

TRIANGLES

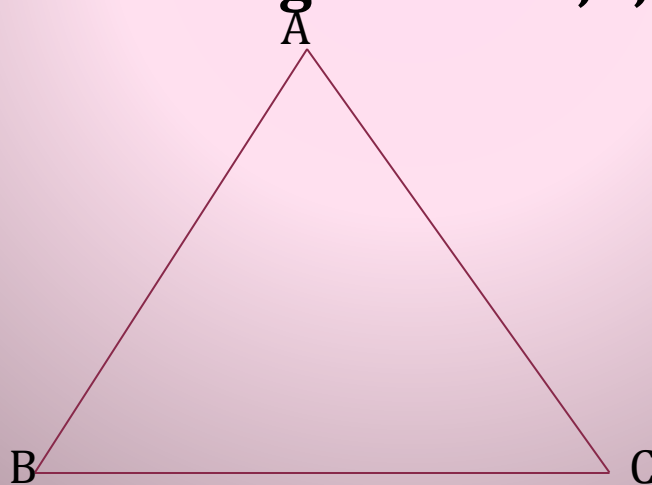
Chapter- 7

Introduction

A closed figure formed by three intersecting lines is called a triangle('Tri' means 'three').

A triangle has three sides, three angles and three vertices.

For example,in $\triangle ABC$, AB, BC, CA are the three sides, $\angle A, \angle B, \angle C$ are three angles and A, B, C are three vertices.



IN THIS LESSON YOU WILL LEARN :

1

- CONGRUENCE OF TRIANGLES.

2

- THE CRITERIA FOR THE CONGRUENCE OF TWO TRIANGLES.

3

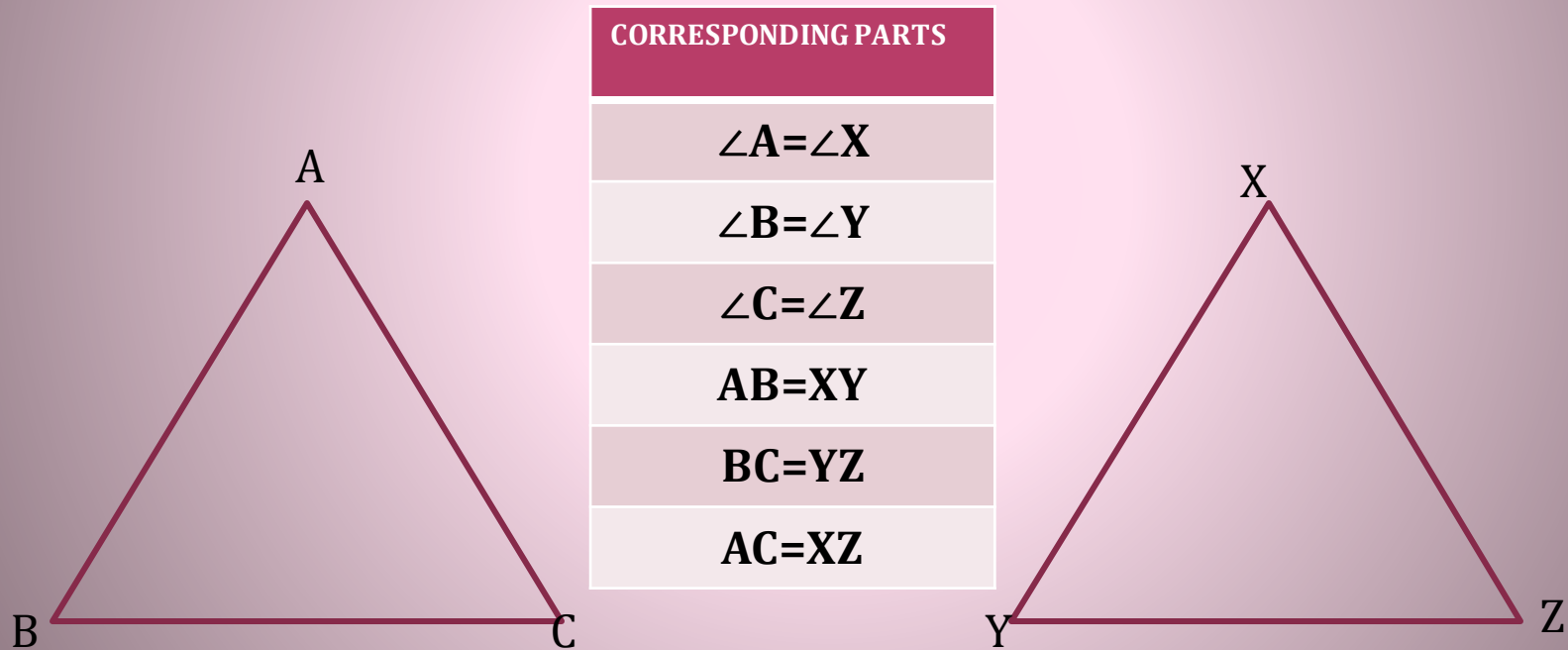
- SOME PROPERTIES OF A TRIANGLE.

