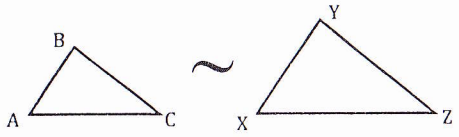
NOTES 8.1: SIMILAR POLYGONS

Objective: I can use similar polygons to find side lengths & ∡ measures.

If two polygons are similar, two things are true:

1) All corresponding ∡s are ≅.
2) Corresponding sides are proportionate.

EXAMPLE 1: Use the figures below to answer the questions that follow.

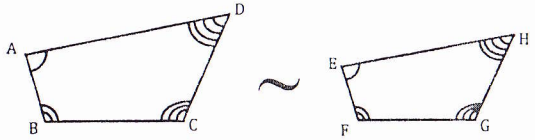


∠A ≅ ∡X $\overline{AB}$: $\overline{XY}$

∠B ≅ ∡Y $\overline{BC}$: $\overline{YZ}$

∠C ≅ ∡Z $\overline{AC}$: $\overline{XZ}$

EXAMPLE 2: If the quadrilaterals below are similar, then what must be true?



About the angles:

∡A ≅ ∡E ∡B ≅ ∡F

∡C ≅ ∡G ∡D ≅ ∡H

About the sides:

$\frac{AD}{EH} = \frac{DC}{HG} = \frac{AB}{EF} = \frac{BC}{FG}$

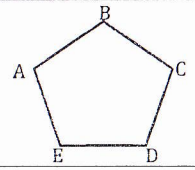
An angle is said to be ***INCLUDED*** between two sides, and a side is said to be ***INCLUDED*** between two angles.

EXAMPLE 3: Use the polygon below to answer the questions that follow.

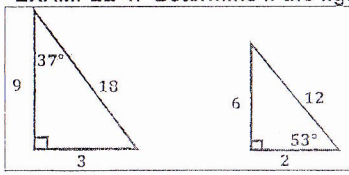
a) Which angle is included between $\overline{AB}$ and $\overline{BC}$? ∡B

b) Which side is included between ∠E and ∠D? $\overline{ED}$

c) Which angle is included between $\overline{AE}$ and $\overline{AB}$? ∡A



EXAMPLE 4: Determine if the figures are similar. Justify your answer.



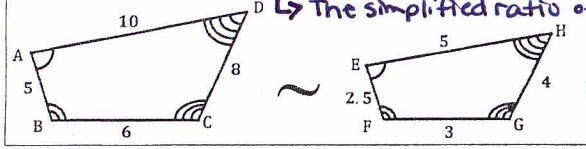
Does $\frac{9}{6} = \frac{18}{12} = \frac{3}{2}$?

Simplify...

$\frac{3}{2} = \frac{3}{2} = \frac{3}{2}$ Yes!

EXAMPLE 5: What is the scale factor of quadrilateral ABCD to quadrilateral EFGH?

big to small



↳ The simplified ratio of corresponding sides.

$\frac{\text{big}}{\text{small}} = \frac{10}{5} = 2$

EXAMPLE 6: Show that the ratio of the perimeters is the same as the scale factor.

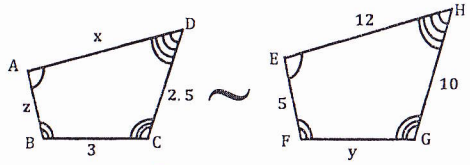
ABCD: P = 29 EFGH: P = 14.5 $\frac{29}{14.5} = 2$

EXAMPLE 7:

a) Quad EFGH ~ Quad ABCD

b) Find the following:

- x = 3
- y = 12
- z = 1.25



$\frac{x}{12} = \frac{2.5}{10}$ $\frac{3}{y} = \frac{2.5}{10}$ $\frac{z}{5} = \frac{2.5}{10}$

$10x = 30$ $2.5y = 30$ $10z = 12.5$

$x = 3$ $y = 12$ $z = 1.25$

c) What is their scale factor? $\frac{10}{2.5} = 4$ (big to small)

d) What is the ratio of their perimeters? 4

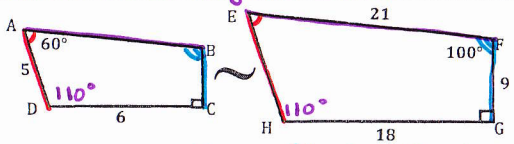
EXAMPLE 8: Complete the following. *Sum of ∡s of a quad = 360°

m∠E = 60° EH = 15

m∠G = 90° BC = 3

m∠B = 100° AB = 7

m∠H = 110°



What is the scale factor of Quad ABCD to Quad EFGH? small to big $\frac{6}{18} = \frac{1}{3}$

$\frac{5}{EH} = \frac{1}{3}$ EH = 15

$\frac{BC}{9} = \frac{1}{3}$ 3(BC) = 9 BC = 3

$\frac{AB}{21} = \frac{1}{3}$ 3(AB) = 21 AB = 7

EXAMPLE 9: If the lengths of the sides of a triangle are in the ratio 3: 5: 7 and its perimeter is 120 *cm*, find the length of the shortest side of the triangle.

$3x + 5x + 7x = 120$

$15x = 120$

$x = 8$

Shortest side = $3x$

$= 3(8)$

$= 24$ cm

EXAMPLE 10: The measures of the angles of a triangle are in the ratios 1: 2: 3. Find the measure of the largest angle.

$x + 2x + 3x = 180$

$6x = 180$

$x = 30$

largest ∡ = $3x$

$= 3(30)$

$= 90°$