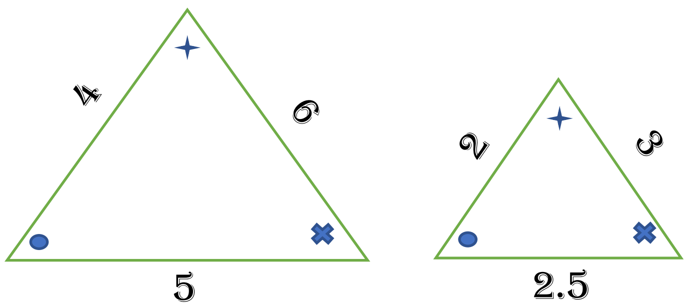
# Similarity in polygons

Two shapes not the same size but the same in everything else



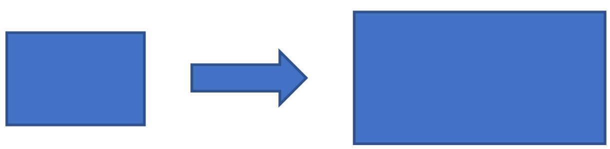

Scale Factor = 6/3 = 2

Two polygons are similar

1- **They have a scale factor** -> (enlargement, entanglement)

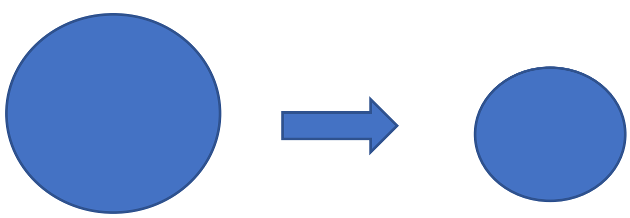
### Enlargement (Magnification):-

Is a scale in which the second term is larger than the first term



### Reduction (Miniature):-

Is a scale in which the second term is smaller than the first term



**2- All their equivalent angles are equal**

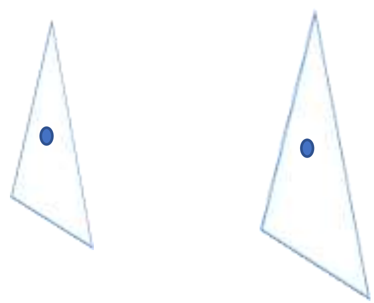
When two shapes are similar and have a scale factor of 1, they are called a **congruent**

# Dilation

Is a transformation that produces an image that is the same shape as the original but with different size, so all dilations are **similar**

It includes

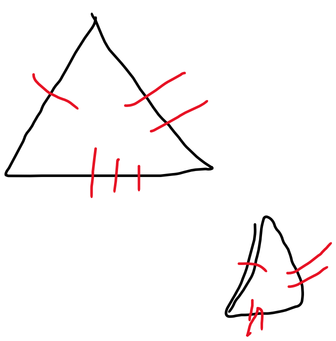
1- **Scale factor**
2- **Center of dilation** (the pivot point)

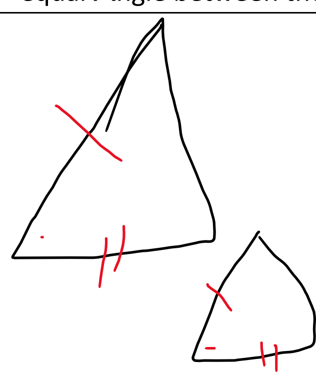


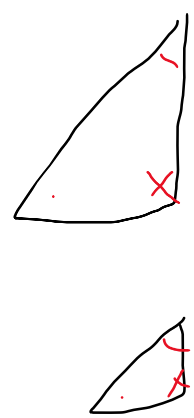
## SIMILARITY IN TRIANGLES

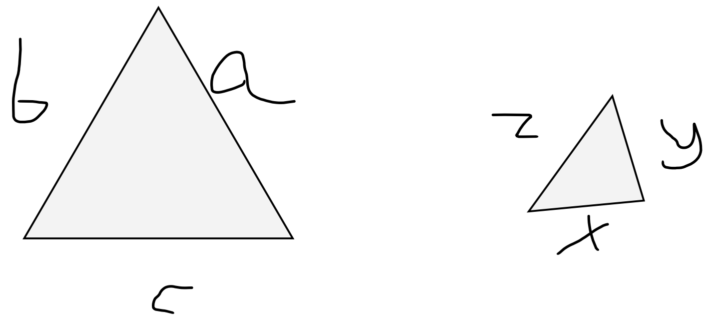
There are 3 cases when triangles are similar