4

INEQUALITIES IN A TRIANGLE

CONGRUENCE OF TRIANGLES

Two **identical** triangles are called **Congruent** Triangles. That means, if $\triangle ABC$ and $\triangle XYZ$ are congruent then their corresponding angles are equal and corresponding sides are equal.



Symbolically, it is expressed as $\triangle ABC \cong \triangle XYZ$

This also means that:-

A corresponds to X

B corresponds to Y

C corresponds to Z

If two triangles are congruent then their corresponding parts are equal.

CPCT – Corresponding Parts of Congruent Triangles

CRITERIA FOR CONGRUENCE OF TWO TRIANGLES

SAS(side-angle-side) congruence

- Two triangles are congruent if two sides and the included angle of one triangle are equal to the two sides and the included angle of the other triangle.

ASA(angle-side-angle) congruence

- Two triangles are congruent if two angles and the included side of one triangle are equal to two angles and the included side of the other triangle.

AAS(angle-angle-side) congruence

- Two triangles are congruent if two angles and one side of one triangle are equal to two angles and the corresponding side of the other triangle.

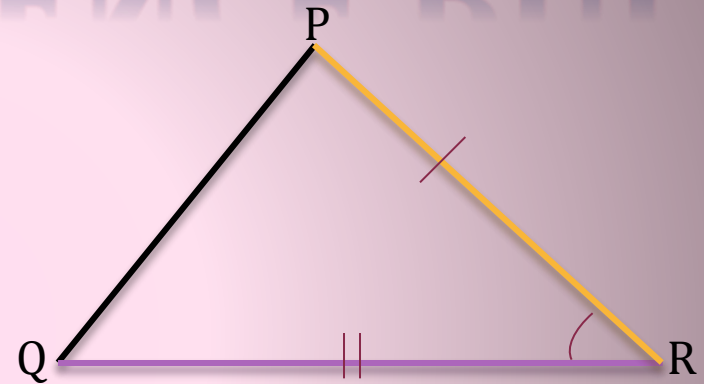
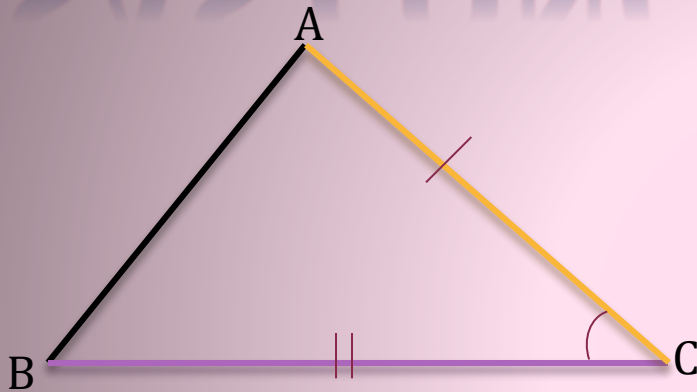
SSS(side-side-side) congruence

- If three sides of one triangle are equal to the three sides of another triangle, then the two triangles are congruent.

