CHAPTER 07

Triangles

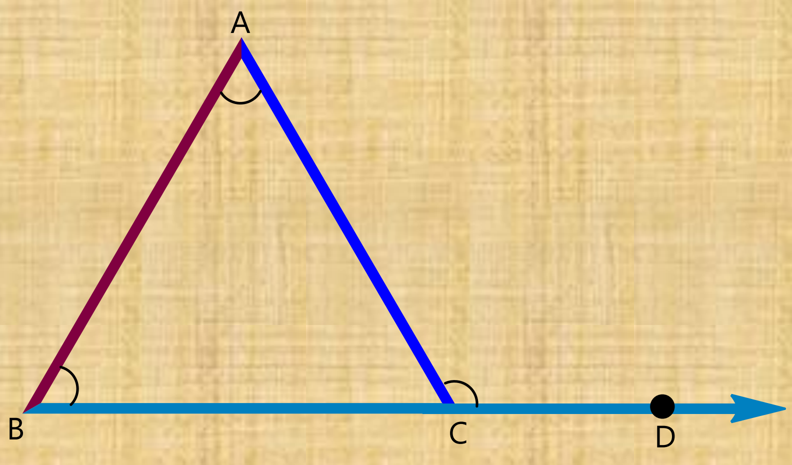
When all the three sides are different, the three angles are also different.

In any triangle, the maximum number of acute angles that can be drawn are three and minimum are two.

Acute angles are necessary. Only one right angle or one obtuse angle is possible in any triangle.

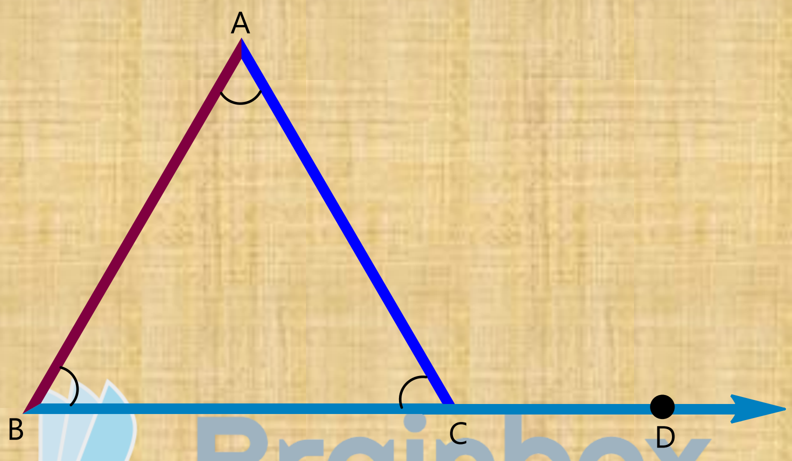
Exterior angle:

If the side BC of ΔABC is extended to D form a ray BD then $\angle ACD$ is called an exterior angle of $\angle ABC$ angled at 'C' and is denoted by the exterior angle $\angle ACD$ as shown the figure.



Interior angle:

The angles A and B are called the remote interior opposite angles of the exterior angle $\angle ACD$.



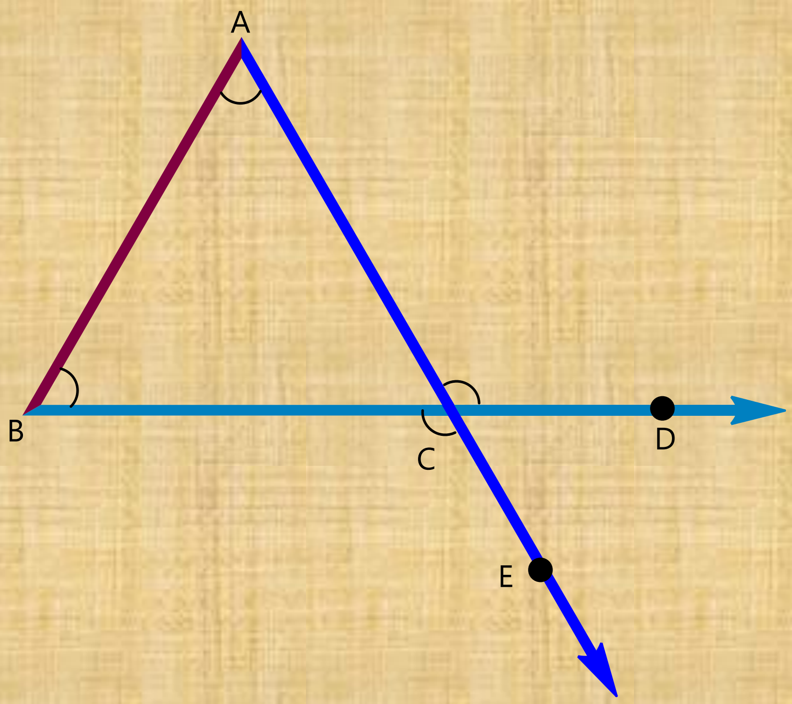
The sum of the interior opposite angles is equal to the exterior angle.

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

The exterior angle is greater than each of the interior opposite angles.

In the above figure ΔABC, if the side AC is extended to E to form a ray AE.

Then $\angle BCE$ is an exterior angle of ΔABC.



From the above, we can conclude that at each vertex of a triangle.

There exists two exterior angles.