| S.S.S | S.A.S | A.A.A |
|---|---|---|
| When all the three Sides are proportional | When two Sides are proportional and there is an equal Angle between them | When all three Angles are equal |










abc ~ xyz

$$\frac{a}{x} = \frac{b}{y} = \frac{c}{z} = \frac{a+b+c}{x+y+z}$$

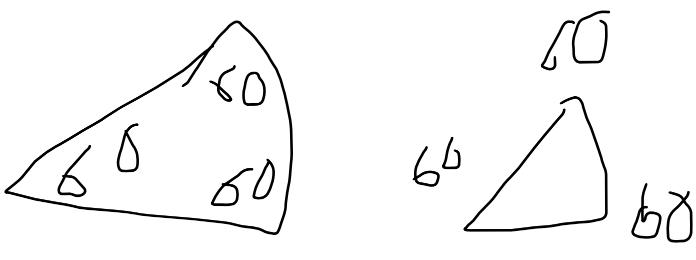
Their sides are proportional and their angles are equal

$$\frac{a(abc)}{a(xyz)} = (\frac{x}{y})^2$$

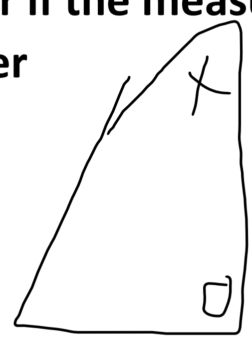
Ratio of the areas = square the ratio of the sides

# NOTES

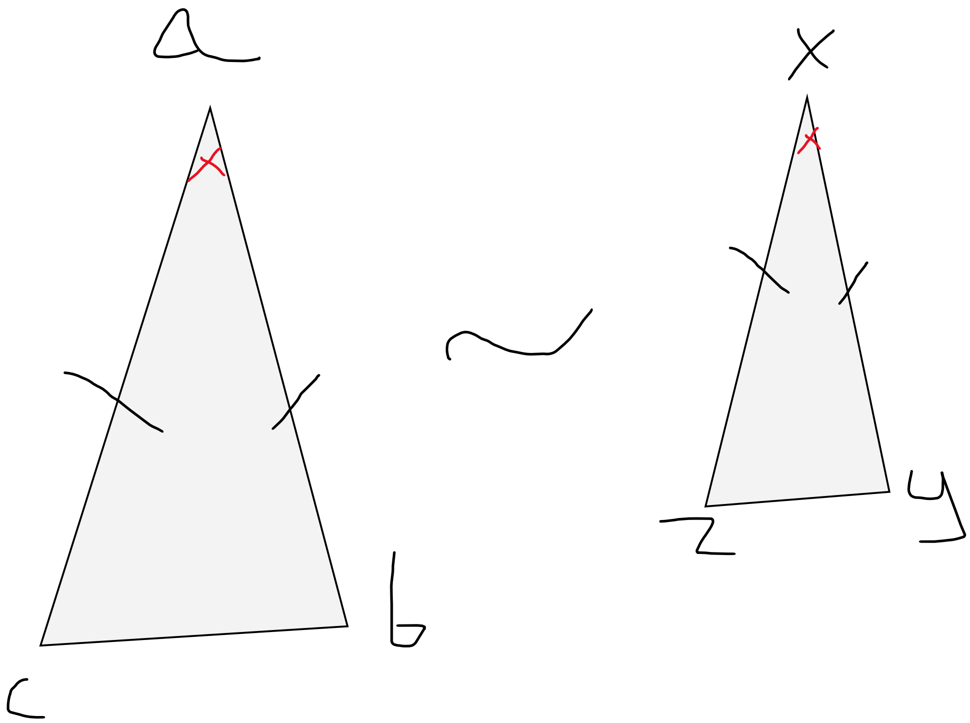
## Any two equilateral triangle are Equal




