Congruence of Triangles

Congruence of Plane Figures



- If two objects are of exactly the same shape and size, they are said to be congruent and the relation between the two objects being congruent is called congruence.
- The method of superposition examines the congruence of plane figures, line segments and angles.
- A plane figure is any shape that can be drawn in two dimensions.
- Two plane figures are congruent, if each, when superimposed on the other, covers it exactly.
- If two line segments have the same or equal length, they are congruent. Also, if two line segments are congruent, they have the same length.
- If two angles have the same measure, they are congruent. Also, if two angles are congruent, their measures are the same.
- If two angles are congruent, the length of their arms do not matter.

Criteria for Congruence of Triangles

Congruence of triangles:

Consider **triangles ABC and XYZ**. Cut triangle ABC and place it over XYZ. The two triangles cover each other exactly, and they are of the **same shape and size**. Also notice that A falls on X, B on Y, and C on Z. Also, side AB falls along XY, side BC along YZ, and side AC along XZ. So, we can say that **triangle** ABC is **congruent** to triangle XYZ. Symbolically, it is represented as $ABC \cong \Delta XYZ$.

So, in general, we can say that two triangles are congruent if all the **sides** and all the **angles** of one triangle are equal to the **corresponding sides and angles** of the other triangle.

In **two congruent triangles** ABC and XYZ, the**corresponding vertices** are A and X, B and Y, and C and Z, that is, A corresponds to X, B to Y, and C to Z. Similarly, the **corresponding sides** are AB and XY, BC and YZ, and AC and XZ. Also, angle A corresponds to X, B to Y, and C to Z. So, we write **ABC corresponds to XYZ**.

We can tell if two triangles are congruent using 4 axioms: **SAS axiom, ASA axiom, SSS axiom** and **RHS axiom**.

SSS congruence criterion: Two triangles are **congruent** if three sides of one triangle are equal to the three**corresponding sides** of the other triangle.

SAS congruence criterion: Two triangles are **congruent** if two sides and the **included angle** of one triangle are equal to the **corresponding two sides** and the **included angle** of the other **triangle**.

RHS congruence criterion: **Two right-angled triangles** are congruent if the **hypotenuse** and a side of one triangle are equal to the **hypotenuse** and the **corresponding side** of the other triangle.

ASA congruence criterion: Two **triangles** are **congruent** if **two angles** and the included side of one **triangle** are equal to the **corresponding two angles** and the **included side** of the other **triangle**.



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