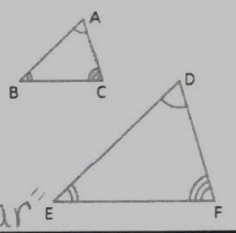
Name: _____ Date: _____

Ratios in Similar Polygons

Fill in the blanks to complete each definition.

- A similarity ratio is the ratio of the lengths of the corresponding sides of two similar polygons.
- Two polygons are similar if and only if they meet the following criteria:
  1. Corresponding angles are congruent.
  2. Corresponding sides are proportional.
- Similar polygons have the same shape but not necessarily the same size.
- Similarity statement: $\triangle ABC \sim \triangle DEF$ (~ symbol means "similar")



$\angle A \cong \angle D$
$\angle B \cong \angle E$
$\angle C \cong \angle F$
and all sides are proportional from original to new.

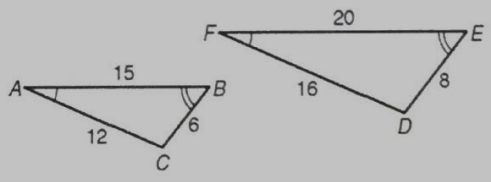
Use the figure for Exercises 1 and 2. $\triangle ABC \sim \triangle FED$

1. Name the pairs of congruent angles.

$\angle A \cong$ $\angle F$

$\angle B \cong$ $\angle E$

$\angle C \cong$ $\angle D$



2. Write the corresponding side lengths in the proportion.

$$\frac{FE}{AB} = \frac{DE}{CB} = \frac{AC}{FD}$$

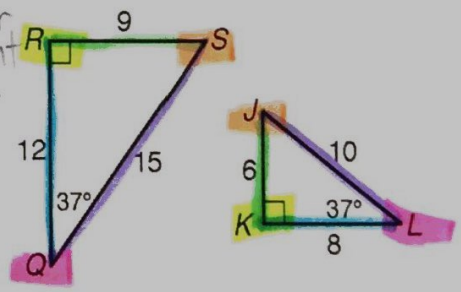
*side lengths that "go together"
Always write new on top of old

Use the figure to the right for Exercises 3 and 4. The triangles are similar.

3. Circle the correct similarity statement. *must go in order w/ congruent angles!

$\angle Q \cong \angle K$
$\triangle QRS \sim \triangle KJL$ | $\triangle RSQ \sim \triangle KJL$ | $\angle S \cong \angle K$ $\triangle QSR \sim \triangle LKJ$

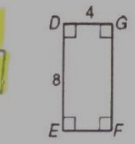
4. Write the corresponding side lengths in the proportion.

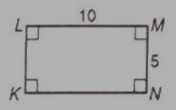


$$\frac{KJ}{RS} = \frac{KL}{RQ} = \frac{JL}{SQ}$$

What's left? Fill in sides you have not used yet!

Use the figure to the right for Exercise 5.





5. Substitute numbers for the side lengths and reduce each ratio to simplest form.

reduce!

$\frac{MN}{DG} = \frac{5}{4}$ *numbers come from side lengths in figure → $\frac{ML}{DE} = \frac{10 \div 2}{8 \div 2} = \frac{5}{4}$ (reduce)

ratios SHOULD BE THE SAME!!!

Use the figure to the right for Exercise 6.

6. ABCD ~ EFGH. Solve for x.

1st: write corresponding sides: new/old

$\frac{EF}{AB} = \frac{FG}{BC}$

2nd: replace

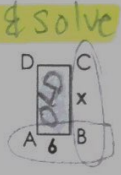
$\frac{18}{6} = \frac{27}{x}$

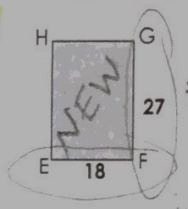
3rd cross-multiply & solve

$18x = 6 \cdot 27$

$\frac{18x}{18} = \frac{162}{18}$

$x = 9$





*use given sides in ratios!

Use the figure to the right for Exercise 7. $\triangle ABC \sim \triangle SLT$

7. Solve for x and y.

1st: $\frac{SL}{AB} = \frac{LT}{BC} = \frac{ST}{AC}$

2nd: $\frac{5}{10} = \frac{Y}{24} = \frac{13}{X}$

since we are solving for more than 1 variable, we must choose the pair of ratios that best helps us.