RHS(right angle-hypotenuse-side) congruence

- If in two right-angled triangles the hypotenuse and one side of one triangle are equal to the hypotenuse and one side of the other triangle, then the two triangles are congruent.

SAS CONGRUENCE RULE

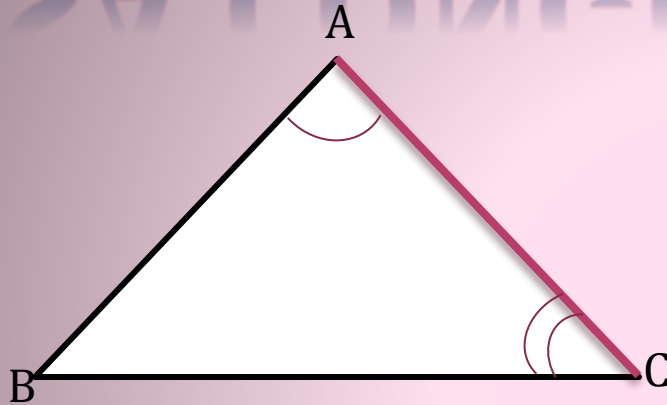


If,

Side	$AC = PQ$
Angle	$\angle C = \angle R$
Side	$BC = QR$

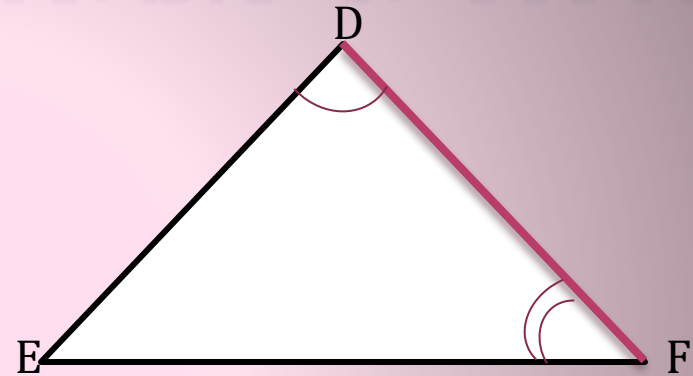
Then $\triangle ABC \cong \triangle PQR$ (by SAS congruence rule)

