Ch 10 Review, pp. 421-424 #1-62

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.

$$\frac{a}{x} = \frac{x}{d}$$

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

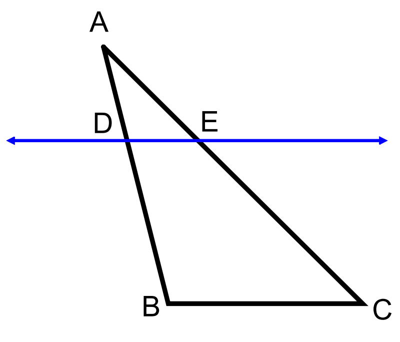
Def: The number b is the geometric mean between the numbers a and c if a, b, and c are positive and a/b=b/c.

$$x^2 = ad \Rightarrow x = \sqrt{ad}$$

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

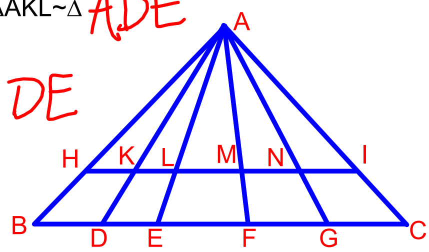
19. What does this theorem say about lines BC and HI?

they are parallel

20. What does the word "concurrent" mean?

they share a point (or intersect)

21. Complete the similarity correspondences: ΔAHK~Δ ABD and ΔAKL~Δ ADE



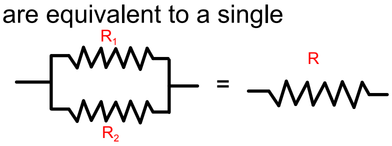
22. Complete the proportions: HK/ BD =AK/ AD and AK/ AD =KL/ DE

23. What proportion follows directly from these two proportions?

HK/BD = KL/DE

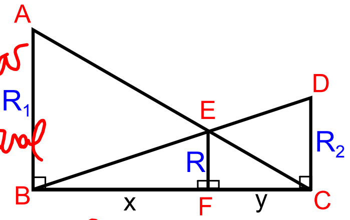
Electricians know that if two resistances R_1 and R_2 are "in parallel," they are equivalent to a single resistance R, where $R=(R_1R_2)/(R_1+R_2)$.

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 $\Delta EFB \sim \Delta DCB$

AA similarity



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

$\frac{R}{R_1} = \frac{y}{x+y} \quad \frac{R}{R_2} = \frac{x}{x+y}$ corresponding parts of similar △'s are proportional

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

$\frac{R}{R_1} + \frac{R}{R_2} = \frac{y}{x+y} + \frac{x}{x+y} = \frac{x+y}{x+y} = 1$ addition

28. $RR_2+RR_1=R_1R_2$

$RR_2+RR_1=R_1R_2$ multiplication

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

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

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

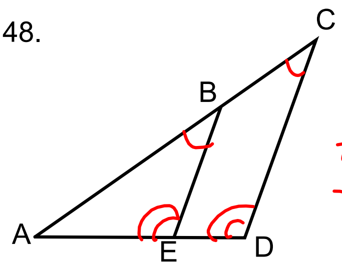
Distributive prop.

$a(b+c) = ab+ac$

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

$R = \frac{R_1R_2}{R_1+R_2}$ Division

48.



<u>Given</u>: ΔACD with BE||CD

<u>Prove</u>: ΔABE~ΔACD

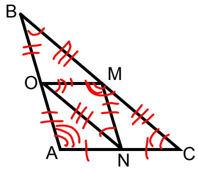
PROOF

1. BE ∥ CD — Given
2. ∠ABE=∠C, ∠AEB=∠D — Parallel Lines form equal corresponding angles

(2.5 ∠A=∠A — Reflexive Property)

3. ΔABE ~ ΔACD — AA Similarity

50.



Given: ΔABC with midsegments MN, MO, and NO
Prove: ΔMNO~ΔABC

PROOF

1. MN, MO, NO are midsegments — Given
2. AN = NC, BO = OA, BM ≅ MC — Midsegments connect midpoints O, M, N; midpoints divide segments into 2 equal segments
3. OM ∥ AC, MN ∥ BA, ON ∥ BC; OM = AN = NC, MN = BO = OA, ON = BM = MC — Midsegment Theorem
4. ΔBOM ≅ ΔOAN ≅ ΔMNC ≅ ΔNMO — SSS congruence
5. ∠B = ∠MNO, ∠A = ∠NMO — corresponding parts of ≅ Δ's are =
6. ΔABC ~ ΔMNO — AA similarity