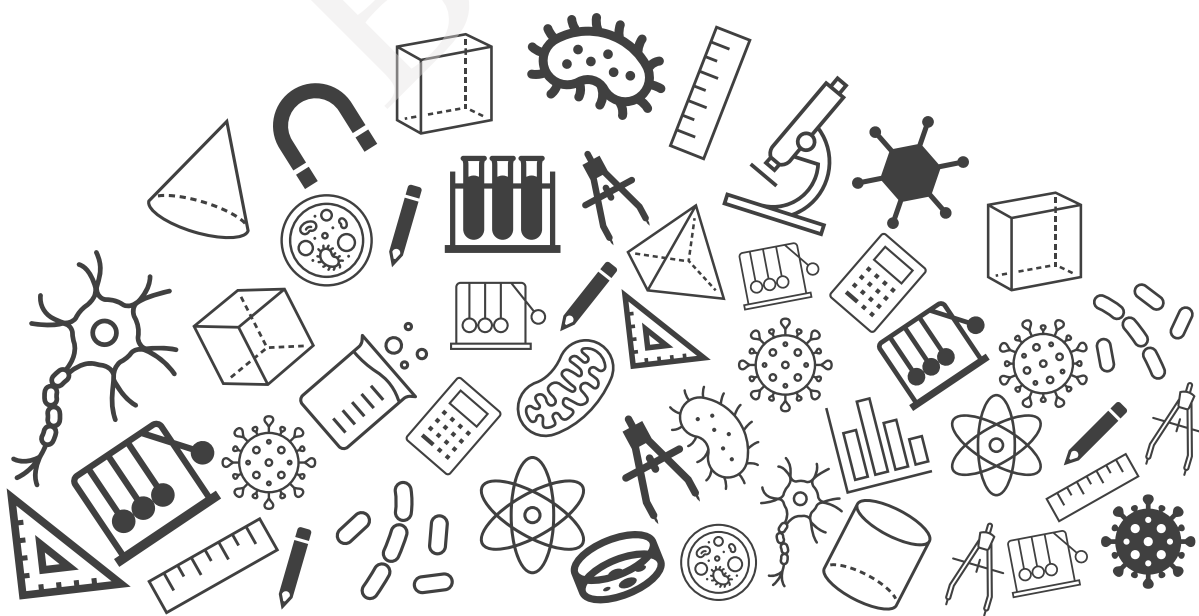




Grade 09

Mathematics Chapter Notes

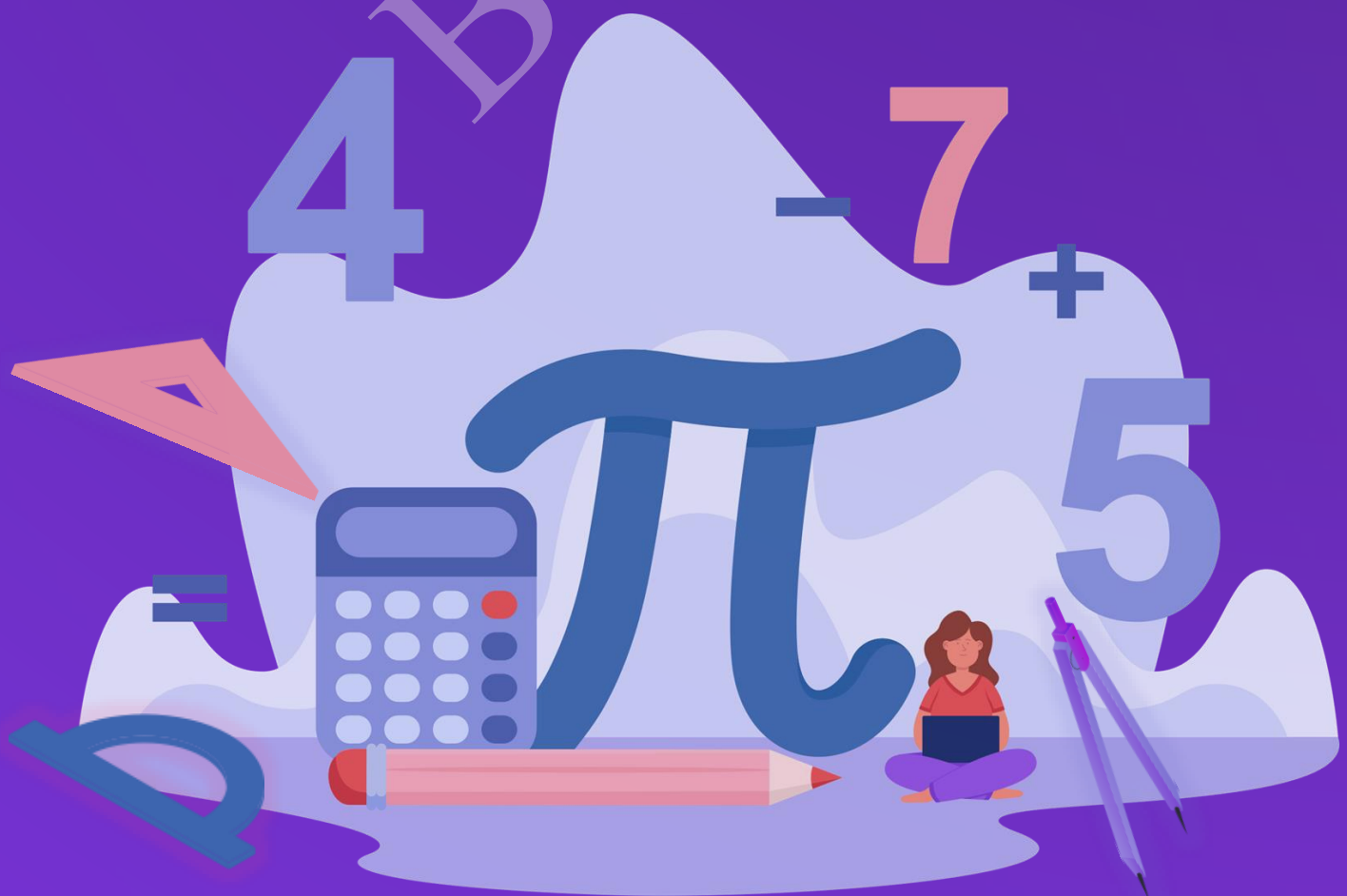


BYJU'S Classes

CHAPTER NOTES

Heron's Formula

Grade 09



Topics to be Covered

1. Basic Formula for Area of a Triangle

- 1.1 Area of an Equilateral Triangle
- 1.2 Area of an Isosceles Triangle
- 1.3 Area of Right-angled Triangle

2. Heron's Formula for Area of a Triangle

1. Basic Formula for Area of a Triangle

$$\text{Area of Triangle} = \frac{1}{2} \times \text{Base} \times \text{Height}$$

1.1 Area of an equilateral triangle

Let $\triangle ABC$ be an equilateral triangle having side of length ' a '.

Perpendicular AD divides base BC into two equal parts.

Now, by Pythagoras theorem in right triangle ADC

