Ch 10 - Similarity

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

10.1 - Ratio and Proportion

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

$$\frac{a}{b}=\frac{c}{d}$$

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.

$$\frac{a}{b}=\frac{b}{c}$$

$$ac=b^2$$

$$\sqrt{a\cdot c}=b$$

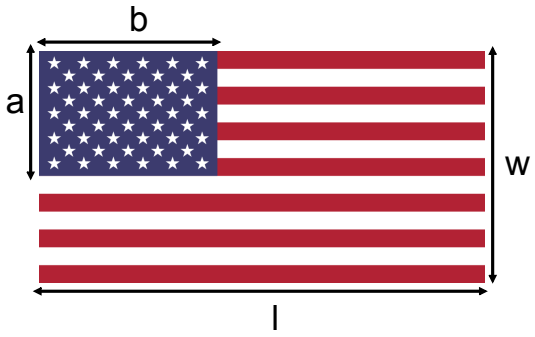
5 & 13

$$\frac{5}{b}=\frac{b}{13}$$

$$b^2=5(13)$$

$$b=\sqrt{65}$$

The official ratio of width to length of the United States flag is w/l=10/19.



What is the ratio of

31. the length to width?

19/10

32. the width of the blue field, a, to the width of the flag?

7/13

33. the number of red stripes to the number of white stripes?

7/6

If the giant flag in the photo is 160 feet wide,

34. What does x represent in the proportion 160/x=10/19?

x = length

$\frac{160}{x}=\frac{10}{19}$ $160(19)=10x$

35. Solve for x.

x = 304 ft

36. What does y represent in the proportion y/160=1/13?

y = width of a stripe

37. Solve for y.

$y=\frac{160}{13}\approx 12.3$ ft

$\frac{y}{160}=\frac{1}{13}$ $13y=160$

38. What is the width, a, in feet of the blue field of this giant flag?

$a=7(160)/13\approx 86.1$ ft

$\frac{7}{13}=\frac{a}{160}$ $13a=7(160)$

The official value of the ratio b/x is 0.76.

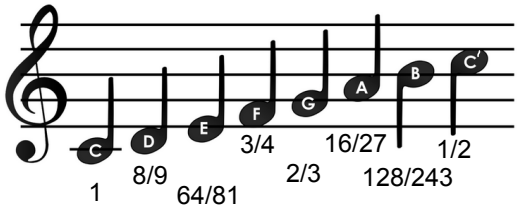
$\frac{b}{x}=0.76$

39. What is the approximate length, b, in feet of the blue field?

$b=0.76x=0.76(304)=231.0$ ft

The rectangle of the blue field would be similar to the shape of the entire flag if a/b=w/l.

40. Are these two rectangles similar?



Pythagoras established a tuning system relating the notes of a musical scale to the relative lengths of the strings that produce them.

The string for middle C is 1 unit long, the string for D is 8/9, etc., as shown in the figure.

Find each of the ratios as a common fraction in lowest terms.

C/D $\frac{1}{8/9} = \frac{9}{8}$

41. D/E $\frac{8/9}{64/81} = \frac{8}{9}\cdot\frac{81}{64} = \frac{9}{8}$

42. E/F $\frac{64}{81}/\frac{3}{4} = \frac{64}{81}\cdot\frac{4}{3} = \frac{256}{243}$

43. F/G $\frac{3}{4}/\frac{2}{3} = \frac{3}{4}\cdot\frac{3}{2} = \frac{9}{8}$

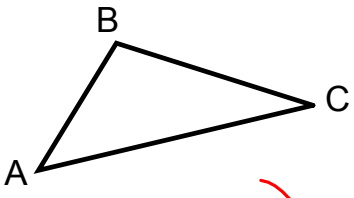
44. G/A $\frac{2/3}{16/27} = \frac{2}{3}\cdot\frac{27}{16} = \frac{9}{8}$

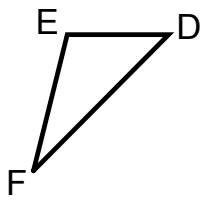
45. A/B $\frac{16/27}{128/243} = \frac{16}{27}\cdot\frac{243}{128} = \frac{9}{8}$

46. B/C' $\frac{128}{243}\cdot\frac{2}{1} = \frac{256}{243}$

10.2 - Similar Figures

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.





