GEOMETRY UNIT 7

7-3 SIMILAR POLYGONS

SIMILAR TRIANGLES

- **Content Objective:** Students will be able to solve for missing side lengths and angle measures in similar polygons.

- **Language Objective:** Students will be able to state and write equations using corresponding parts of similar polygons.

SIMILAR POLYGONS

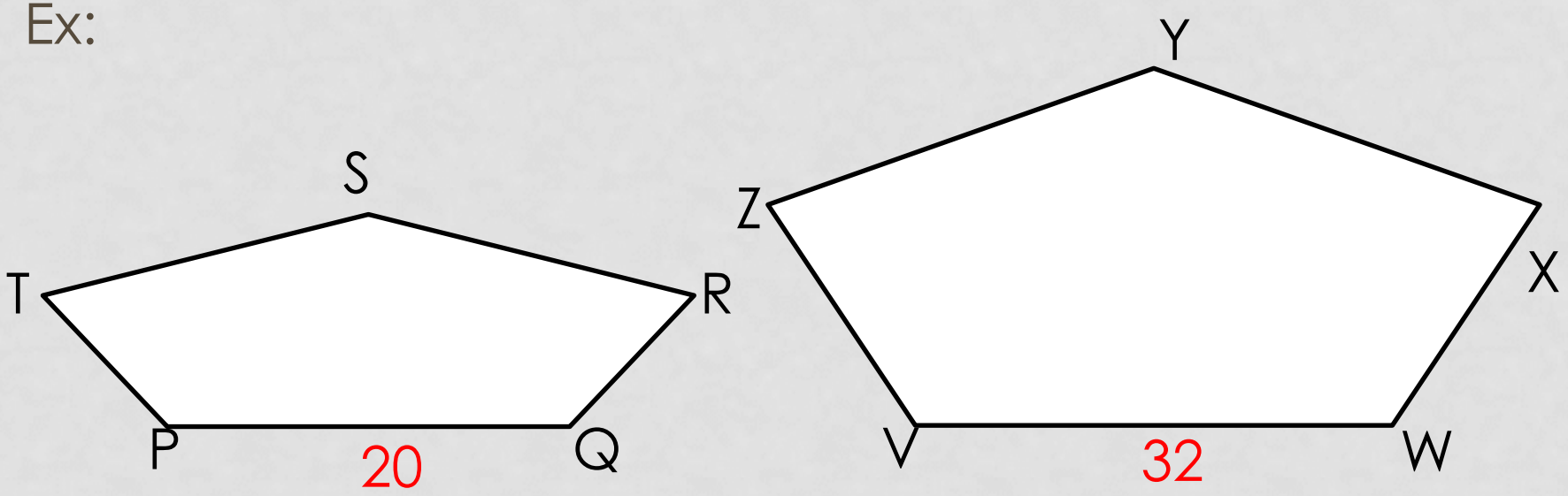
- Two polygons are **similar** if their vertices can be paired so that:

1.) Corresponding angles are congruent.

2.) Corresponding sides are in proportion.

(i.e. Their side lengths have the same ratio.)

Ex:



SIMILAR POLYGONS

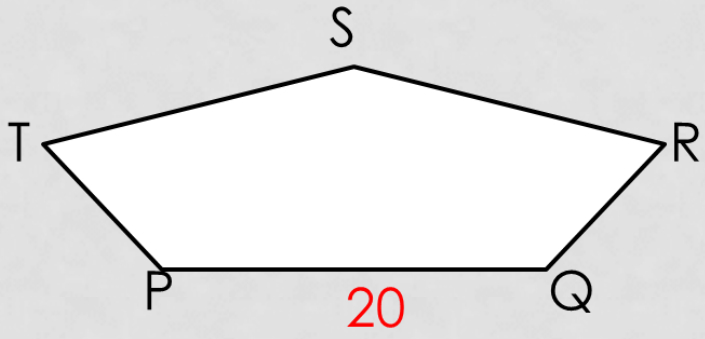
Ex Cont.: I give you that polygon PQRST is similar to polygon VWXYZ, written as

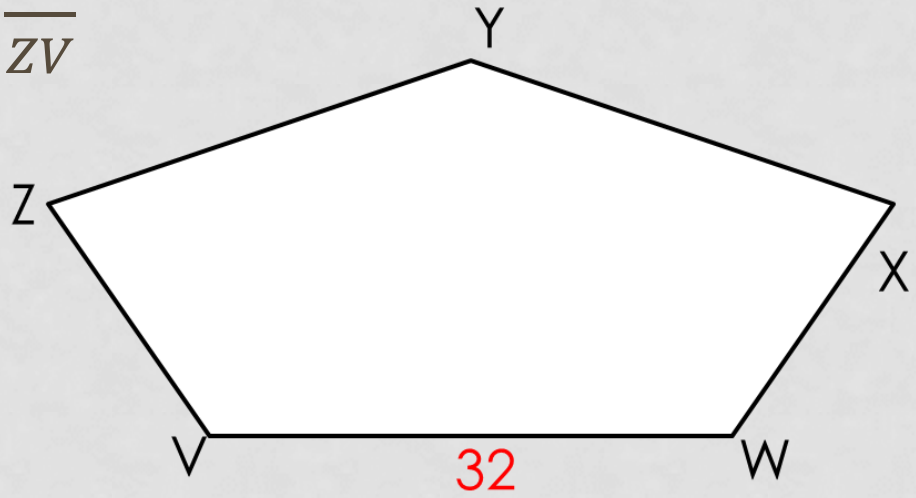
$$\text{polygon } PQRST \sim \text{polygon } VWXYZ$$