ASA CONGRUENCE RULE



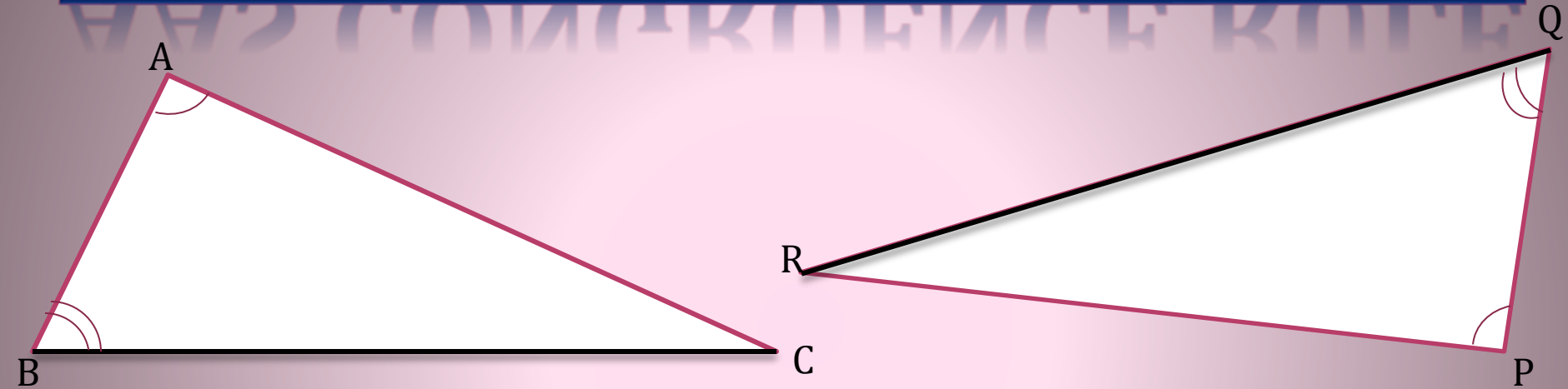
If,

Angle	$\angle BAC = \angle EDF$
Side	$AC = DF$
Angle	$\angle ACB = \angle DFE$



Then $\triangle ABC \cong \triangle DEF$ (by ASA congruence rule)

AAS CONGRUENCE RULE

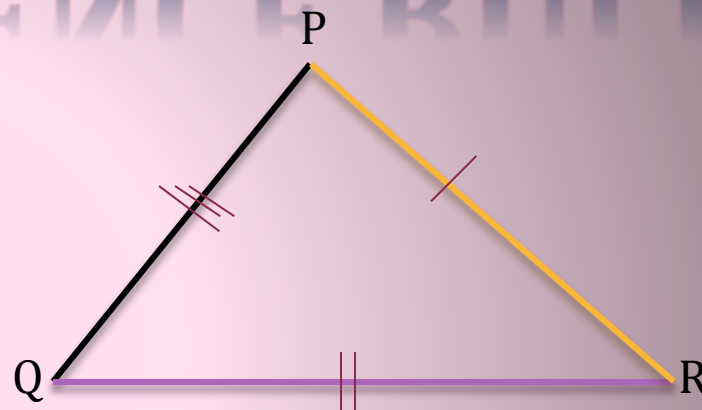
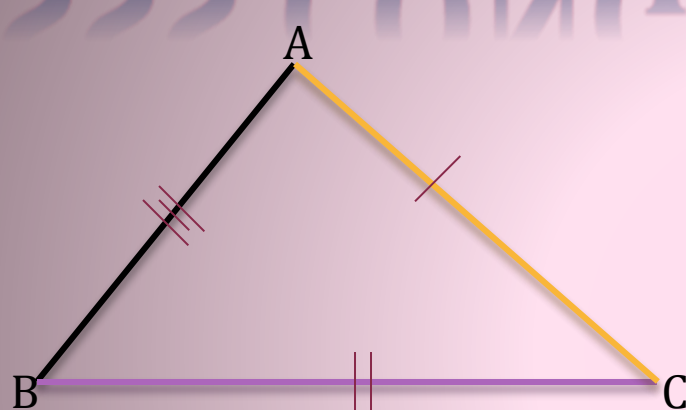


If,

Angle	$\angle BAC = \angle QPR$
Angle	$\angle CBA = \angle RQP$
Side	$BC = QR$

Then $\triangle ABC \cong \triangle PQR$ (by AAS congruence rule)

