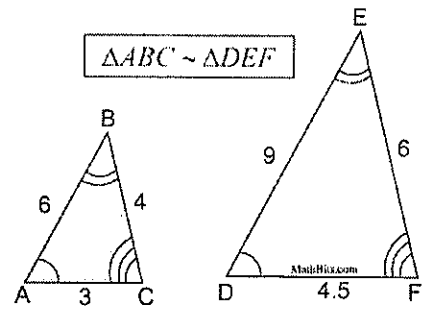# Similar Triangles
Summary

1. Two figures are similar if:
   a. corresponding angles are congruent
   and
   b. corresponding sides are proportional

$\triangle ABC \sim \triangle DEF$

$$\frac{6}{9} = \frac{4}{6} = \frac{3}{4.5} = \frac{2}{3}$$

2. Properties of Similar Figures
   a. Corresponding angles always in a 1:1 ratio
   b. Ratio of perimeters EQUALS the ratio of corresponding sides
   c. Ratio of areas is equal to the SQUARE of the ratio of corresponding sides

3. Side Splitter Theorem:

   If a line is parallel to a side of a triangle and intersects the other two sides, then this line divides those two sides proportionally.
   THE CONVERSE IS ALSO TRUE
   If a line intersects two sides of a triangle and divides the sides proportionally, then this line is parallel to the third side.
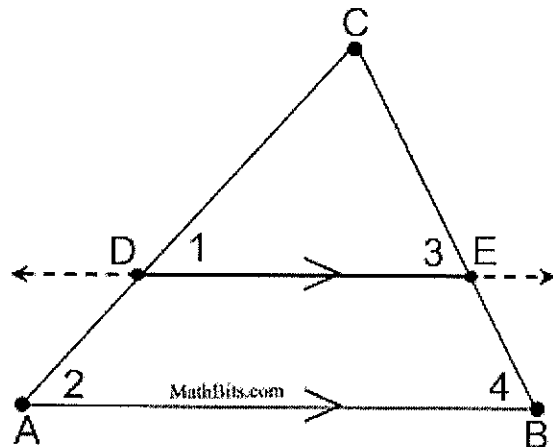
   Proportion involving pieces of sides
   $$\frac{CD}{DA} = \frac{CE}{EB}$$

   Proportions involving WHOLE sides
   $$\frac{CD}{CA} = \frac{CE}{CB} \quad OR \quad \frac{DA}{CA} = \frac{EB}{CB}$$
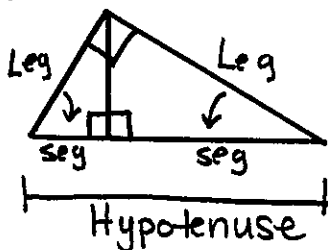
   When ∥ sides are involved, you must use WHOLE SIDES!!!
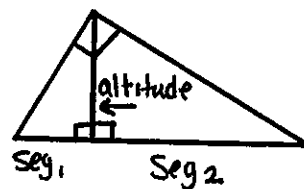
   BEWARE
   $$\frac{CD}{DE} = \frac{CA}{AB}$$

4. Altitude to Hypotenuse

   ### HLLS

   Leg Leg
   seg seg
   Hypotenuse

   $$\frac{H}{L} = \frac{L}{S}$$ same (mean proportional)

   ### SAAS

   altitude
   Seg₁ Seg₂
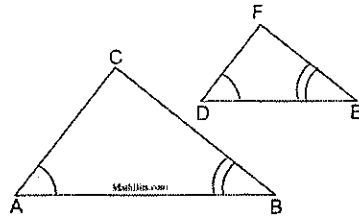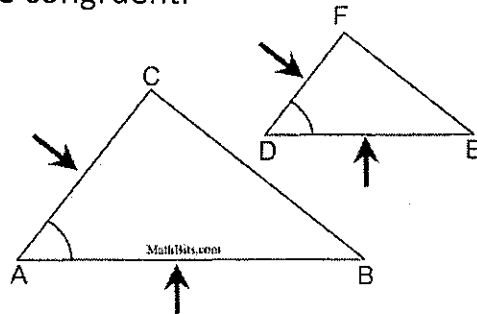
   $$\frac{S_1}{A} = \frac{A}{S_2}$$ same (mean proportional)
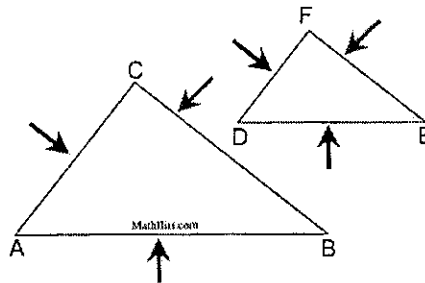
5. Proving Triangles Similar

    a. AA – Two angles of one triangle are congruent to the corresponding angles of another.

    b. SAS – Two sets of corresponding sides are proportional and the corresponding included angles are congruent.

    c. SSS – Three pairs of corresponding sides are proportional

6. TWO COLUMN Similar Triangle proof (last lines)

Statement	Reason
$\triangle ABC \sim \triangle EFH$	$AA \cong AA$
$\dfrac{AB}{EF} = \dfrac{AC}{EH}$	Corresponding sides of similar triangles are in proportion
$AB \cdot EH = EF \cdot AC$	In a Proportion, the product of the means = the product of the extremes.