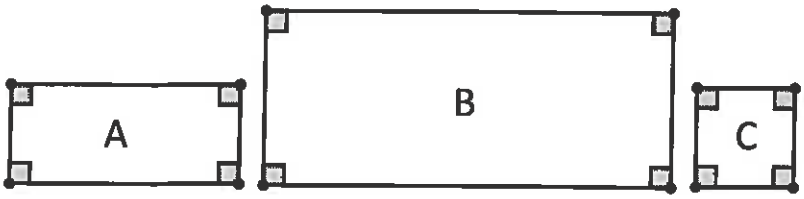
Geometry R– Mr. Bo
Unit 8 - Day 2 notes

Name: Notes.
Date: _____

Similar Polygons

1. Which of the three rectangles below appear to be similar? Explain your reasoning.

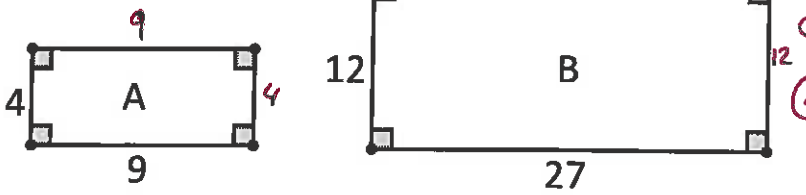


A and B are similar because B looks like A only bigger.

Similar Polygons - 2 polygons are similar if:

1. All corresponding angles are congruent.

2. The ratios of corresponding sides are equal (*proportional*).



Rectangle A and B are similar.
① All the corr. $\angle$'s are 90° (thus $\cong$)
② $\frac{4}{12} = \frac{9}{27}$ (the ratios are =)

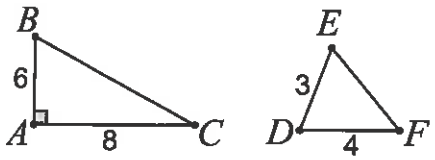
Similarity Ratio: The reduced ratio of any **corresponding lengths** of two similar polygons.

2. What is the similarity ratio for Rectangle A and B above?

Sim Ratio is $\frac{4}{9}$

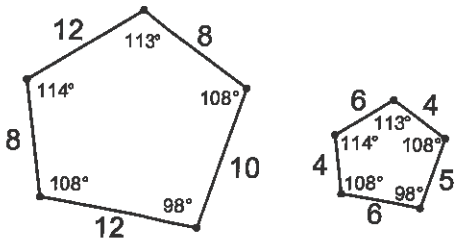
3. Are the polygons similar? If so, find the similarity ratio.

a.



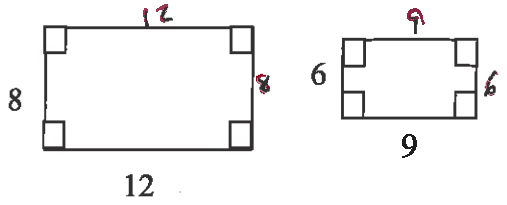
The $\triangle$'s are not similar because $\angle A$ is not $\cong$ to any of the $\angle$'s in $\triangle DEF$.

b.



All corr. $\angle$'s are $\cong$
$\frac{8}{4} = \frac{12}{6} = \frac{8}{4} = \frac{10}{5} = \frac{12}{6}$ } ratios are all =.
yes the pentagons are similar.
Sim Ratio = $\frac{2}{1}$

4a. Are these two rectangles similar? Explain your reasoning.



yes.
* All corr. ∠'s are ≅
* $\frac{8}{6} = \frac{12}{9}$

b. What is the similarity ratio, and explain how you found it.

$\frac{8}{6} = \frac{4}{3}$ Sim Ratio is $\frac{4}{3}$. I found the ratio of 2 sides and reduced it to lowest terms.

c. Find the ratio of the perimeters of the rectangles. How does this ratio compare to the similarity ratio?

Large rect. Perim = 8+8+12+12 = 40 units

Small rect. Perim = 6+6+9+9 = 30 units

Ratio Perims = $\frac{40}{30}$ → this ratio is equal to the Sim ratio.

d. Find the ratio of the areas of the rectangles. How does this ratio compare to the similarity ratio?

Large Area = 8(12) = 96 sq. units

Small Area = 6(9) = 54 sq. units

Ratio Areas = $\frac{96}{54} = \frac{16}{9}$ → this ratio is the sim ratio squared.

ie) $\frac{4^2}{3^2} = \frac{16}{9}$

5. Use your results from Question 4 to complete the Theorems:

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

Theorem: The ratio of the **areas** of two similar polygons = (Sim Ratio)^2

6. ΔABC is **similar** to ΔDEF. The ratio of their perimeters is 9:12.

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

b. What is $AB : DE$?
3/4

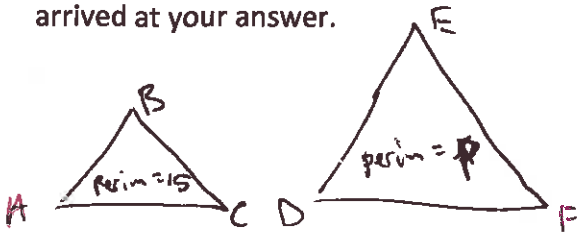
c. What is the ratio of their **altitudes**?
3/4

d. What is the ratio of their **medians**?
3/4

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

e. What is the ratio of $m\angle A : m\angle D$?
1:1 $\angle A \cong \angle D$ by ~ similarity rules.

7. If the Perimeter of ΔABC from question 6 is 15 units, what is the perimeter of ΔDEF ? Show how you arrived at your answer.



