Get out your homework and have it ready to check.

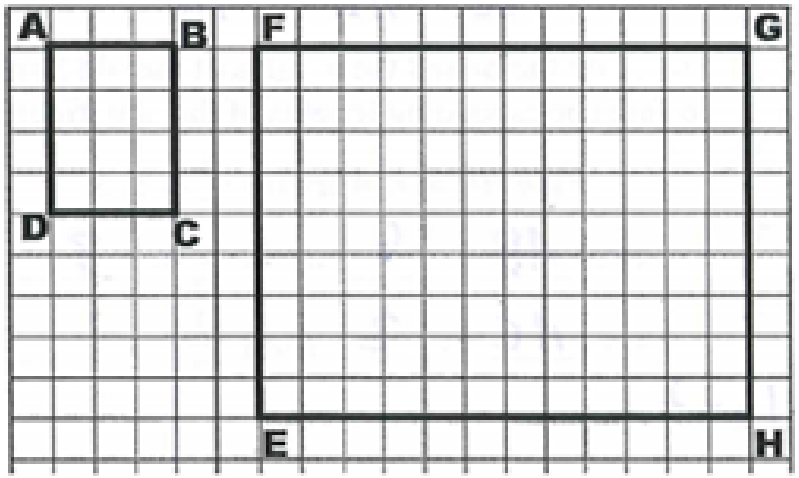
Classwork - Similarity and Transformations

Remember

$old\ side \cdot scale\ factor = new\ side$ Scale Factor Ratio Comparing Corresponding Sides → $\frac{New}{Old}$

1) Find the corresponding sides of the two similar rectangles show below. Then find the scale factor that resulted in the change from Rectangle $ABCD$ to Rectangle $EFGH$.

$ABCD \sim EFGH$



Old: ABCD → New: EFGH

Determine the corresponding sides by comparing the final figure to the original figure.

$\frac{EF}{AB} = \frac{9}{3} = \frac{3}{1}$ $\frac{FG}{BC} = \frac{12}{4} = \frac{3}{1}$

$\frac{GH}{CD} = \frac{9}{3} = \frac{3}{1}$ $\frac{EH}{AD} = \frac{12}{4} = \frac{3}{1}$

The scale factor is = 3

I can multiply a side length of $ABCD$ (old) by 3 to find the corresponding side length of $EFGH$ (new).

A) Find the perimeter of both $ABCD$ and $EFGH$.

Perimeter of $ABCD$ = 14 units

Perimeter of $EFGH$ = 42 units

B) What relationship do you see between the two perimeters?

Old New

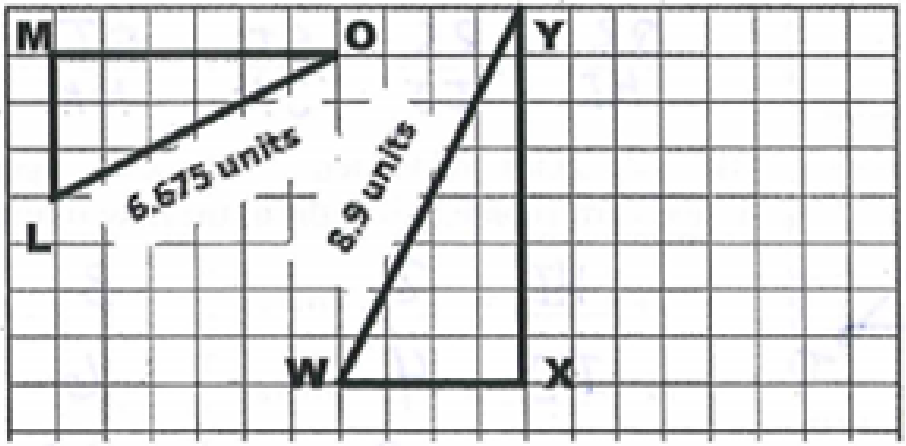
$14 \cdot 3 = 42$

Perimeter of ABCD multiplied by the scale factor equals perimeter of EFGH

2) Find the corresponding sides of the two similar rectangles show below. Then find the scale factor that resulted in the change from Triangle WXY to Triangle LMO.

$\triangle LMO \sim \triangle WXY$

Old: WXY → New: LMO



Determine the corresponding sides by comparing the final figure to the original figure.

$\frac{LM}{WX} = \frac{3}{4}$ $\frac{MO}{XY} = \frac{6}{8} = \frac{3}{4}$

$\frac{LO}{WY} = \frac{6.675}{8.9} = 0.75 = \frac{3}{4}$ The scale factor is = 3/4

I can multiply a side length of $\triangle WXY$ (old) by 3/4 to find the corresponding side length of $\triangle LMO$ (new).

) Find the perimeter of both $\triangle LMO$ and $\triangle WXY$. B) What relationship do you see between the two perimeters?

Perimeter of $\triangle LMO$ = 15.675 units

Perimeter of $\triangle WXY$ = 20.9 units

old New
$20.9 \cdot 3/4 = 15.675$

Perimeter of WXY multiplied by the scale factor is equal to the perimeter of LMO.

