

7th Standard- Maths

The Triangle and its Properties

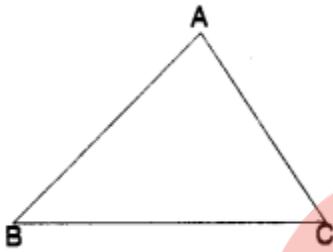
Triangle: A triangle is a simple closed curve made of three line segments. It has three vertices, three sides and three angles. Here in $\triangle ABC$, it has

Sides: \overline{AB} , \overline{BC} , \overline{CA} .

Vertices: A, B, C.

Angles: $\angle BAC$, $\angle ABC$, $\angle BCA$.

The side opposite to the vertex A is BC. The angle opposite to the side AB is $\angle BCA$.



Classification of triangles based on sides

- A triangle having three unequal sides is called a scalene triangle.
- A triangle having two equal sides is called an isosceles triangle.
- A triangle having three equal sides is called an equilateral triangle.

Classification of triangles based on angles

- If each angle is less than 90° , then the triangle is called an acute-angled triangle.
- If anyone angle is a right angle, then the triangle is called a right-angled triangle.

- If anyone angle is greater than 90° , then the triangle is called an obtuse-angled triangle.

Medians of a Triangle

The line-segment joining a vertex of a triangle to the mid-point of its opposite side is called a median of the triangle. Since there are three vertices in a triangle, therefore, a triangle has three medians.

Altitudes of a Triangle

A line segment drawn from a vertex of a triangle perpendicular to its opposite side is called an altitude (height) of the triangle corresponding to the opposite side. Since there are three vertices in a triangle, therefore, a triangle has three altitudes.

Exterior Angle of a Triangle and its Property

An exterior angle of a triangle is formed when a side of a triangle is produced. At each vertex, we have two ways of forming an exterior angle. The measure of an exterior angle of a triangle is equal to the sum of the measures of its two interior opposite angles.

Angle Sum Property of a Triangle

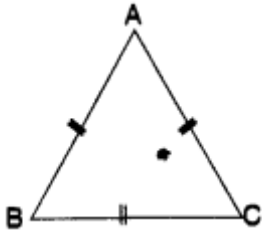
The sum of the measures of the three angles of a triangle is 180° .

Two Special Triangles: Equilateral and Isosceles

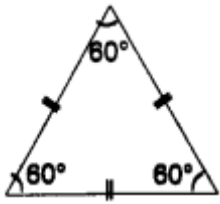
Equilateral Triangle: A triangle in which all three sides are of equal length is called an equilateral triangle.

In an equilateral triangle

(i) all sides have the same length and



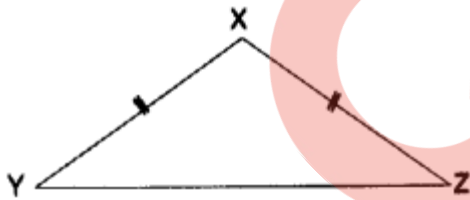
(ii) each angle has measure 60°



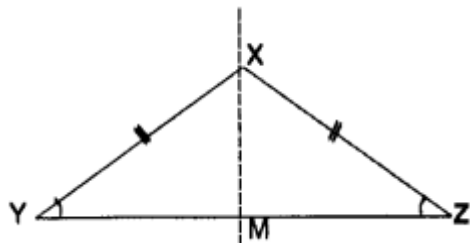
Isosceles Triangle: A triangle in which two sides are of equal length is called an isosceles triangle.

In an isosceles triangle.

(i) two sides have the same length.



(ii) base angles opposite to the equal sides are equal.



Sum of the Lengths of Two Sides of a Triangle

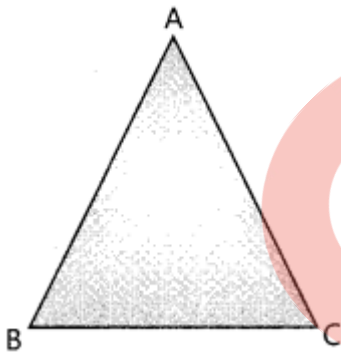
The sum of the lengths of any two sides of a triangle is greater than the third side.

Right-Angled Triangle and Pythagoras Property

A triangle whose one angle is a right-angle is called a right-angled triangle.

The side opposite to the right angle is called the hypotenuse, the other two sides are known as the legs of the right-angled triangle.

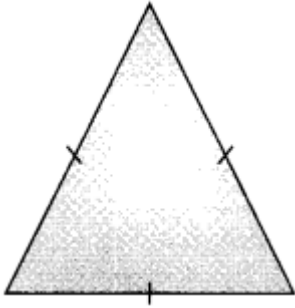
Pythagoras Property: In a right-angled triangle, the square on the hypotenuse = sum of the squares on the legs. Conversely if the Pythagoras Property (holds) the triangle must be right-angled.