Thus, by the definition of similar polygons, we know that

(1) $< P \cong < V \quad < Q \cong < W \quad < R \cong < X \quad < S \cong < Y \quad < T \cong < Z$

(2) $\frac{PQ}{VW} = \frac{QR}{WX} = \frac{RS}{XY} = \frac{ST}{YZ} = \frac{TP}{ZV}$





SIMILAR POLYGONS

If two polygons are similar, then the ratio of the lengths of the corresponding sides is called the **scale factor**.

Ex: The Scale Factor from PQRST to VWXYZ is $\frac{PQ}{VW} = \frac{20}{32} = \frac{5}{8}$

*Note: This ratio should be exactly the same between all sets of corresponding sides

SIMILAR POLYGONS

Example:

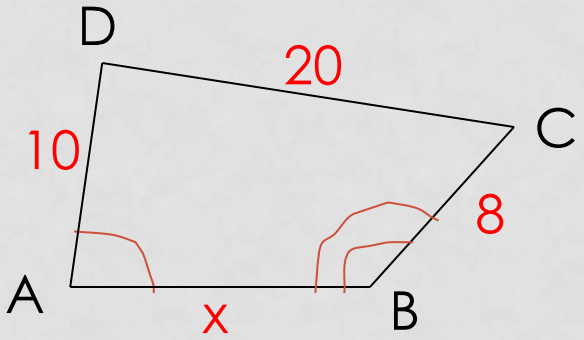
Quad $ABCD \sim$ Quad $A'B'C'D'$. Find:

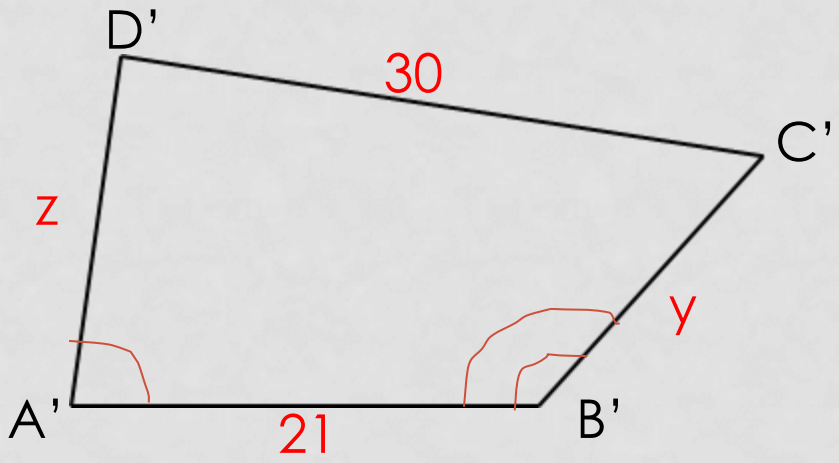
a.) Their Scale Factor

b.) the values of x, y, and z

c.) the perimeters of the two quadrilaterals

d.) the ratio of the perimeters





SIMILAR POLYGONS

Solutions:

a.) Scale Factor: $\frac{DC}{D'C'} = \frac{20}{30} = \frac{2}{3}$

b.)

$$\frac{DC}{D'C'} = \frac{AB}{A'B'}$$

$$\frac{2}{3} = \frac{x}{21}$$

$$3x = 42$$

$$x = 14$$

$$\frac{DC}{D'C'} = \frac{BC}{B'C'}$$

$$\frac{2}{3} = \frac{8}{y}$$

$$2y = 24$$

$$y = 12$$

$$\frac{DC}{D'C'} = \frac{AD}{A'D'}$$

$$\frac{2}{3} = \frac{10}{z}$$

$$2z = 30$$

$$z = 15$$

SIMILAR POLYGONS

Solutions:

c.) the perimeters of the two quadrilaterals

Perimeter of Quad. ABCD is $10 + 20 + 8 + 14 = 52$

Perimeter of Quad A'B'C'D' is $15 + 30 + 12 + 21 = 78$

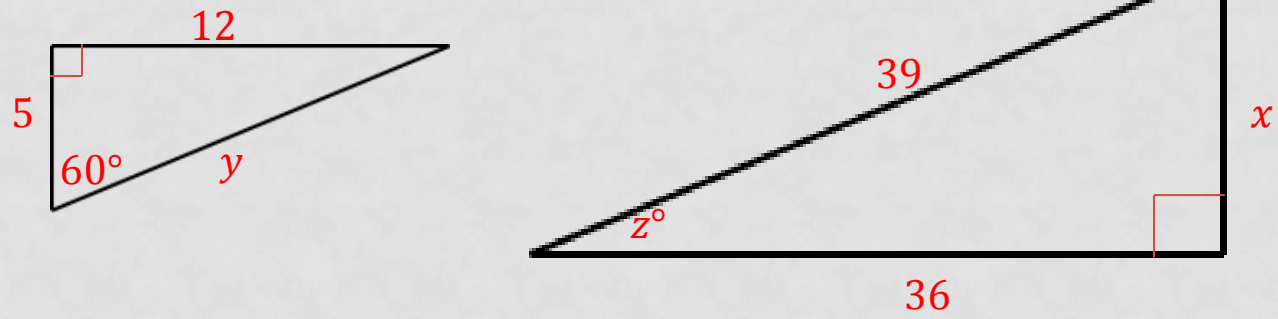
d.) the ratio of the perimeters

The ratio of the perimeters is

$$\frac{ABCD}{A'B'C'D'} = \frac{52}{78} = \frac{2}{3}$$

SIMILAR POLYGON EXAMPLES

Two similar polygons are shown. Find the values of x, y, and z.

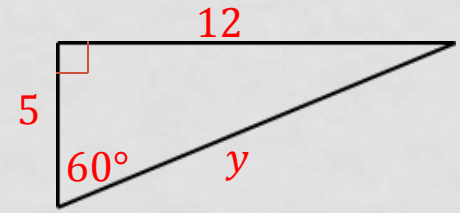


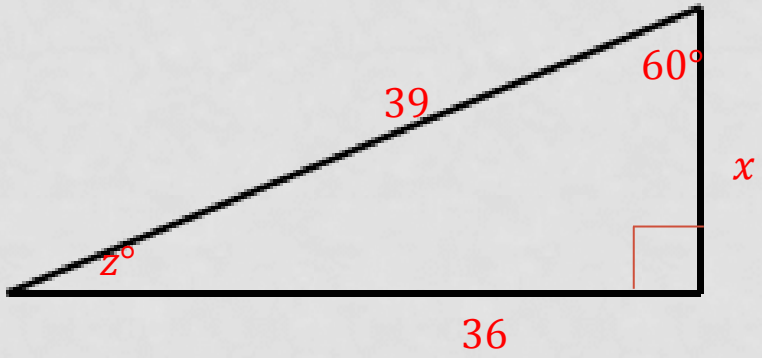
To Find x and y, we first need the scale factor between the two triangles. Using the pair of known corresponding sides, we get

Scale Factor: $\frac{12}{36} = \frac{1}{3}$

SIMILAR POLYGON EXAMPLES

Two similar polygons are shown. Find the values of x, y, and z.





Using this scale factor, we can make proportions to solve for x and y.

For x:

$$\frac{1}{3} = \frac{5}{x}$$

$$x = 15$$

For y:

$$\frac{1}{3} = \frac{y}{39}$$

$$3y = 39$$

$$y = 13$$

To Find z, first match the corresponding angles.

For z:

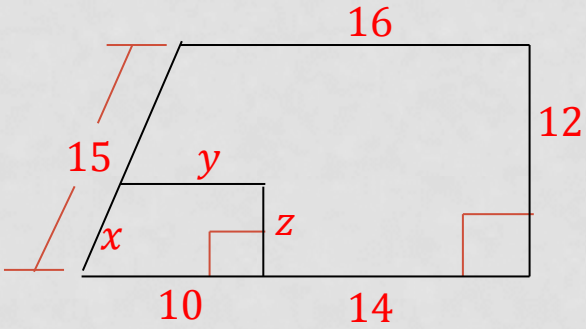
$$z + 60 + 90 = 180$$

$$z + 150 = 180$$

$$z = 30$$

SIMILAR POLYGON EXAMPLES

Two similar polygons are shown. Find the values of x, y, and z.

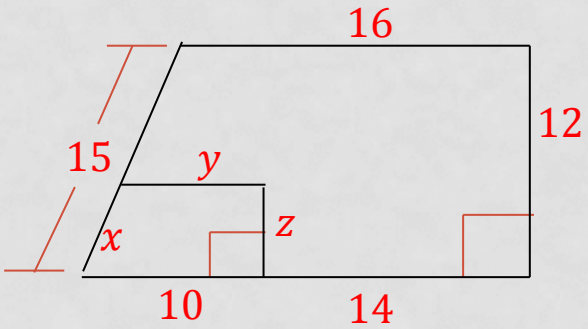


To Find x, y and z, we first need the scale factor between the two polygons. Using the pair of known corresponding sides, we get

Scale Factor: $\frac{10}{24} = \frac{5}{12}$

SIMILAR POLYGON EXAMPLES

Two similar polygons are shown. Find the values of a, b, and c.



Using this scale factor, we can make proportions to solve for x, y and z.

For x:

$$\frac{5}{12} = \frac{x}{15}$$

$$12x = 75$$

$$x = \frac{75}{12} = \frac{25}{4}$$

For y:

$$\frac{5}{12} = \frac{y}{16}$$

$$12y = 80$$

$$y = \frac{80}{12} = \frac{20}{3}$$

For z:

$$\frac{5}{12} = \frac{z}{12}$$

$$12z = 60$$

$$z = 5$$