## Two right triangles are similar if the measure of one acute angle are equal to the other



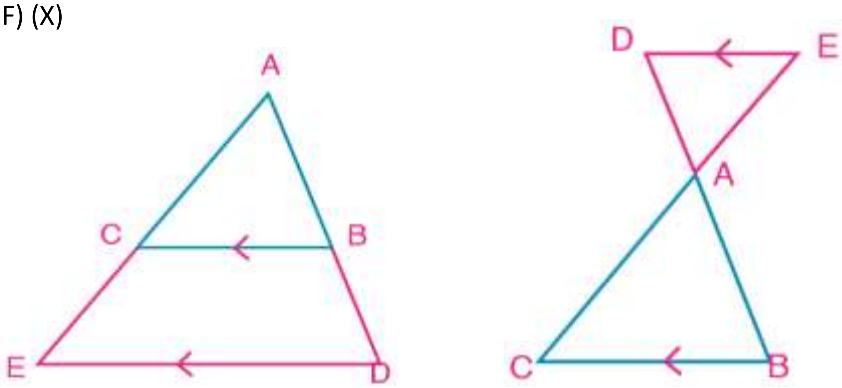
**Two isosceles (متساوي الساقين ) triangles are similar if the measure of the two base angles is equal**




**IMPORTANT COROLLARIES (نتائج)**

### Corollary 1:-

If a line is drawn parallel to one side of a triangle and intersects the other two sides or the lines containing them, then the resulting triangle is similar to the original triangle.
The letter (F) (X)

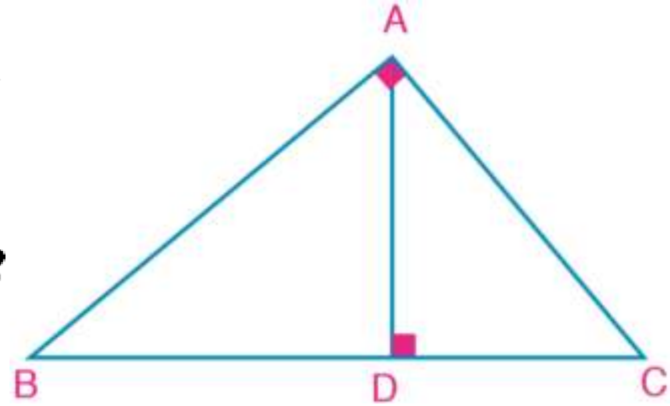


## Corollary 2:-

In any right triangle, the altitude to the hypotenuse separates the triangle into two triangles which are similar to each other and to the original triangle.

Aka (Ecledian)

$$(AB)^2 = BD \times BC$$
$$(AC)^2 = CD \times CB$$
$$(AD)^2 = DC \times DB$$




ABC ~ ACD

ABC ~ BCD

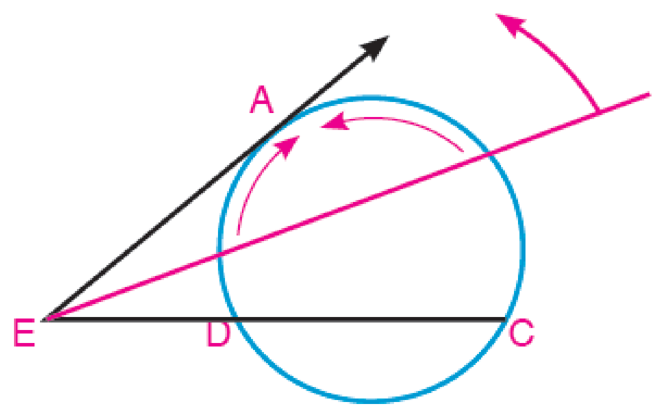
ACD ~ BCD

## Corollary 3:-

When a secant segment (EC) and a tangent segment (EA) are drawn on a circle from an external point (E)

The product of the secant segment (EC) and its external segment is (ED) is equal to the square of the tangent segment (EA)

$$(EA)^2 = ED \times EC$$



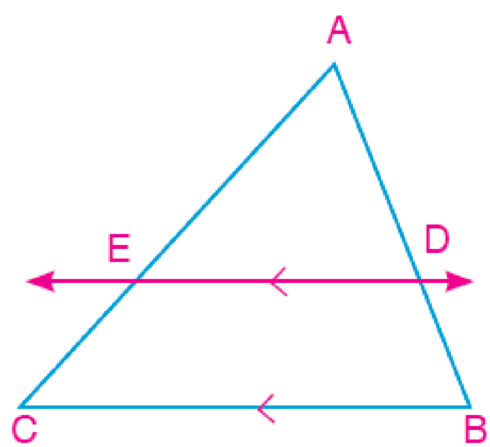
## IMPORTANT THEROEMS (نظريات)

### Theorem 1:-

If a line is drawn parallel to one side of a triangle and Intersects the other two sides, then it divides them into segments whose lengths are proportional.

