Geometry – Mr. Bo
Unit 7 - Day 1 notes

Name: _____
Date: _____

Ratio and Proportions

Ratio: Comparison of 2 or more Quantities.

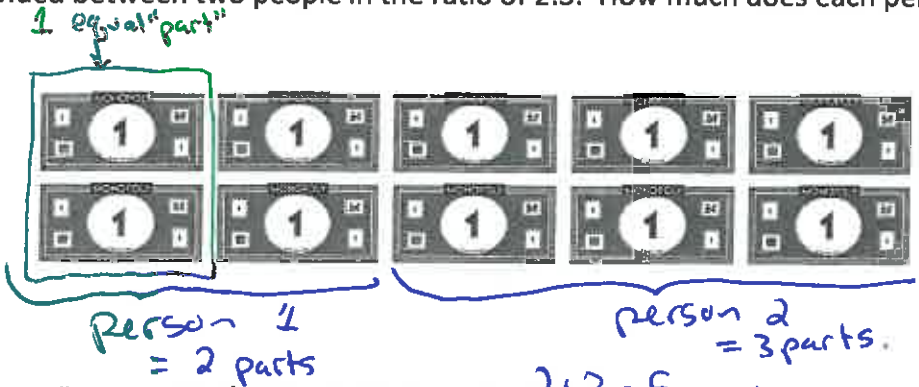
A ratio can be written in a variety of ways...

Example: The number of boys to girls in this classroom

8:12 or 8 to 12 or $\frac{8}{12}$

Using Ratios:

Example: $10 is divided between two people in the ratio of 2:3. How much does each person get?



How many equal "parts" should the $10 be divided into? 2+3=5 parts.

How big is each equal "part"? $\frac{\$10}{5} = \$2$

How many equal "parts" does person 1 get? 2 Person 2? 3

How much $ does person 1 get? 2($2) = $4 Person 2? 3($2) = $6

Example: $160,000 is distributed to three people in the ratio of 2:3:5. How much does each person receive?

2+3+5 = 10 parts.

$\frac{\$160,000}{10} = \$16,000$ ← 1 part

person 1 2(16,000) = $32,000

person 2 3(16,000) = $48,000

person 3 5(16,000) = $80,000

Example: The measures of the angles of a triangle are in the ratio of 2: 3: 4. Find the number of degrees in the smallest angle of the triangle.

2+3+4 = 9 parts

$\frac{180°}{9} = 20°$ ← 1 part

m∠1 = 2(20°) = 40°

m∠2 = 3(20°) = 60°

m∠3 = 4(20°) = 80°

Proportion: two equal ratios.

Examples:

1. $\frac{8}{2}=\frac{4}{1}$

2. $5:25=10:50$ ("means" / "extremes")

3. $\frac{2}{5}=\frac{12}{30}$

Postulate: In a proportion the product of the means = the product of the extremes.
(means to cross-multiply)

Solve each of the following proportions:

To solve a proportion you must: Cross-multiply

1. $\frac{5}{15}=\frac{a}{8+a}$

$15a = 5(8+a)$
$15a = 40 + 5a$
$10a = 40$
$a = 4$

2. $x+11 : x = 12 : 16$ (means / extremes)

$12x = 16(x+11)$
$12x = 16x + 176$
$-4x = 176$
$x = -44$

3. $\frac{x-4}{2}=\frac{3x}{x+4}$

$2(3x) = (x-4)(x+4)$
$6x = x^2 - 16$
$0 = x^2 - 6x - 16$
$0 = (x-8)(x+2)$

$x-8=0$ | $x+2=0$
$x=8$ | $x=-2$

Similar Polygons

Similar (~) means: "Same Shape."

2 polygons are similar if:

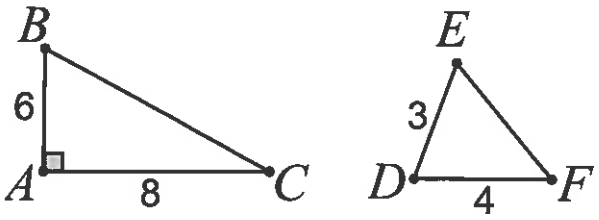
1.) all corr. ∠'s are ≅

2.) ratios of all corr. sides are proportional (=)

Similarity Ratio: Ratio of any two corr. sides of 2 similar polygons. Simplified

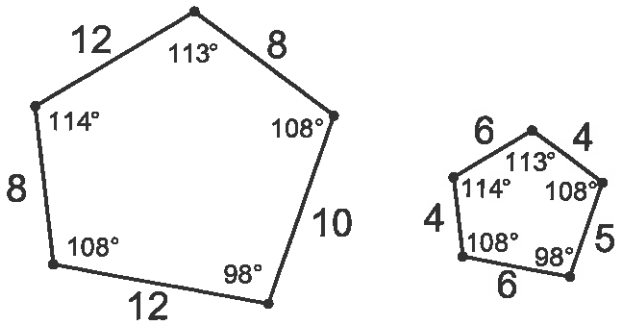
Examples: Are the polygons similar? If so, find the similarity ratio.

1.



NO, since ∠A ≠ ∠D.

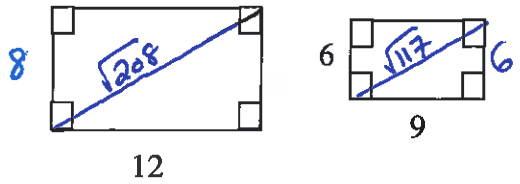
2.



yes.
- all corr. ∠'s ≅.
- ratios all =.
ie) $\frac{12}{8} = \frac{8}{4} = \frac{10}{5} = \frac{12}{6} = \frac{8}{4}$

Similarity ratio: $\frac{2}{1}$

Example: Given the similar rectangles:



Similarity Ratio = $\frac{8}{6} = \frac{4}{3}$

Diagonals	**Perimeters**	**Areas**
Large = $\sqrt{208} = 4\sqrt{13}$	Large = 40	Large = 96
Small = $\sqrt{117} = 3\sqrt{13}$	Small = 30	Small = 54
Ratio = $\frac{4\sqrt{13}}{3\sqrt{13}} = \frac{4}{3}$	Ratio = $\frac{40}{30} = \frac{4}{3}$	Ratio = $\frac{96}{54} = \frac{16}{9} = \left(\frac{4}{3}\right)^2$

Theorem: The ratio of any **corresponding lengths** of two similar polygons = Similarity Ratio.
(Sides, Perimeter, Diagonals, Altitudes, Medians, etc.)

Theorem: The ratio of the **areas** of two similar polygons = $(\text{Similarity Ratio})^2$

1. The ratio of the perimeters (← Length.) of two similar triangles is 9:12.

a. What is the **similarity ratio**? $\frac{9}{12} = \frac{3}{4}$

b. What is the ratio of their **smallest sides**? $\frac{3}{4}$ Length

c. What is the ratio of their **altitudes**? $\frac{3}{4}$ Length

d. What is the ratio of their **medians**? $\frac{3}{4}$ Length

e. What is the ratio of their **areas**? $\left(\frac{3}{4}\right)^2 = \frac{9}{16}$ Area.

2. The ratio of the areas of two similar pentagons is 25:144. If the largest side of the smaller pentagon is 7, what is the length of the largest side of the larger pentagon?

$\frac{25}{144} = \frac{7^2}{x^2}$ ← Small sides / Large sides

$\frac{25}{144} = \frac{49}{x^2}$

$25x^2 = 7056$

$x^2 = \frac{7056}{25}$

$x = \sqrt{\frac{7056}{25}}$

$= \frac{84}{5} \approx 16.8$ units