SSS CONGRUENCE RULE

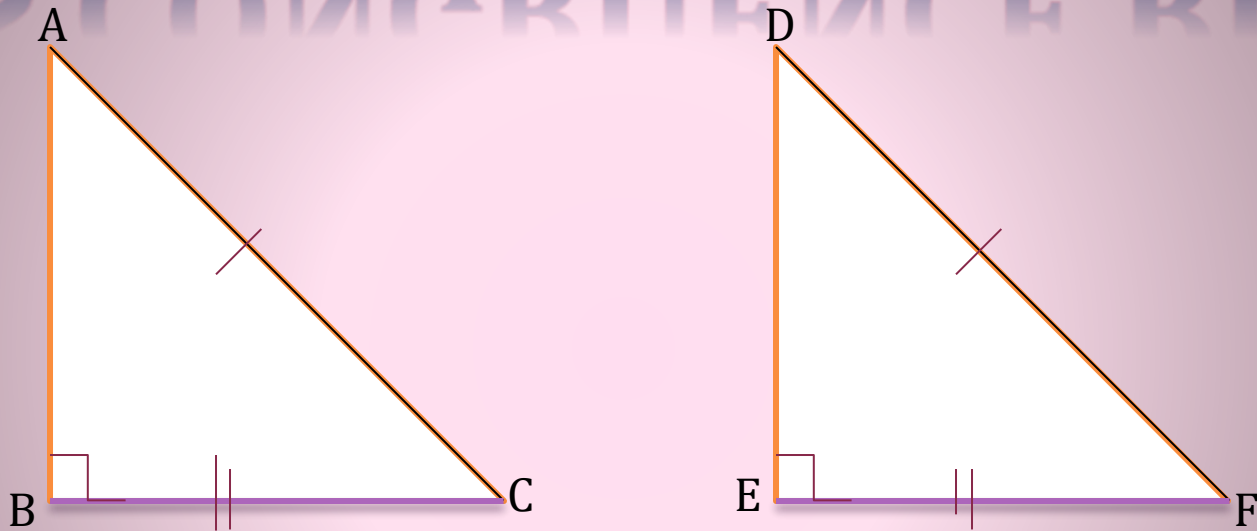


If,

Side	$AB = PQ$
Side	$BC = QR$
Side	$CA = RP$

Then $\triangle ABC \cong \triangle PQR$ (by SSS congruence rule)

RHS CONGRUENCE RULE

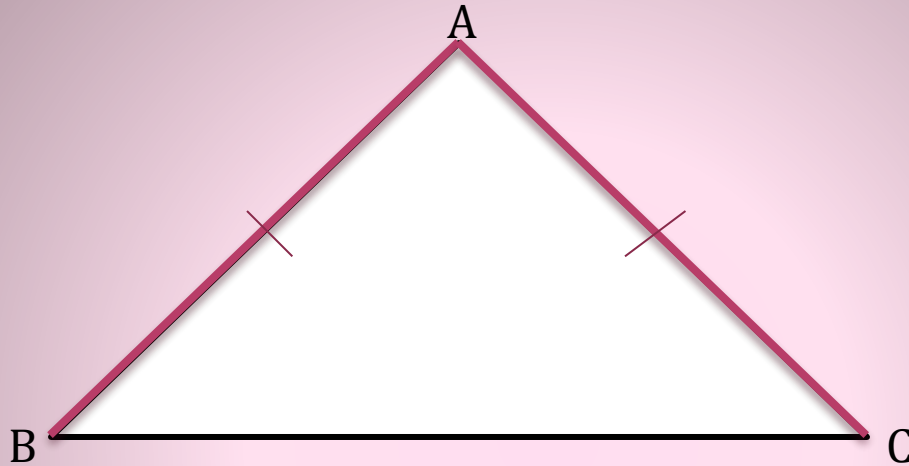


If,

Right Angle	$\angle ABC = \angle DEF = 90^\circ$
Hypotenuse	$AC = DF$
Side	$BC = EF$

Then $\triangle ABC \cong \triangle DEF$ (by RHS congruence rule)