ABC ~ ADE

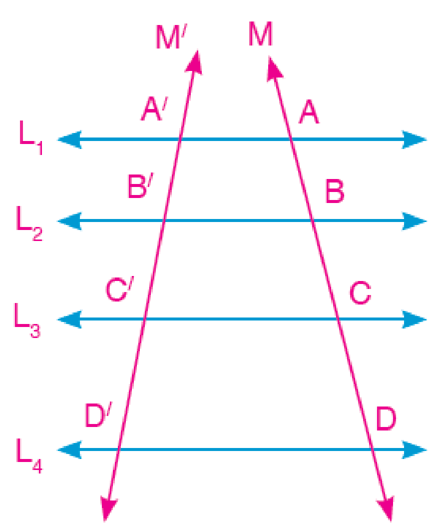
$$\frac{AD}{DB} = \frac{AE}{EC}$$




### Theorem 2:-

Given several coplanar parallel lines and two transversals then the lengths of the corresponding segments on the transversals are proportional.

AA’ ~ BB’ ~ CC’ ~ DD’

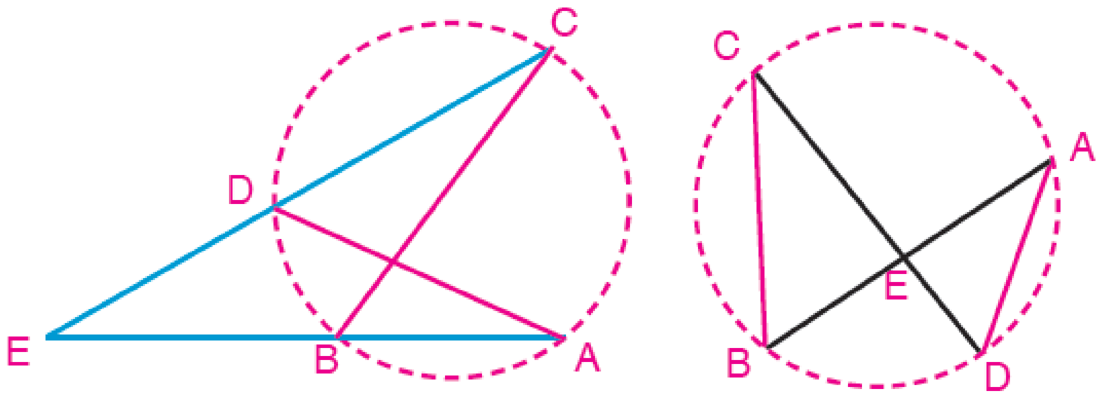


## Theorem 3:-

If the two lines containing the two segments AB & CD intersect at a point E (A, B, C, D, and E are

Distinct points) and EA * EB = EC * ED so

Then: the points A, B, C and D lie on a circle.

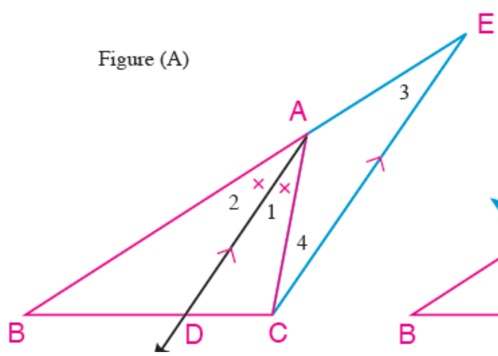


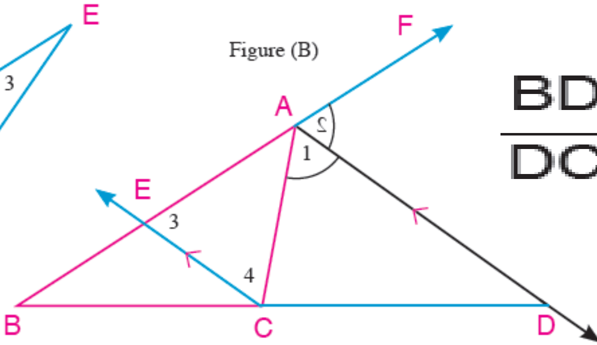

$$\boxed{\frac{EA}{EB} = \frac{ED}{EC} = \frac{AD}{CB}}$$

## ANGLES BISECTOR THEOREM

## Theorem 1:-

The bisector of the interior or exterior angle of a triangle at any vertex divides the opposite base of the triangle internally or externally into two parts the ratio of their lengths is equal to ratio of the lengths of the other two sides of the triangle.




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