In ΔABC, then exterior angles $\angle ACD$ and $\angle BCE$ are equal as they are vertically opposite angles.

i.e. $\angle ACD = \angle BCE$

- The two interior opposite angles will be the same for the two exterior angles formed at a particular vertex.

Interior angle theorem:

The sum of all the three interior angles of a triangle is 180^o.

Exterior angle theorem:

If one side of a triangle is extended then the exterior angle so formed is equal to the sum of the interior opposite angles.

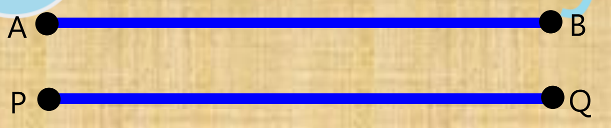
Congruent triangles:

Two geometrical figures are said to be congruent if they have exactly the same shape and size.

Congruency is denoted by the symbol ' $\cong$ '.

Two line – segments are said to be congruent if and only it their lengths are equal.

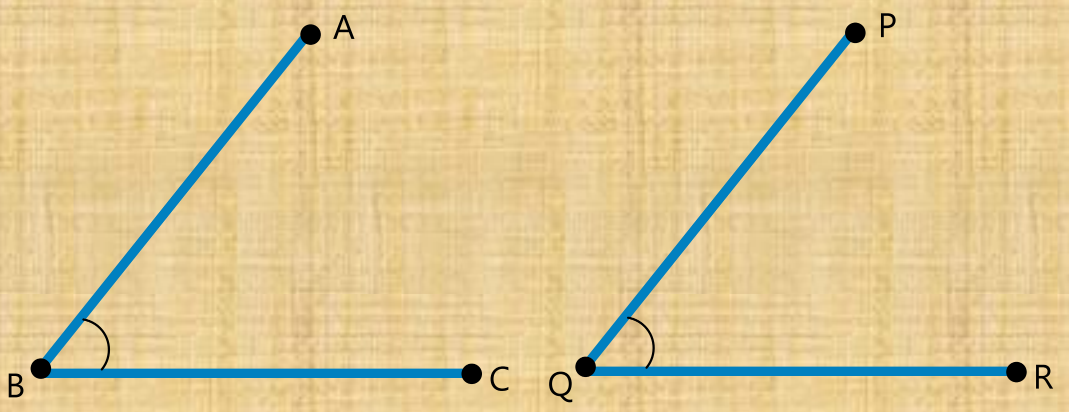
Example:



$AB \cong PQ$

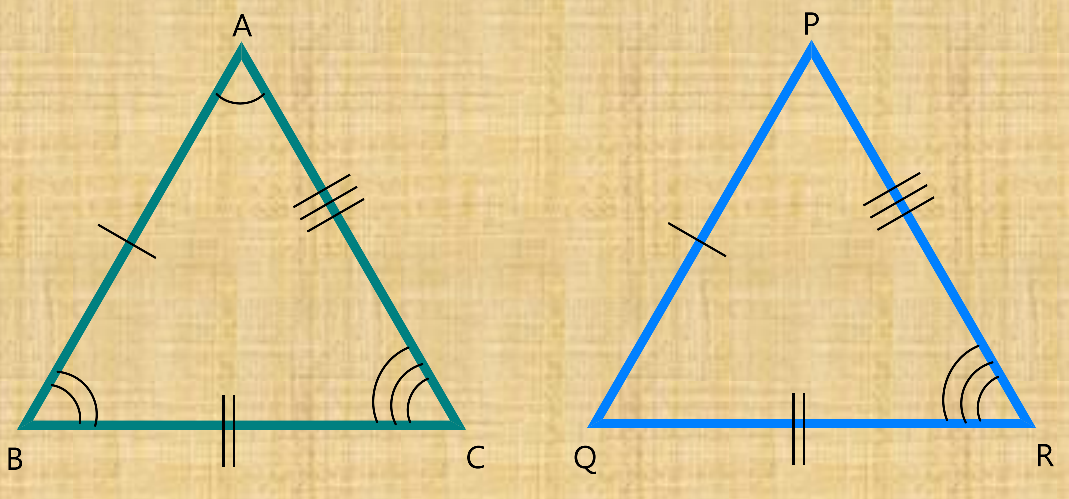
Two angles are said to be congruent if and only if their measures are equal.

Example:



$$\angle ABC \cong \angle PQR \Leftrightarrow m\angle ABC = m\angle PQR$$

Two triangles are said to be equal in all respects when one is placed on the other to exactly co-inside with it in which each part of the first triangle is equal to the corresponding part of the other. Triangles are equal in area also.



Example:

$A \leftrightarrow P$, $B \leftrightarrow Q$ and $C \leftrightarrow R$.

$\Delta ABC \cong \Delta PQR$

Two triangles ABC and PQR are said to be congruent if one and only if there is a correspondence between their vertices such that the corresponding sides and the corresponding angles are equal.

Congruent triangles are similar but similar triangles are not congruent always.

i.e.

Congruent triangles $\xrightarrow[\text{Always}]{\text{Area}}$ Similar triangles

Similar triangles $\xrightarrow[\text{Always}]{\text{Not}}$ Congruent triangles

In congruent triangles, corresponding parts are equal and we write in short C.P.C.T for corresponding parts of congruent triangles.