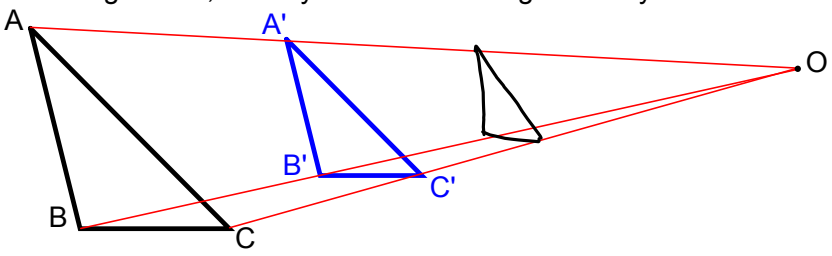
$\angle A = \angle D$
$\angle B = \angle E$
$\angle C = \angle F$

$\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$

$\cong$ congruence

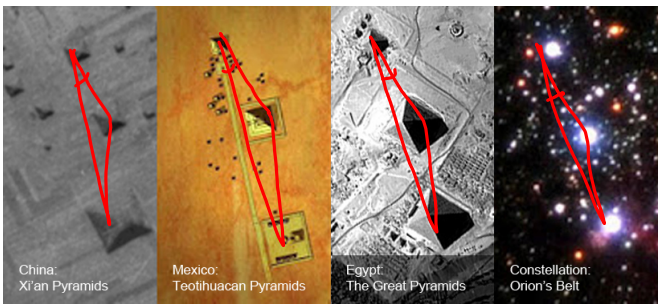
$\triangle ABC \sim \triangle DEF$

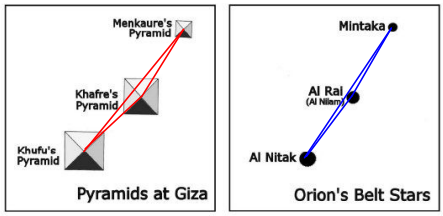
While reflections were the key to understanding isometries (translations, rotations, glide reflections) and congruence, the key to understanding similarity is dilation.



Point O is the center of dilation. The magnitude r of the dilation gives the relative size of the image compared with the original, and is calculated as the raio of the corresponding rays.

The image can be larger than, smaller than, or equal to the original, depending on whether r>1, r<1, or r=1.





The three pyramids at Giza lie at corners of a long narrow triangle that appears to be similar to the triangle formed by the three stars in Orion's belt.

Given that the two triangles are similar, what can you conclude about

1. their corresponding sides?

proportional

2. their corresponding angles?

equal

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.

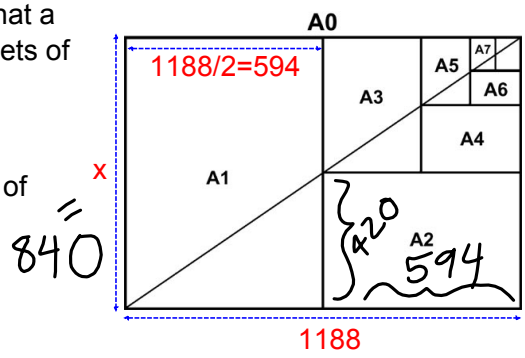
The product of the means is equal to the product of the extremes.
If a/b=c/d, then ad=bc.

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.

The International Standard for paper sizes is set up so that a sheet of given size can be cut in half to produce two sheets of the next size that are similar to it, within a millimeter.

Size A0 has length 1188 mm.



41. Write a proportion for the corresponding dimensions of sizes A0 and A1.

$\frac{1188}{x} = \frac{x}{594}$

42. Solve the proportion to find x, the width of size A0.

$x^2 = 1188(594)$

$x = 840$ mm

43. What is x called with respect to the numbers 1188 and 594?

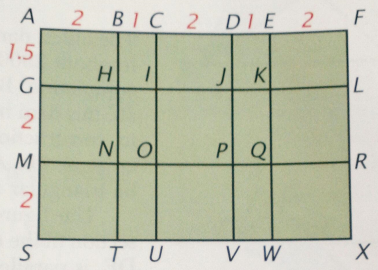
Geometric Mean

45. What is the width of a sheet of size A2?

420

$\frac{1188}{840} \approx 1.428$

$\frac{594}{420} \approx 1.428$



How many sets of similar rectangles of different sizes can you find whose dimensions have each of the following ratios? Name the rectangles in each set and their dimensions.

1. $\frac{1}{2}$.
2. $\frac{1}{4}$.
3. $\frac{2}{3}$.
4. $\frac{3}{4}$.

$\frac{1}{2}$: HION, NOUT
JKQP, PQWV

$\frac{2}{4}$: KLXW; IJVU; GHTS
NQWT; HKQN

$\frac{3}{6}$: