8.2. Honors Geometry

DATE: 2/22

Target 7B. Understand and apply the definition of similarity including indirect measurement

Similar figures/polygons have the same shape but not necessarily the same size. Similar polygons are polygons in which:

1) The ratios of the measures of corresponding sides are equal.
2) Corresponding angles are congruent.

We did a Nspire activity to explain this idea.

*In addition, the ratio of the perimeters of two similar polygons equals the ratio of any pair of corresponding sides.

Example 1

Given: $\triangle JHK \sim \triangle POM$

$m\angle H = 90$

$m\angle J = 40$

$m\angle M = x+5$

$m\angle O = 0.5y$

Find the value of x and y.

According to 2), corresponding $\angle$s $\cong$. So,

$\angle J \cong \angle P$

$\angle H \cong \angle O$

$\angle K \cong \angle M$

So $\angle K$

$180-90-40=50°$

$\frac{90}{0.5} = \frac{0.5y}{0.5}$

$180 = y$

$50 = x+5$

$-5 \quad -5$

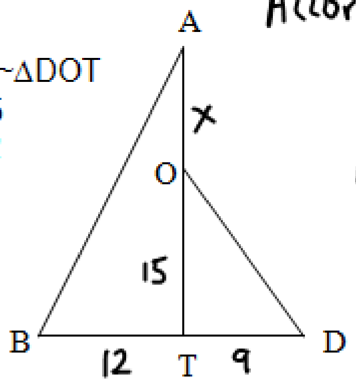
$45 = x$

Example 2

Example 2

Given: ΔBAT~ΔDOT
OT=15
BT=12
TD=9

Find AO.
‖
? = x



According to (1), $\frac{BA}{DO} = \frac{AT}{OT} = \frac{BT}{DT} \Rightarrow \frac{BA}{DO} = \boxed{\frac{x+15}{15} = \frac{12}{9}}$

$\frac{x+15}{15} \times \frac{12}{9} \Rightarrow 9(x+15) = 15(12)$

$\Rightarrow 9x + 135 = 180$
$\quad -135 \quad -135$

$\frac{9x}{9} = \frac{45}{9}$

$x = 5$

Example 3

Given: ABCD~EFGH
AB=6
BC=4
CD=3
AD=7
EF=9

Find FG, GH, EH, and ABCD:EFGH.

‖ 6 ‖ 9 $9/2 = 4.5$

$\to \frac{6}{9} = \frac{2}{3}$ according to *

According to (1), $\frac{AB}{EF} = \frac{BC}{FG} = \frac{CD}{GH} = \frac{AD}{EH} \Rightarrow$

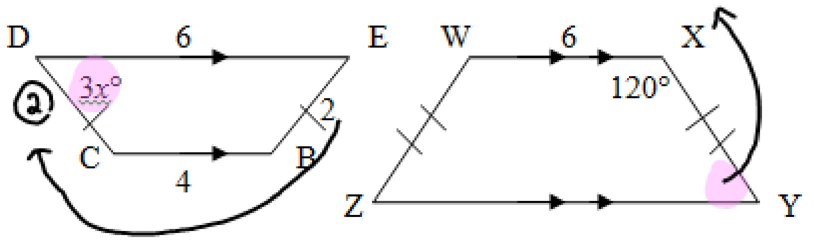
1st

$\boxed{\frac{6}{9} = \frac{4}{FG}} = \frac{3}{GH} = \frac{7}{EH}$

2nd 3rd

- 1st: $\frac{6}{9} \times \frac{4}{FG} \Rightarrow 6 \cdot FG = 9(4) \Rightarrow \frac{\cancel{6} \cdot FG}{\cancel{6}} = \frac{36}{6} \Rightarrow FG = 6$
- 2nd: $\frac{6}{9} = \frac{3}{GH} \Rightarrow 6 \cdot GH = 27 \Rightarrow GH = \frac{27}{6} = \frac{9}{2}$
- 3rd: $\frac{6}{9} = \frac{7}{EH} \Rightarrow$ after work $EH = 9$

1. Quad BCDE~Quad WXYZ. $180-120=60$



Relationship between the sides:

$$\frac{BC}{WX}=\frac{CD}{XY}=\frac{DE}{YZ}=\frac{BE}{WZ}$$

Relationship between the angles:

$\angle B \cong \angle W$, $\angle D \cong \angle Y$

$\angle C \cong \angle X$, $\angle E \cong \angle Z$

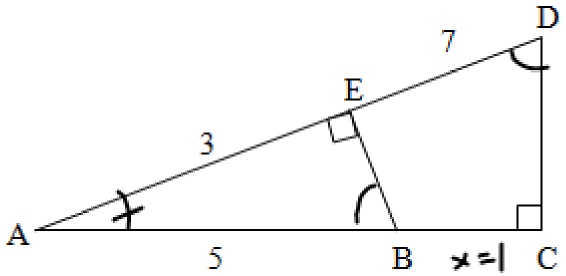
a) What is the ratio of $\underbrace{\text{BCDE to WXYZ}}^{\text{perimeters}}$? Ratio of perimeters of ~ figures is equal to the ratio of any two corr. sides. So, $\frac{BC}{WX}=\frac{4}{6}=\frac{2}{3}=\frac{BCDE}{WXYZ}$	**b)** Find XY. $\frac{BC}{WX}=\frac{CD}{XY} \Rightarrow \frac{4}{6}=\frac{2}{XY} \Rightarrow$ $4 \cdot XY = 6 \cdot 2 \Rightarrow \frac{4 \cdot XY}{4}=\frac{12}{4} \Rightarrow XY=3$
c) Find x. $\angle D \cong \angle Y \Rightarrow \frac{3x}{3}=\frac{60}{3}$ $x=20$	**d)** Find the perimeter WXYZ. $\frac{BCDE}{WXYZ}=\frac{BC}{WX} \Rightarrow \frac{14}{WXYZ} \times \frac{4}{6}$ $\Rightarrow \frac{4 \cdot WXYZ}{4}=\frac{84}{4} \Rightarrow WXYZ=21$

2. $\Delta AEB \sim \Delta ACD$

Relationship between sides:

D
7

2. $\Delta AEB \sim \Delta ACD$



Relationship between sides:

$\frac{AE}{AC} = \frac{EB}{CD} = \frac{AB}{AD}$

Relationship between angles:

$\angle EAB \cong \angle CAD$, $\angle AEB \cong \angle ACD$

$\angle ABE \cong \angle ADC$

a) Find BC. Call BC x. Then

$\frac{AE}{AC} = \frac{AB}{AD} \Rightarrow \frac{3}{(5+x)} \times \frac{5}{10} \Rightarrow 3(10) = 5(5+x)$

$30 = 25 + 5x$

$-25 \quad -25$

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

$x = 1$

b) Find EB.

$\frac{AE}{AC} = \frac{EB}{CD} = \frac{AB}{AD}$

$\frac{3}{6} = \frac{EB}{CD} = \frac{5}{10}$ $\therefore$ By pattern, $\frac{EB}{CD} = \frac{4}{8}$

c) Find DC.

$DC = 8$

b) and c) can be found by Pythagorean Theorem also.

d) If $m\angle EBC = 143.1°$, then find $m\angle D$.

$m\angle EBA = 180 - 143.1 = 36.9°$

Since $\angle EBA \cong \angle D$, $\angle D = 36.9°$