Module 2c: Side Lengths of Similar Triangles

Math Practice(s):

-Reason abstractly & quantitatively

-Construct viable arguments & critique the reasoning of others

Learning Target(s):

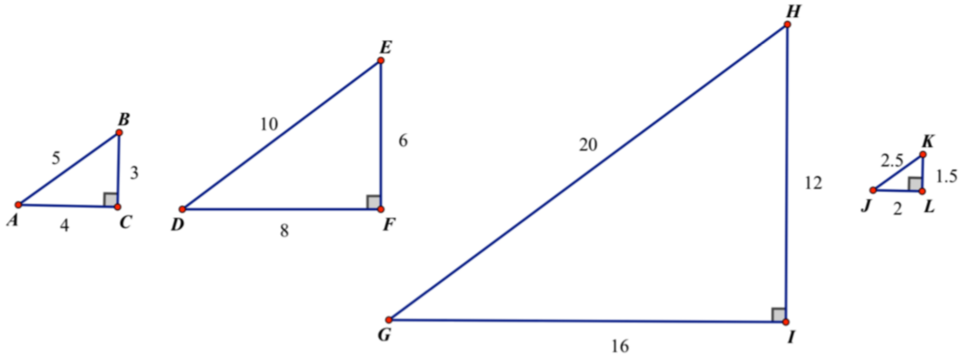
-Use proportions in similar triangles.

Homework:

HW #9: 2c #1-5

Warm-up

1. All four right triangles below are similar to each other. With a partner, discuss the questions that follow and then write a complete sentence to answer each question.



A. What do you notice about the side lengths for ΔDEF relative to the corresponding side lengths of ΔABC?

The side lengths for ΔDEF are 2 times the length of the side lengths in ΔABC.

B. How are the side lengths for ΔGHI related to the corresponding side lengths of ΔABC?

The side lengths for ΔGHI are 4 times the length of the side lengths in ΔABC.

C. How are the side lengths for ΔGHI related to the corresponding side lengths of ΔDEF?

The side lengths for ΔGHI are 2 times the length of the side lengths in ΔDEF.

D. How are the side lengths of ΔGHI related to the corresponding side lengths of ΔJKL?

The side lengths for ΔGHI are 8 times the length of the side lengths in ΔJKL.

E. How are the side lengths for ΔJKL related to the corresponding side lengths of ΔDEF?

The side lengths for ΔJKL are 4 times the length of the side lengths in ΔDEF.

F. Notice that the ratio of the shortest to longest leg lengths in ΔABC is $\frac{BC}{AC} = \frac{3}{4}$. What do you notice about the corresponding ratios in the other three triangles?

The ratios of the shortest to longest leg in each of the other triangles is also $\frac{3}{4}$.

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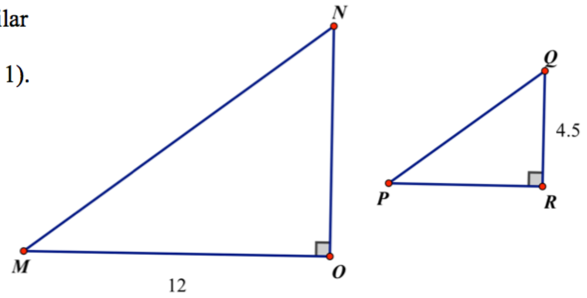
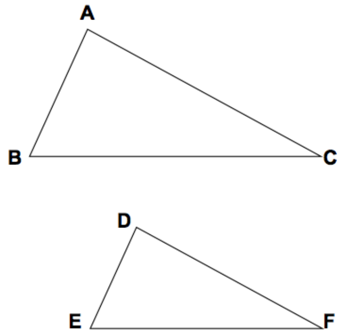
ΔMNO and ΔPQR (shown below) are similar to each other AND are similar to the four triangles on the previous page (in question 1).



Side-Lengths Similarity (#THM)

ΔABC is similar to ΔDEF if and only if there sides are proportional.

$$\frac{AB}{DE} = \frac{BC}{EF} = \frac{CA}{FD}$$



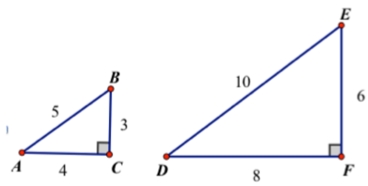
➔ In your own words, explain what the theorem above means.

In similar Δs, the lengths of the sides of one Δ will always be to scale with the lengths in the other triangle.

Proportional side lengths allow each pair of similar triangles to have a similarity ratio.

