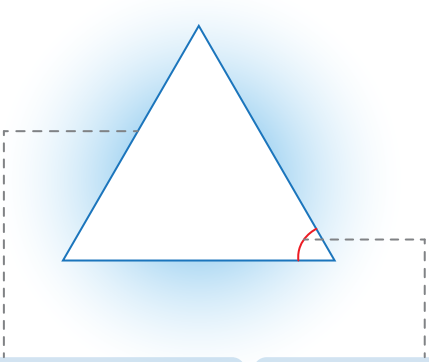
# TRIANGLES - Part 1

## Classification of Triangles

A triangle has 3 sides, 3 vertices, 3 angles

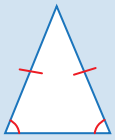
They have been classified as follows:



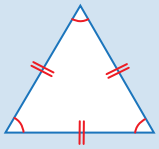
### Based on sides

1) Scalene triangle

2) Isosceles triangle

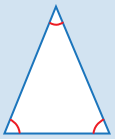


3) Equilateral triangle

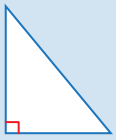


### Based on angles

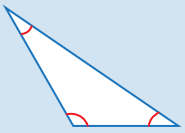
1) Acute triangle



2) Right triangle



3) Obtuse triangle

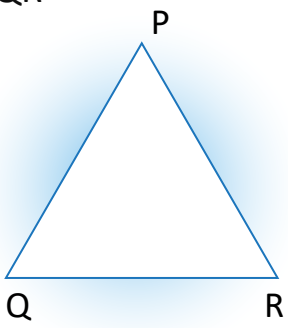


## Inequalities of Triangle

1) If PQ > PR
   then ∠PRQ > ∠PQR
   i.e. ∠R > ∠Q

2) If ∠R > ∠Q
   then PQ > PR

3) For the ΔPQR,
   PQ + PR > QR
   PR + QR > PQ
   PQ + QR > PR




## Comparison of Triangles

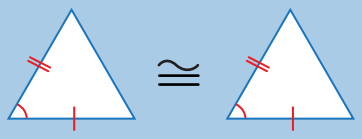
### Congruent Triangles

Pair of triangles with corresponding sides and corresponding angles equal are congruent triangles.

Symbol for congruency ≅

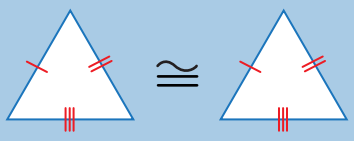
**Test to prove congruency**

1) SAS ( Side-Angle-Side )



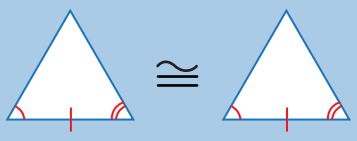
2 sides and included angle are equal

2) SSS ( Side-Side-Side )



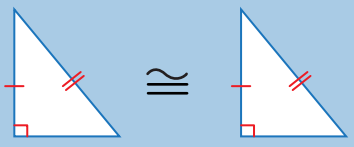
All 3 sides are equal

3) ASA ( Angle-Side-Angle )



2 angles and the included side are equal

4) RHS( Right angle-Hypotenuse-Side )



Hypotenuse and one side of a right angled triangle is equal to the respective ones of the other triangle

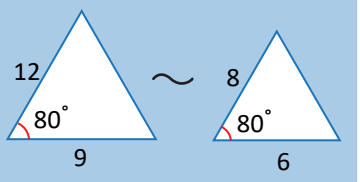
### Similar Triangles

Pair of triangles with corresponding angles equal and corresponding sides proportional are similar triangles.

Symbol for similarity ~

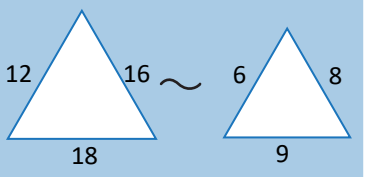
**Test to prove similarity**

1) SAS ( Side-Angle-Side )



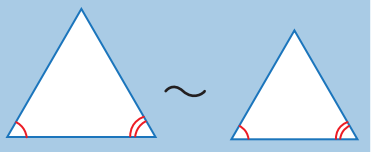

2 sides are proportional and included angle is equal

2) SSS ( Side-Side-Side )




All 3 sides are proportional

3) AA ( Angle-Angle )

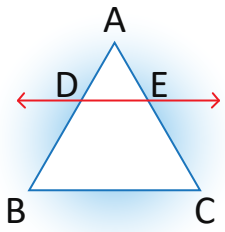


2 angles are equal

# TRIANGLES - Part 2

## Basic Proportionality Theorem (BPT)

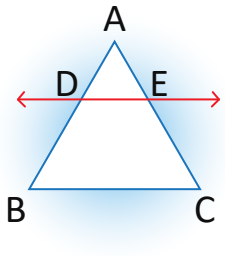
Statement :- If a line is parallel to a side of a triangle which intersects other two sides in distinct points, then the line divides other two sides in proportion.




If DE || BC , then by BPT

$$\frac{AD}{DB} = \frac{AE}{EC}$$

Converse of BPT :- If a line segment intersecting two sides in two distinct points divides them in same ratio , then the line is parallel to the third side.



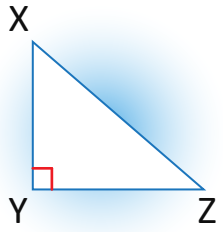

If $\frac{AD}{DB} = \frac{AE}{EC}$

then by converse of BPT,

DE || BC

## Pythagoras Theorem

Statement :- In a right angled triangle the square of hypotenuse ( *longest side of the triangle* ) is equal to the sum of squares of remaining two sides.

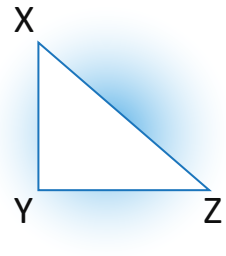



In $\Delta XYZ$ , $\angle Y = 90^\circ$

By Pythagoras Theorem,

$XZ^2 = XY^2 + YZ^2$

Converse of Pythagoras Theorem :- If square of one side of a triangle is equal to the sum of squares of other two sides then, the triangle is right angled triangle.




In $\Delta XYZ$ ,

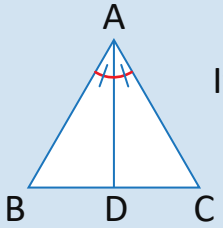
$XZ^2 = XY^2 + YZ^2$

By converse of Pythagoras theorem,

$\angle Y = 90^\circ$

## Property of Angle Bisector

Statement :- In a triangle, the angle bisector divides the side opposite to angle in the ratio of remaining sides.

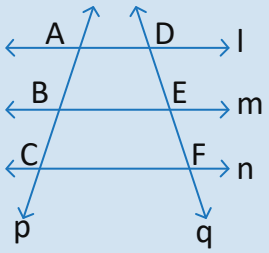



If AD is angle bisector then,

$$\frac{BD}{DC} = \frac{AB}{AC}$$

## Property of intercepts made by three parallel lines

Statement :- The ratio of intercepts made on transversal by 3 parallel lines is equal to ratio of corresponding intercepts made on any other transversal of the same parallel lines.




If AD || BE || CF ,

then $\frac{AB}{BC} = \frac{DE}{EF}$