Geometry, *You Can Do It !*
Applications: Similar Δ's

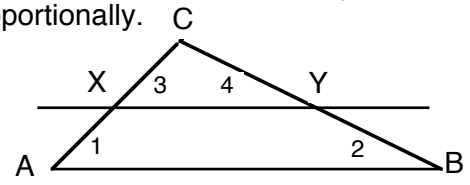
by Bill Hanlon

We learned last time that the sides of similar polygons are in proportion. Using that information, we are able to solve problems.

If we continued in our study, we might be able to draw some more conclusions based on our observations.

Theorem

If a line is parallel to one side of a triangle and intersects the other two sides, it divides them proportionally.



Given: ΔABC, $\overline{XY} \parallel \overline{AB}$

Prove: $\frac{AX}{XC} = \frac{BY}{YC}$

Statements	Reasons
1. $\overline{XY} \parallel \overline{AB}$	Given
2. $\angle 1 \cong \angle 3$, $\angle 2 \cong \angle 4$	ll lines cut by t
3. Δ ABC ~ ΔXYC	AA Postulate
4. $\frac{AC}{XC} = \frac{BC}{YC}$	Similar Δ's
5. $\frac{AC - XC}{XC} = \frac{BC - YC}{YC}$	Prop of pro.
6. AC - XC = AX BC - YC = BY	Sub. prop =.
7. $\frac{AX}{XC} = \frac{BY}{YC}$	Substitution

Following as a direct result of that theorem, we have the folowing corollary.

Corollary

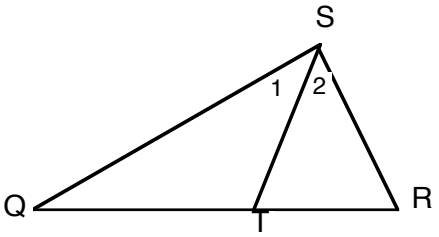
If three parallel lines intersect two transversals, they divide them proportionally.

Moving along, we have another theorem.

Theorem

If a ray bisects an angle of a triangle, it divides the opposite side into segments whose lengths are proportional to the lengths of the other two sides.

Let's look at a picture of that.



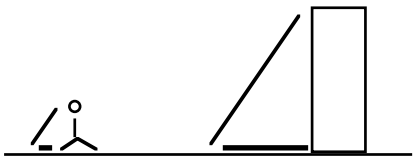
That theorem states that if $\angle 1 \cong \angle 2$, then

$$\frac{QT}{QS} = \frac{TR}{RS}$$

Isn't this stuff neat ? Let's find the height of some buildings using similar triangles.

A 6 foot tall person casts a shadow 2 feet long. A building's shadow is 30 feet long, how tall is the building.

Drawing a picture, we have Mr Man, Mr. Sun, and Mr. Building.



Because of the sun's distance from the earth, the top angles will be the same. We also have right angles, therefore by the AA Postulate, the triangles are similar.

$$\frac{\text{height of man}}{\text{length of shadow}} = \frac{\text{height of bldg.}}{\text{length of shadow}}$$