PROPERTIES OF A TRIANGLE

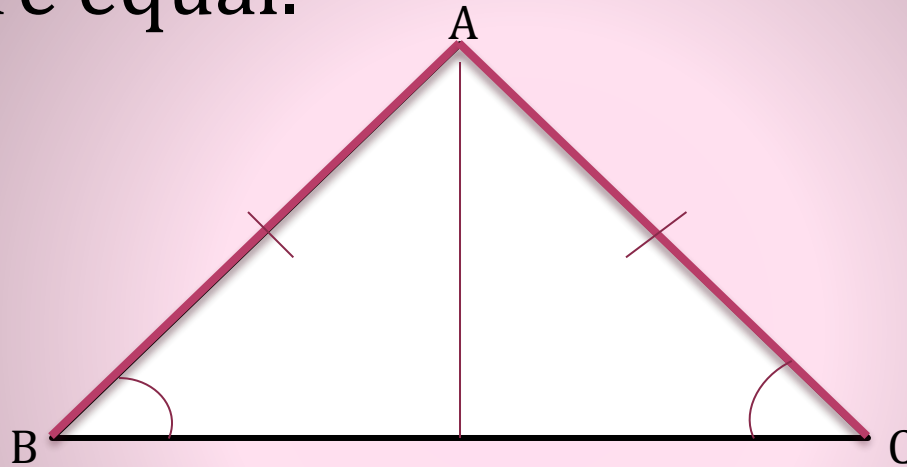


Before we learn the properties of a triangle, let's recall that a triangle in which two sides are equal in length is called an **ISOSCELES TRIANGLE**.

So, in the figure given above,
 $\triangle ABC$ is an isosceles triangle with $AB = AC$.

PROPERTY 1

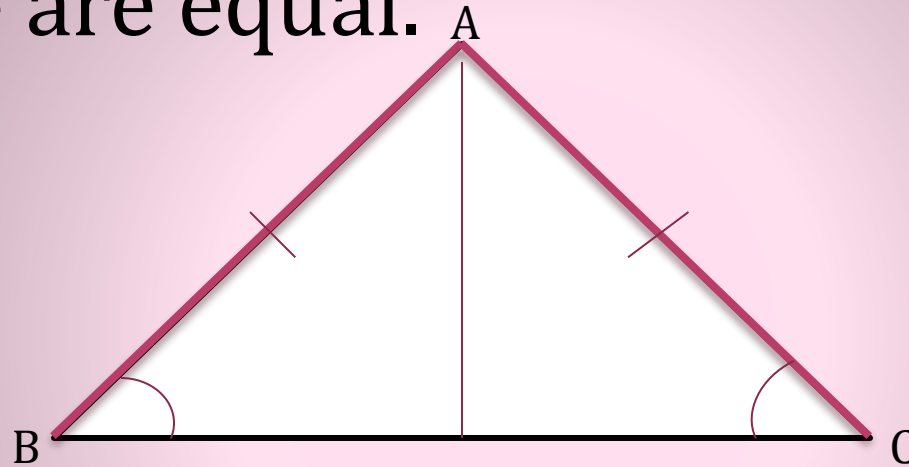
Angles opposite to equal sides of an isosceles triangle are equal.



For example, if $\triangle ABC$ is an isosceles triangle with $AB = AC$, then $\angle C = \angle B$ [because angle opposite to side AB is $\angle C$ and the angle opposite to side AC is $\angle B$].

PROPERTY 2

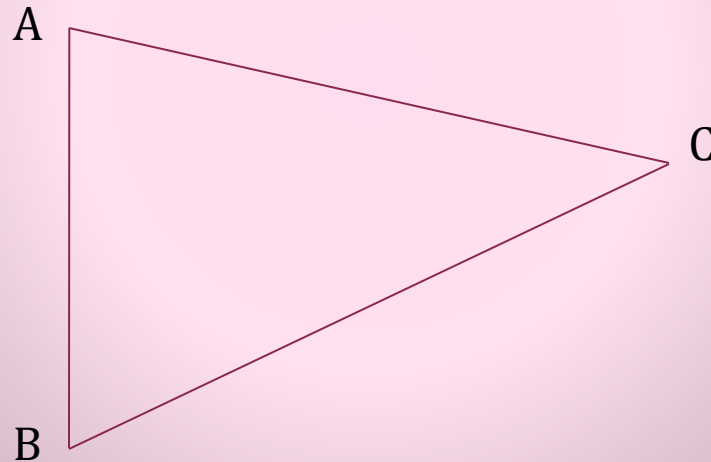
The sides opposite to equal angles of a triangle are equal.



For example, if in $\triangle ABC$, $\angle B = \angle C$,
then $AC = AB$ [because side opposite to $\angle B$ is AC
and the side opposite to $\angle C$ is AB .