$$AC^2 = AD^2 + DC^2$$

$$\Rightarrow a^2 = AD^2 + \left(\frac{a}{2}\right)^2$$

$$\Rightarrow AD = \frac{\sqrt{3}a}{2}$$

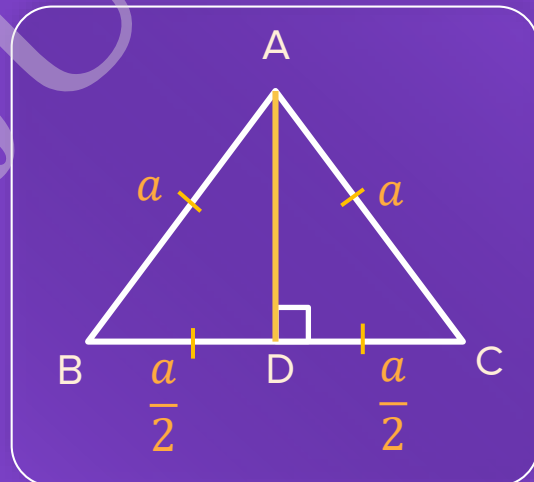
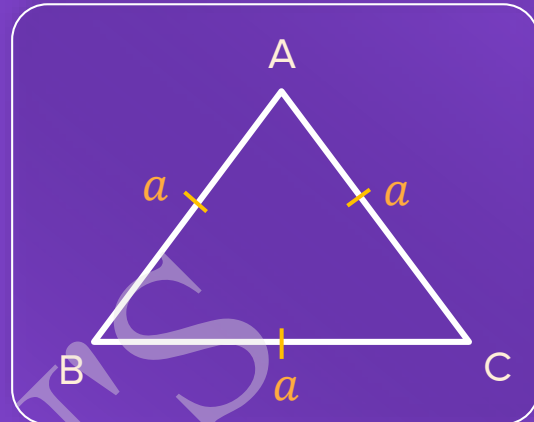
Then area of $\triangle ABC$

$$= \frac{1}{2} \times \text{Base} \times \text{Height}$$

$$= \frac{1}{2} \times BC \times AD$$

$$= \frac{1}{2} \times a \times \frac{\sqrt{3}a}{2} = \frac{\sqrt{3}}{4} a^2$$

$$\text{Area of an equilateral triangle} = \frac{\sqrt{3}}{4} a^2$$



1. Basic Formula for Area of a Triangle

1.2. Area of an isosceles triangle

Let $\triangle LMN$ be an isosceles triangle with equal sides ' a ' and base ' b '.

Perpendicular LP divides base MN into two equal parts.