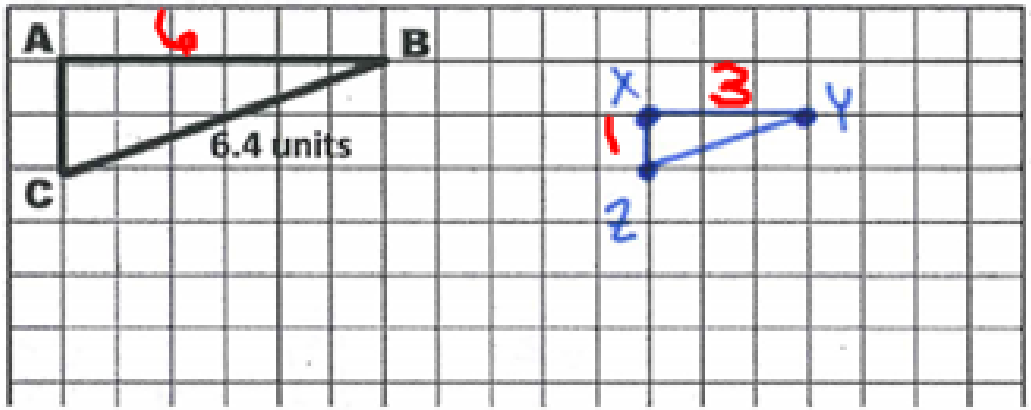
3) Triangle ABC is multiplied by a scale factor of $\frac{1}{2}$ (1 to 2) to make the final/new figure of Triangle XYZ.

A) Do you think the new figure will be larger or smaller than the old figure? Why?

Smaller. When scale factor is between 0 and 1 the new figure is a reduction.

Use the scale factor given to draw the new figure.

Label the new figure.



Old: ABC → New: XYZ

Determine the corresponding sides of the two figures.

$\frac{YZ}{BC}$ $\frac{\cancel{BC}}{\cancel{BC}}$, $\frac{XY}{AB}$, $\frac{XZ}{AC}$

Use scale factor and the lengths of the old figure to find corresponding lengths of the new figure.

Side $BC = 6.4$ units $\cdot \frac{1}{2} = 3.2$

Side AB = 6 units $\cdot \frac{1}{2}$ = 3

Side AC = 2 units $\cdot \frac{1}{2}$ = 1

Write the exact side lengths of the new figure $\triangle XYZ$ below in the space provided.

Side XY = 3 units Side $YZ = 3.2$ **units** Side XZ = 1 unit

B) **Use the scale factor and perimeter of $\triangle ABC$** to find the perimeter of the new figure $\triangle XYZ$.

P of $\triangle ABC$ = 14.4 14.4 $\cdot \frac{1}{2}$ = 7.2 units P of $\triangle XYZ$

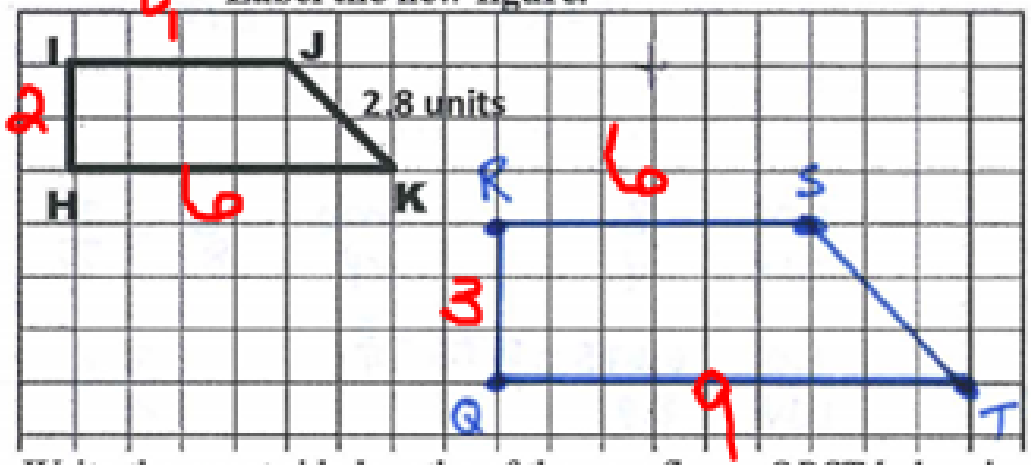
4) Quadrilateral $HIJK$ is multiplied by a scale factor of $\frac{3}{2}$ (3 to 2) to make the new figure of Quadrilateral $QRST$.

A) Do you think the new figure will be larger or smaller than the old figure? Why?

Larger. $\frac{3}{2} = 1\frac{1}{2}$ When scale factor is larger than 1 the new figure is an enlargement.

Use the scale factor given to draw the new figure.

Label the new figure.



Write the exact side lengths of the new figure $QRST$ below in the space provided.

Side QR = 3 units

Side RS = 6 units

Side ST = 4.2 units

Side QT = 9 units

Old: HIJK → New: QRST

Determine the corresponding sides of the two figures.

$\frac{QR}{HI}$, $\frac{RS}{IJ}$, $\frac{ST}{JK}$, $\frac{QT}{HK}$

Use scale factor and the lengths of the old figure to find corresponding lengths of the new figure.