ΔABC~ΔDEF

$$\frac{AB}{DE} = \frac{BC}{EF} = \frac{CA}{FD} \rightarrow \frac{5}{10} \rightarrow \frac{1}{2}$$



OR

ΔDEF ~ ΔABC

$$\frac{DE}{AB} = \frac{EF}{BC} = \frac{FD}{CA} \rightarrow \frac{10}{5} \rightarrow \frac{2}{1}$$

*The order of the similarity statement will determine how the similarity ratio is written.

2. Consider the following proportion: $\frac{K}{L} = \frac{7}{2}$

a. If $K = 7$, then $L =$ 2. $\frac{7}{L} \times \frac{7}{2}$ $7L=14$ $L=2$

b. If $K = 14$, then $L =$ 4. $\frac{14}{L} \times \frac{7}{2}$ $7L=28$ $L=4$

c. If $K = 15$, then $L =$ $\frac{30}{7}$. $\frac{15}{L} \times \frac{7}{2}$ $7L=30$ $L=\frac{30}{7}$

d. If $K = 1$, then $L =$ $\frac{2}{7}$. $\frac{1}{L} \times \frac{7}{2}$ $7L=2$ $L=\frac{2}{7}$

e. If $L = 4$, then $K =$ 14. $\frac{K}{4} \times \frac{7}{2}$ $2K=28$ $K=14$

f. If $L = 5$, then $K =$ $\frac{35}{2}$. $\frac{K}{5} \times \frac{7}{2}$ $2K=35$ $K=\frac{35}{2}$

g. If $L = 1$, then $K =$ $\frac{7}{2}$. $\frac{K}{1} \times \frac{7}{2}$ $2K=7$ $K=\frac{7}{2}$

3. Solve for x such that $\frac{25}{5} = \frac{x}{12}$.

$5x=300$

$\boxed{x=60}$

4. Solve for x such that $\frac{15}{x} = \frac{12}{8}$.

$12x=120$

$\boxed{x=10}$

Sep 5-10:53 AM

Practice

5. Given: $\frac{A}{B} = \frac{4}{5}$

a. If A = 12 then B = 15.

b. If A = 4 then B = 5.

c. If A = 2 then B = $\frac{5}{2}$.

d. If A = $\frac{4}{5}$ then B = 1.

e. If B = 5 then A = 4.

f. If B = 1 then A = $\frac{4}{5}$.

g. If B = $\frac{3}{5}$ then A = $\frac{12}{25}$.

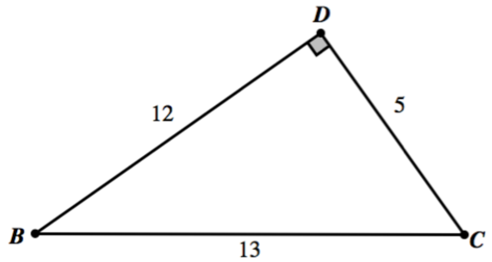
h. If B = $\frac{5}{3}$ then A = $\frac{4}{3}$.

$5A = 4$

$\frac{A}{\frac{5}{3}} = \frac{4}{5}$

6. ΔBCD ~ ΔJKL (which is not shown). If the similarity ratio is $\frac{1}{7}$, determine the lengths of all three sides of ΔJKL.

$\frac{BC}{JK} = \frac{CD}{KL} = \frac{BD}{JL} = \frac{1}{7}$



$\frac{BC}{JK} = \frac{1}{7}$

$\frac{13}{JK} = \frac{1}{7}$

$\boxed{JK = 91\text{ units}}$

$\frac{CD}{KL} = \frac{1}{7}$

$\frac{5}{KL} = \frac{1}{7}$

$\boxed{KL = 35\text{ units}}$

$\frac{BD}{JL} = \frac{1}{7}$

$\frac{12}{JL} = \frac{1}{7}$

$\boxed{JL = 84\text{ units}}$

7. ΔGRE ~ ΔCHP with a similarity ratio of $\frac{1}{4}$. If $CH = 28$, $RE = 8.5$ and $EG = \frac{13}{4}$, determine the lengths of the following sides.

a. GR = 7 units b. HP = 34 units c. PC = 13 units

$\frac{GR}{CH} = \frac{RE}{HP} = \frac{EG}{PC} = \frac{1}{4}$

$\frac{GR}{CH} = \frac{1}{4}$

$\frac{GR}{28} = \frac{1}{4}$

$4(GR) = 28$

$\boxed{GR = 7\text{ units}}$

$\frac{RE}{HP} = \frac{1}{4}$

$\frac{8.5}{HP} = \frac{1}{4}$

$\boxed{HP = 34\text{ units}}$

$\frac{EG}{PC} = \frac{1}{4}$

$\frac{\frac{13}{4}}{PC} = \frac{1}{4}$

$PC = \frac{4}{1} \cdot \frac{13}{4}$

$PC = \frac{52}{4}$

$\boxed{PC = 13\text{ units}}$