Sim Ratio $= \frac{3}{4}$

So, $\frac{3}{4} = \frac{15}{P}$

$3P = 4(15)$ → $3P = 60$ → $P = 20$

8. 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? Show how you arrived at your answer.

Ratio Areas $= \frac{25}{144}$

Sim Ratio $= \frac{7}{x}$

Ratio Area = (Sim ratio)^2

$\frac{25}{144} = \frac{7^2}{x^2}$

$25x^2 = 49(144)$ → $25x^2 = 7056$ → $x^2 = 282.24$ → $x = \sqrt{282.24} = 16.8$

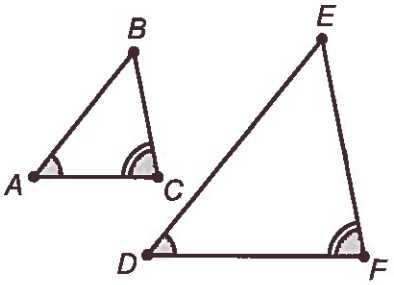
Similar Triangles

The conditions for having two similar triangles are fewer than those for other polygons. There are three different ways to conclude that two triangles are similar.

AA Similarity – Two triangles are similar, if they have two pairs of corresponding angles congruent.

9. Name the two pairs of congruent corresponding angles and state which triangles are similar.

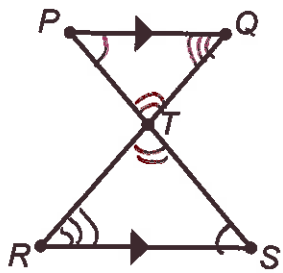
a.



$\angle A \cong \angle D$, $\angle C \cong \angle F$

$\Delta ABC \sim \Delta DEF$

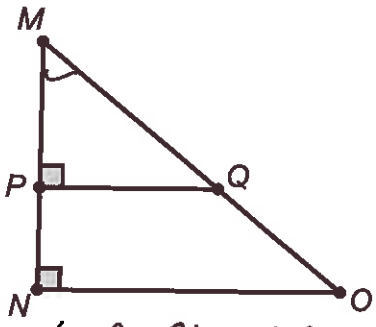
b.



$\angle P \cong \angle S$, $\angle Q \cong \angle R$

$\Delta PQT \sim \Delta SRT$

c.

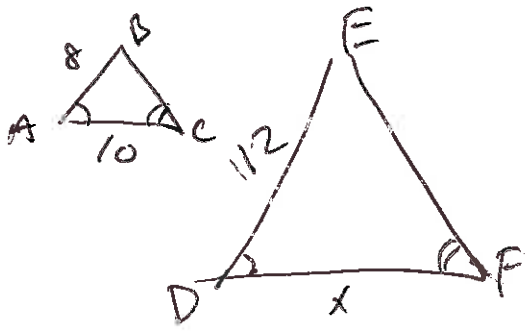


$\angle MPQ \cong \angle MNO$

$\angle M \cong \angle M$

$\Delta MPQ \sim \Delta MNO$

10. In ΔABC and ΔDEF in question 9, AB=8, AC = 10, and DE = 12. What is DF? What is the ratio of their perimeters?



$\frac{8}{12} = \frac{10}{x}$

$8x = 120$

$x = 15$

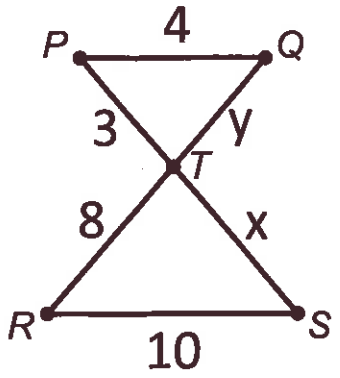
DF = 15

Ratio Perims = Sim Ratio

$= \frac{8}{12}$

$= \frac{2}{3}$

SSS Similarity – Two triangles are similar, if the ratios of all corresponding sides are equal.



11. Given: $\Delta PQT \sim \Delta SRT$. Find x and y.

$\frac{PQ}{SR} = \frac{PT}{ST} = \frac{QT}{RT}$

$\frac{4}{10} = \frac{3}{x} = \frac{y}{8}$

$\frac{4}{10} = \frac{3}{x}$

$4x = 30$

$x = 7.5$

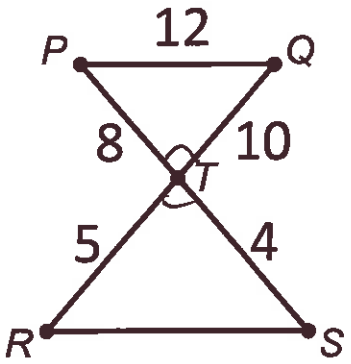
$\frac{4}{10} = \frac{y}{8}$

$4(8) = 10y$

$32 = 10y$

$y = 3.2$

SAS Similarity – Two triangles are similar, if the ratios of two pairs of corresponding sides are equal and the included angles are congruent.



12a. Explain why $\Delta PQT \sim \Delta SRT$.

① $\frac{8}{4} = \frac{10}{5} = \frac{2}{1} \Rightarrow \frac{PT}{ST} = \frac{QT}{RT}$

② $\angle PTQ \cong STR$

This satisfies SAS similarity.

b. Find RS.

Since the Δ's are similar:

$\frac{8}{4} = \frac{12}{RS} \rightarrow 8(RS) = 4(12)$

$8(RS) = 48$

$RS = 6$

c. What is the ratio of the areas of the two triangles? Show how you got your answer.

Sim Ratio $= \frac{8}{4} = \frac{2}{1}$

Ratio areas = (Sim Ratio)^2

$= \left(\frac{2}{1}\right)^2$

$= \frac{4}{1}$