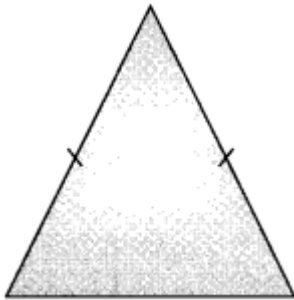
Triangle ΔABC has

- three sides, AB, BC, CA.
- three angles, $\angle BAC$, $\angle ABC$, $\angle BCA$ and also denoted by $\angle A$, $\angle B$, $\angle C$ respectively.
- three vertices, A, B, C.

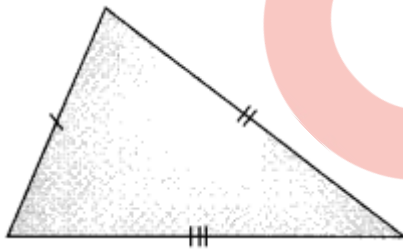
A triangle having all sides equal is called an equilateral triangle.



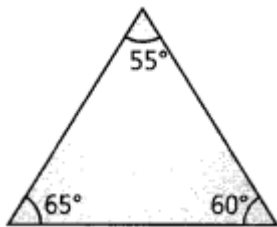
A triangle having two sides equal is called an isosceles triangle.



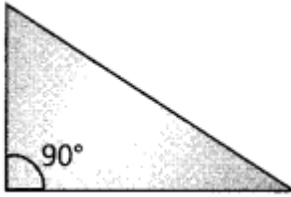
A triangle having all sides of different lengths is called a scalene triangle.



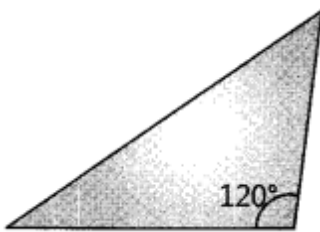
A triangle whose each angle measures less than 90° is called an acute-angled triangle.



A triangle one of whose angle measures 90° is called a right-angled triangle.



A triangle one of whose angle measures more than 90° is called an obtuse angled triangle.

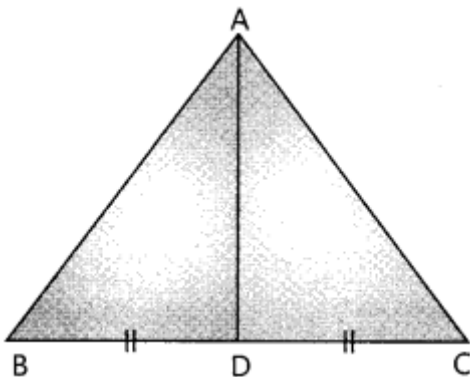


Each angle of an equilateral triangle measures 60° .

The angles opposite to equal sides of an isosceles triangle are equal.

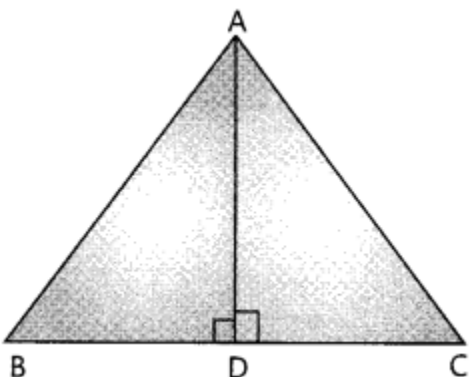
A scalene triangle has no equal angles.

A median connects a vertex of a triangle to the mid-point of the opposite side.



AD is the median of triangle ABC.

An altitude has one endpoint at a vertex of the triangle and the other on the line containing the opposite side.

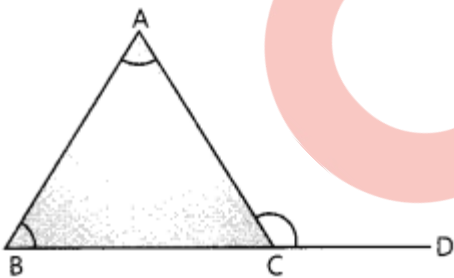


AD is the altitude of triangle ABC.

$$\angle ADB = \angle ADC = 90^\circ.$$

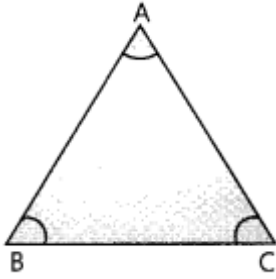
A triangle has 3 medians and 3 altitudes.

An exterior angle of a triangle is equal to the sum of its interior opposite angles.



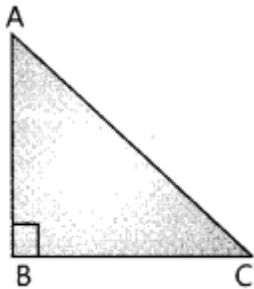
$$\angle ACD = \angle A + \angle B.$$

Angle Sum Property: The total measure of the three angles of a triangle is 180° .



$$\angle A + \angle B + \angle C = 180^\circ.$$

In right angled triangle, the square on the hypotenuse = sum of the squares on the legs.



$$AC^2 = AB^2 + BC^2$$

It is known as Pythagoras Property.