Now, by Pythagoras theorem in right triangle LPN

$$LN^2 = LP^2 + PN^2$$

$$\Rightarrow a^2 = LP^2 + \left(\frac{b}{2}\right)^2$$

$$\Rightarrow LP = \frac{1}{2}\sqrt{4a^2 - b^2}$$

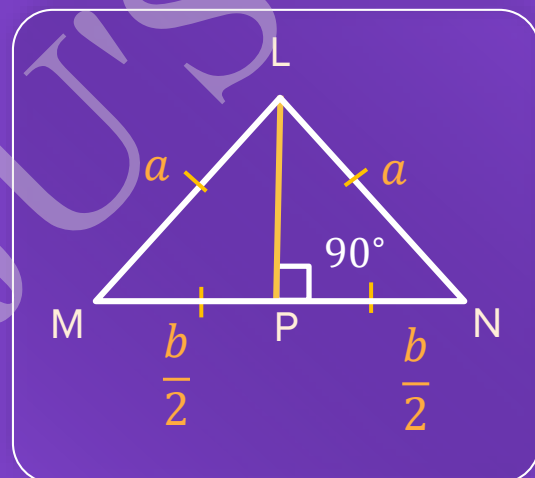
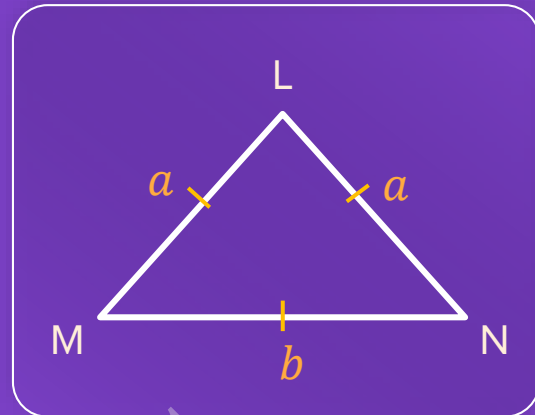
Then area of $\triangle LMN$

$$= \frac{1}{2} \times \text{Base} \times \text{Height}$$

$$= \frac{1}{2} \times MN \times LP$$

$$= \frac{1}{2} \times b \times \frac{1}{2}\sqrt{4a^2 - b^2}$$

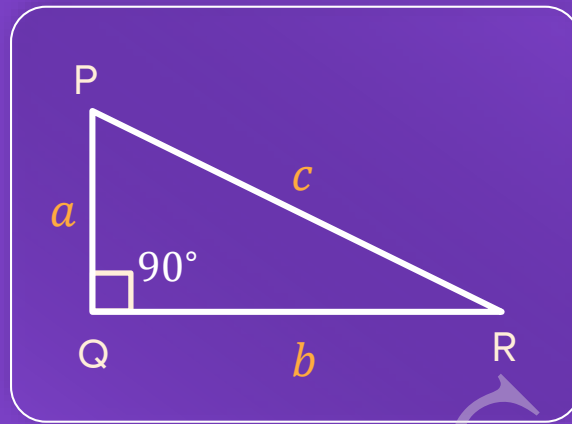
$$= \frac{b}{4}\sqrt{4a^2 - b^2}$$



$$\text{Area of an isosceles triangle} = \frac{b}{4}\sqrt{4a^2 - b^2}$$

1. Basic Formula for Area of a Triangle

1.3 Area of right-angled triangle



Let ΔPQR be a right-angled triangle with sides a, b and c .

Area of ΔPQR

$$= \frac{1}{2} \times \text{Base} \times \text{Height}$$

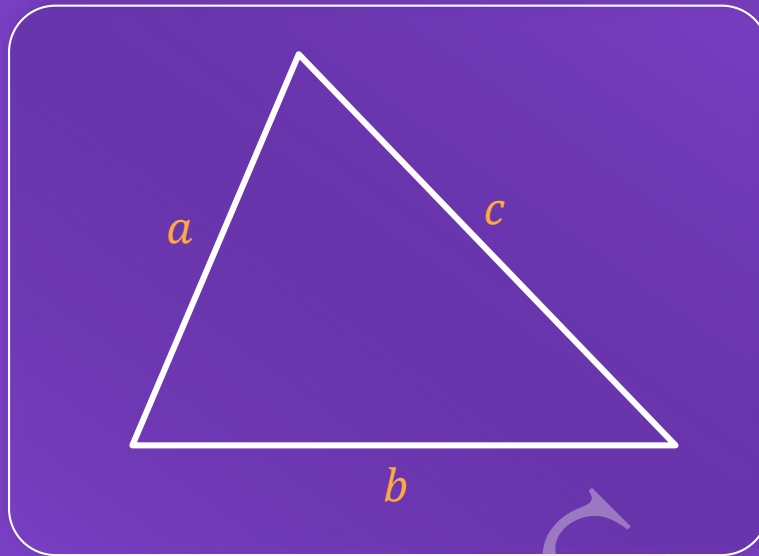
$$= \frac{1}{2} \times QR \times PQ$$

$$= \frac{1}{2} \times b \times a$$

Area of a right-angled triangle

$$= \frac{1}{2} \times \text{product of its perpendicular sides}$$

2. Heron's Formula for Area of Triangle



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

$$s = \frac{a+b+c}{2}$$

where,
 s is semi-perimeter
 a, b and c are sides of triangle.

Heron's formula is useful for all triangles or mostly when length of all sides of a triangle are given but height is not given or is difficult to calculate.

Mind Map

