Def: The ratio of the number a to the number b is the number a/b.
A proportion is an equality between ratios. a/b=c/d

a, b, c, and d are called the *first, second, third, and fourth terms*.
The second and third terms, b and c, are called the means.
The first and fourth terms, a and d, are called the extremes.

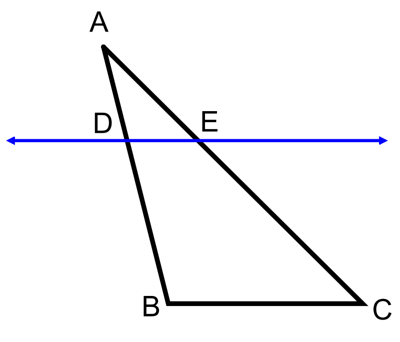
The product of the means is equal to the product of the extremes.
If a/b=c/d, then ad=bc.

Def: The number b is the geometric mean between the numbers a and c if a, b, and c are positive and a/b=b/c.

Def: Two triangles are similar iff there is a correspondence between their vertices such that their corresponding sides are proportional and their corresponding angles are equal.

10.3 - The Side-Splitter Theorem

Theorem 44 - The Side-Splitter Theorem
If a line parallel to one side of a triangle intersects the other two sides in different points, it divides the sides in the same ratio, that is, if in triangle ABC, DE||BC, then AD/DB=AE/EC.

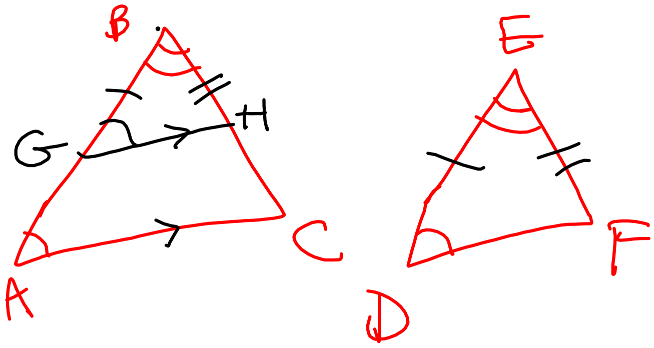


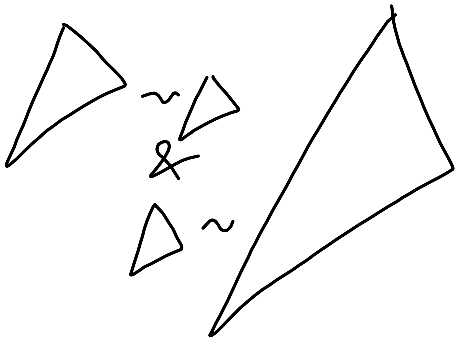
Corollary to the Side-Splitter Theorem:
If a line parallel to one side of a triangle intersects the other two sides in different points, it cuts off segments proprtional to the sides, that is, AD/AB=AE/AC and DB/AB=EC/AC

10.4 - AA Similarity

Theorem 45 - The AA Theorem - If two angles of one triangle are equal to two angles of another triangle, the triangles are similar.

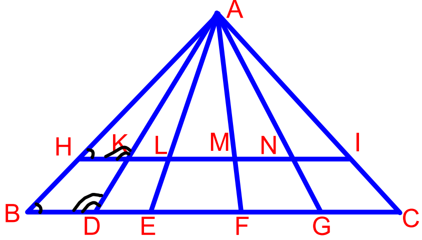
Corollary to the AA Theorem - Two triangles similar to a third triangle are similar to each other.





Piero della Francesca, an important painter of the 15th century, was also a mathematician. In his book *On Perspective for Painting*, he proved the following theorem:

> "If above a line divided into several parts a line be drawn parallel to it and from the points dividing the first line there be drawn lines which are concurrant, they will divide the parallel line in the same proportion as the given line."