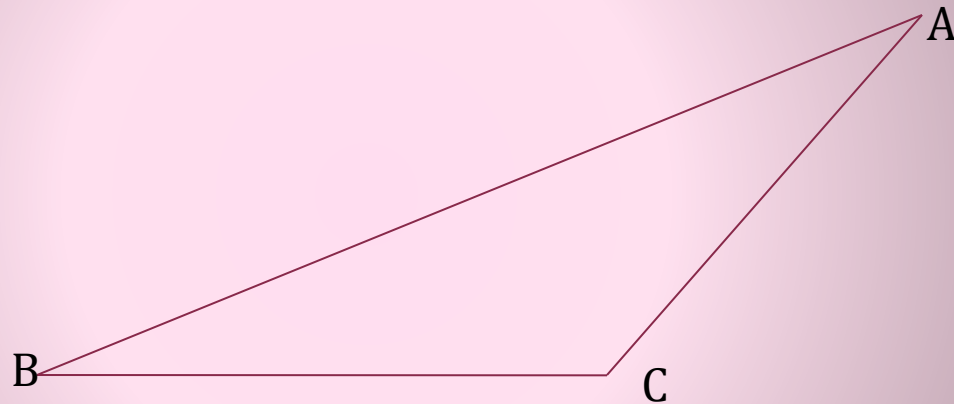
INEQUALITIES IN A TRIANGLE

1.If two sides of a triangle are unequal, the angle opposite to the longer side is larger (or greater)



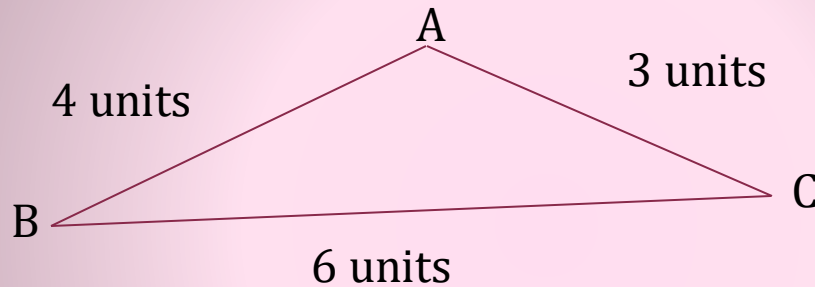
**In $\triangle ABC$, side BC is longer than side AB [that is, $BC > AB$].
So, $\angle A > \angle C$ [because angle opposite to side BC is $\angle A$
and the angle opposite to side AB is $\angle C$].**

2. In any triangle, the side opposite to the larger(greater) angle is longer.



**In $\triangle ABC$, $\angle C$ is larger than $\angle B$ [that is, $\angle C > \angle B$].
So, $AB > AC$ [because side opposite to $\angle C$ is AB and
the side opposite to $\angle B$ is AC].**

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



Let's see if the property is satisfied by the given triangle:

$$4+3>6$$

$$3+6>4$$

$$6+4>3$$

So, in a triangle, sum of any two sides is greater than the third side.

SUMMARY

1. Two figures are congruent, if they are of the same shape and size.
2. If two sides and the included angle of one triangle is equal to the two sides and the included angle of the other triangle then the two triangles are congruent (SAS Congruence Rule).
3. If two angles and the included side of one triangle are equal to the two angles and the included side of other triangle then the two triangles are congruent (ASA Congruence Rule).
4. If two angles and the one side of a triangle is equal to the two angles and the corresponding side of other triangle then the two triangles are congruent (AAS Congruence Rule).
5. If three sides of a triangle are equal to the three sides of the other triangle then the two triangles are congruent (SSS Congruence Rule).
6. If in two right-angled triangles, hypotenuse and one side of a triangle are equal to the hypotenuse and one side of the other triangle then the two triangles are congruent (RHS Congruence Rule).
7. Angles opposite to equal sides of a triangle are equal.
8. Sides opposite to equal angles of a triangle are equal.
9. In a triangle, angle opposite to the longer side is larger.
10. In a triangle, side opposite to the larger angle is longer.
11. Sum of any two sides of triangle is greater than the third side.