Solve for x: $\frac{5}{10} = \frac{13}{X}$

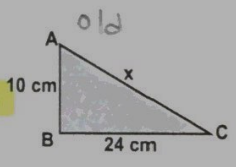
$\frac{5X}{5} = \frac{130}{5}$

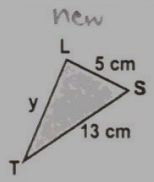
$X = 26$

Solve for y: $\frac{5}{10} = \frac{Y}{24}$

$\frac{120}{10} = \frac{10Y}{10}$

$12 = Y$





Word Problem: A tree cast a shadow 18 feet long. At the same time a person who is 6 feet tall cast a shadow 4 feet long. How tall is the tree?

*notice both tree values on top and Person values on bottom

$\frac{\text{tree's shadow}}{\text{person's shadow}} = \frac{\text{tree's height}}{\text{person's height}}$ → $\frac{6 \cdot 18}{4} = \frac{X \cdot 6}{6}$

So $\frac{6 \cdot 18}{4} = X$

$\frac{108}{4} = X$

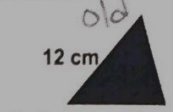
$27 = X$

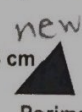
Ratios of similar polygons — Corresponding side: Corresponding side

OR

Perimeter: Perimeter	Area: Area	Volume: Volume
$A : B$	$A^2 : B^2$	$A^3 : B^3$

Example: *Find the perimeter of the smaller triangle.*





$\frac{\text{new side}}{\text{old side}} = \frac{\text{new perimeter}}{\text{old perimeter}}$ → $\frac{4}{12} = \frac{X}{60}$ (·60)

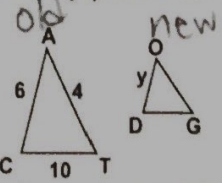
$\frac{240}{12} = X$

$20 = X$

Example: *The ratio of the perimeters of two similar polygons equals the ratio of any pair of corresponding sides.*

giving you one fraction!

The ratio of the perimeters of CAT to DOG is 3:2. Find the value of y.



$\frac{3}{2} = \frac{OD}{AC}$ → $\frac{3}{2} = \frac{Y}{6}$ (·6)

$\frac{18}{2} = Y$

$9 = Y$

*you do not need to cross-multiply if variable is alone on top.

Scale Factor

Scale Factor – the ratio of corresponding sides

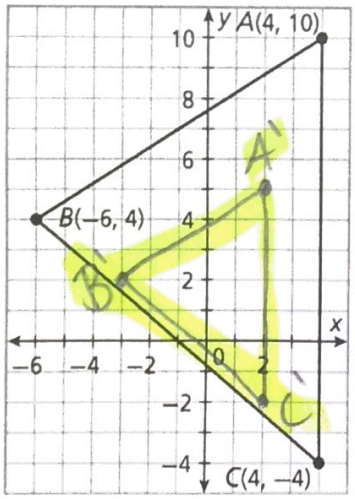
- When scale factor is greater than 1, the shape gets *bigger* and this is called an enlargement.
- When scale factor is less than 1, but greater than 0, the shape gets *smaller* and this is called a reduction.
- Formula: $\frac{\text{new}}{\text{original}}$

Dilations

Apply the dilation *D* to the polygon with the given vertices. Name the coordinates of the image points. Identify and describe the transformation as an enlargement or reduction.

8. $D\ (x, y) \rightarrow \left(\frac{1}{2}x, \frac{1}{2}y\right)$

$A(4, 10)$, $B(-6, 4)$, and $C(4, -4)$



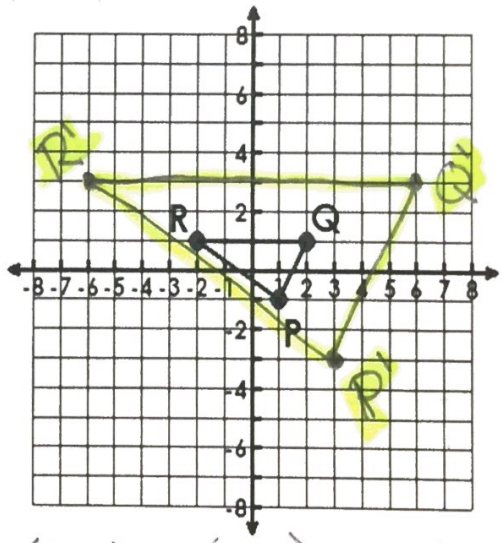
A' (2,5), B' (-3,2), and C' (2,-2)

This shape is a/n reduction.

The scale factor is 1/2.

9. $D\ (x, y) \rightarrow (3x, 3y)$

$P(1, -1)$, $Q(2, 1)$, $R(-2, 1)$



P' (3,-3), Q' (6,3), and R' (-6,3)

This shape is a/n enlargement.

The scale factor is 3.