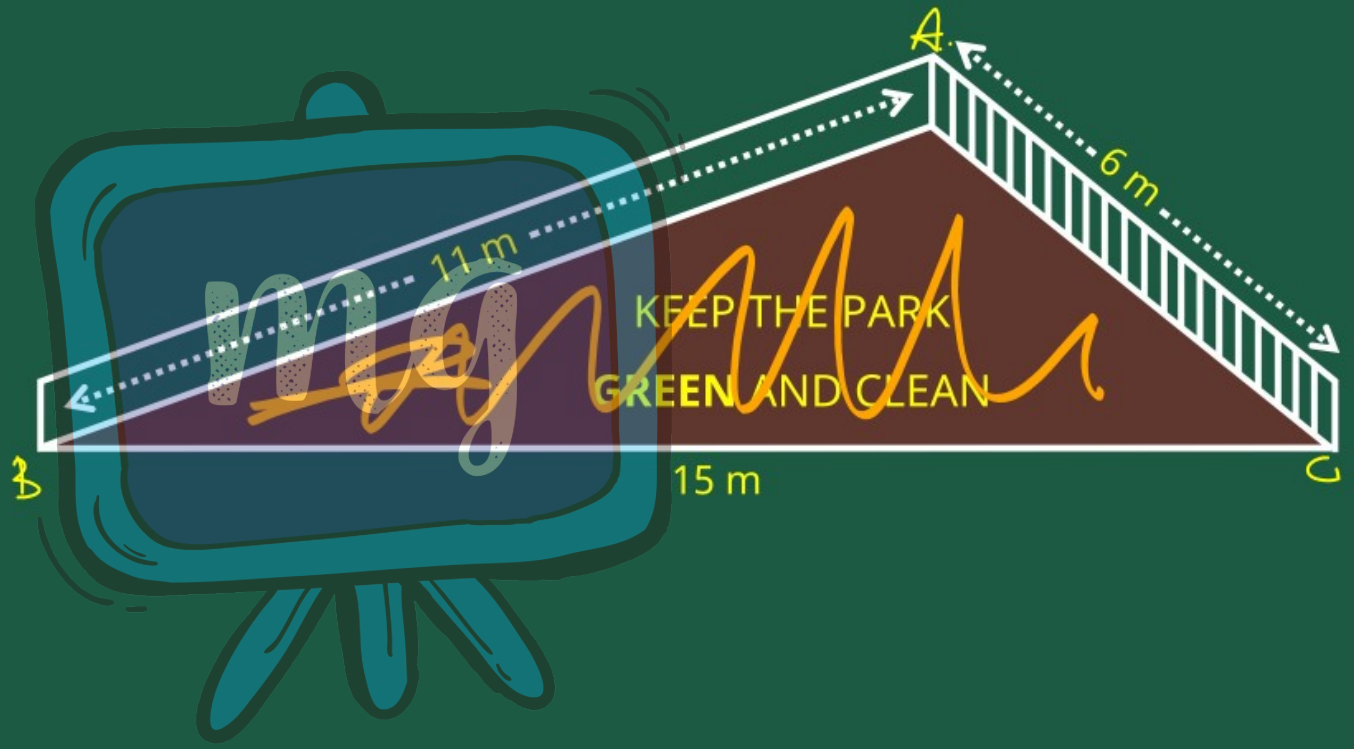

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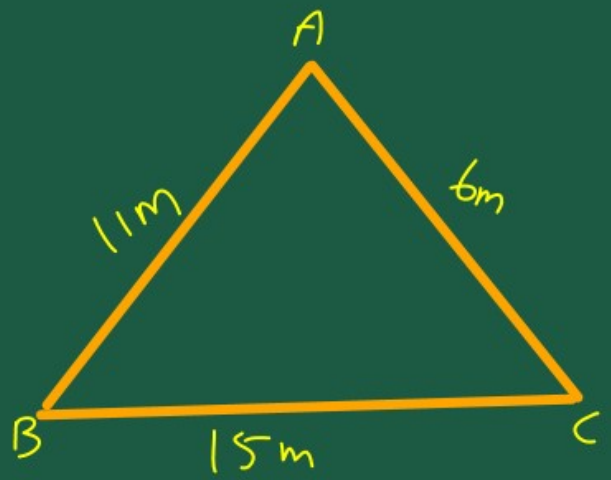
·A·T·Q

△ ABC represent triangular wall

AB = 11m

BC = 15m

AC = 6m



Perimeter of △ABC = AB + BC + AC

= 11 + 15 + 6

= 32m

Semiperimeter = $\frac{P}{2} = \frac{32}{2} = 16$.

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In $\triangle ABC$

(a) — $AB = 11\,m$

(b) — $BC = 15\,m$

(c) — $AC = 6\,m$

$P = 32\,m$

$S = 16\,m$

So by Heron's formula

$$\text{Area of } \triangle ABC = \sqrt{S \times (S-a) \times (S-b) \times (S-c)}$$

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

$$= \sqrt{16 \times 5 \times 1 \times 10}$$

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$$= \sqrt{16 \times 5 \times 10 \times 1}$$

$$= \sqrt{16 \times 5 \times 5 \times 2 \times 1}$$

$$= \sqrt{(4)^2 \times 5^2 \times 2}$$

$$= 4 \times 5 \times \sqrt{2}$$

Area of $\triangle ABC = 20\sqrt{2}\ m^2$