View of an Ideal City, 1460

19. What does this theorem say about lines BC and HI?

parallel

20. What does the word "concurrent" mean?

meeting @ at least one point

21. Complete the similarity correspondences: ΔAHK~ΔABD and ΔAKL~ΔADE

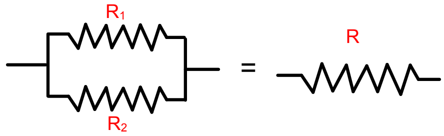
22. Complete the proportions: HK/BD =AK/AD and AK/AD =KL/DE

23. What proportion follows directly from these two proportions?

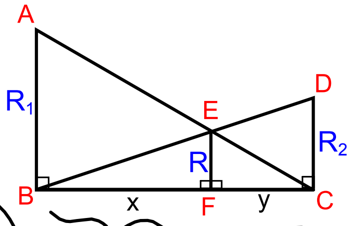
HK/BD = KL/DE

Electricians know that if two resistances R_1 and R_2 are "in parallel," they are equivalent to a single resistance R, where $R=(R_1R_2)/(R_1+R_2)$.

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} \Leftrightarrow R = \frac{R_1R_2}{R_1+R_2}$$



Prove that the figure below illustrates this equation by giving a reason for each of the following statements.



25. $\Delta EFC \sim \Delta ABC$ and $\Delta EFB \sim \Delta DCB$

$\angle ACB = \angle ECF$

& $\angle ABC = \angle EFC$

26. $R/R_1=y/(x+y)$ and $R/R_2=x/(x+y)$

side lengths of similar Δ's are proportional

27. $R/R_1+R/R_2=y/(x+y)+x/(x+y)=(y+x)/(x+y)=1$

$\frac{y}{x+y} + \frac{x}{x+y} = \frac{y+x}{x+y}$ (addition/simplification)

28. $RR_2+RR_1=R_1R_2$

$\frac{R}{R_1} + \frac{R}{R_2} = 1$

$R_1R_2\left(\frac{R}{R_1} + \frac{R}{R_2}\right) = (1)R_1R_2$

29. $R(R_2+R_1)=R_1R_2$

~~factoring~~ distributive property

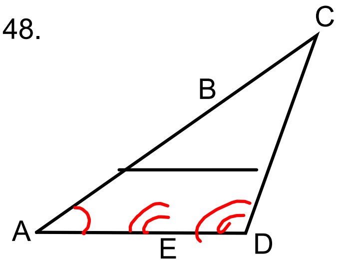
$\frac{\cancel{R_1}R_2R}{\cancel{R_1}} + \frac{R_1\cancel{R_2}R}{\cancel{R_2}} = R_1R_2$

30. $R=(R_1R_2)/(R_1+R_2)$

division by (R_1+R_2)

$R_2R + R_1R = R_1R_2$

48.



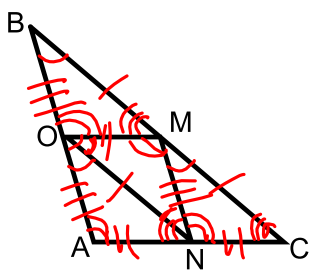
Given: ΔACD w/ $BE \parallel CD$

Prove: $\Delta ABE \sim \Delta ACD$

Proof

1. $BE \parallel CD$	Given
2. $\angle BAE = \angle CAD$	Reflexive
3. $\angle BEA = \angle CDA$	Parallel lines form equal corresponding $\angle$'s
4 $\Delta ABE \sim \Delta ACD$	AA similarity

50.



Given: $\triangle ABC$ w/ midsegments MN, MO, & NO

Prove: $\triangle MNO \sim \triangle ABC$

1. Given stuff
2. $MN \parallel BA$, $OM \parallel AC$ & $ON \parallel BC$ by midsegment Theorem
3. $\angle CMN = \angle CBA$ parallel lines form equal corresponding $\angle$'s

Wed. 01/28 - Quiz #6 (Ch 9 Area) - 2nd per.

Thurs. 01/29 - Quiz #6 (Ch 9 Area) - 3rd per.

Fri. 01/30 - **HW #9** (Compass & Straightedge constructions) due

Tues./Wed. 02/03 (2nd per.) 02/04 (3rd per.) - Quiz #7 (Ch 10 similarity)

Fri. 02/06 - **HW #10** (Ch 10 Review) due; **Test #4**