Side HI = 2 units $\cdot \frac{3}{2}$ = 3

Side IJ = 4 units $\cdot \frac{3}{2}$ = 6

Side JK = 2.8 units $\cdot \frac{3}{2}$ = 4.2

Side HK = 6 units $\cdot \frac{3}{2}$ = 9

B) **Use the scale factor and perimeter of *HIJK*** to find the perimeter of the new figure $QRST$.

P of HIJK = 14.8 units

P of QRST → $14.8 \cdot \frac{3}{2}$ = 22.2 units

Vocabulary Start-Up

Recall that a dilation changes the size of a figure by a scale factor, but does not change the shape of the figure. Since the size is changed, the image and the preimage are not congruent.

Complete the graphic organizer. Consider each word on the Rating Scale and place a check ✓ in the appropriate column next to the word. If you do not know the meaning of a word, find the meaning in the glossary or on the Internet.

Rating Scale				
Word	**Know it well**	**Have seen or heard it**	**No clue**	**What it means**
dilation				
scale factor				
similar figures				

Identify Similarity

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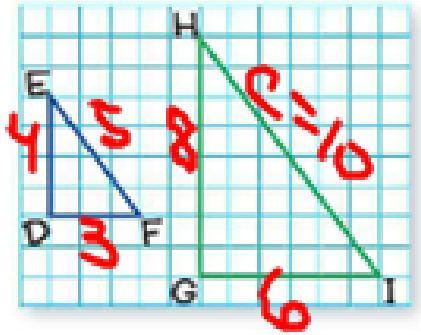
Two figures are **similar** if the second can be obtained from the first by a sequence of transformations and dilations.

New / Old

Examples

Tutor

1. Determine if the two triangles are similar by using transformations.



$8^2+6^2=c^2$

$64+36=c^2$

$\sqrt{100}=\sqrt{c^2}$

$10=c$

Since the orientation of the figures is the same, one of the transformations is a translation.

Step 1 Translate $\triangle DEF$ down 2 units and 5 units to the right so D maps onto G.

Step 2 Write ratios comparing the lengths of each side.

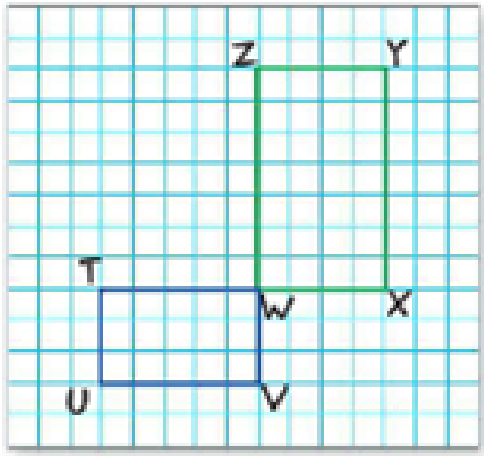
$\frac{HG}{ED}=\frac{8}{4}$ or $\frac{2}{1}$ $\quad \frac{GI}{DF}=\frac{6}{3}$ or $\frac{2}{1}$ $\quad \frac{IH}{FE}=\frac{10}{5}$ or $\frac{2}{1}$

$\frac{\triangle HGI}{\triangle DEF}$

Since the ratios are equal, $\triangle HGI$ is the dilated image of $\triangle EDF$. So, the two triangles are similar because a translation and a dilation maps $\triangle EDF$ onto $\triangle HGI$.

2. Determine if the two rectangles are similar by using transformations.

The orientation of the figures is different, so one of the transformations is a rotation.

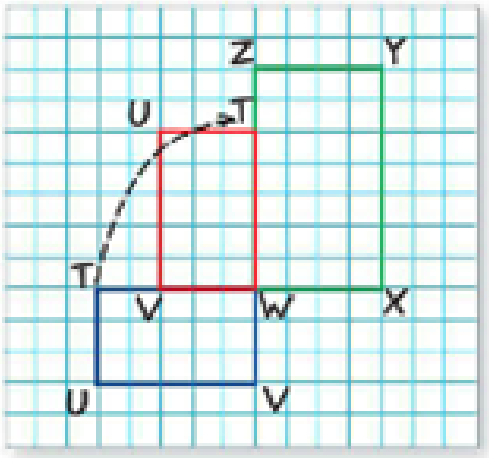


Step 1 Rotate rectangle *VWTU* 90° clockwise about *W* so that it is oriented the same way as rectangle *WXYZ*.

Step 2 Write ratios comparing the lengths of each side.

$$\frac{WT}{XY} = \frac{5}{7} \quad \frac{TU}{YZ} = \frac{3}{4}$$

$$\frac{UV}{ZW} = \frac{5}{7} \quad \frac{VW}{WX} = \frac{3}{4}$$



The ratios are not equal. So, the two rectangles are not similar since a dilation did not occur.

Proves they aren't similar

Got it? Do these problems to find out.

Blue → Green

Green / Blue

$3^2+5^2=c^2$

$9+25=c^2$

$\sqrt{34}=\sqrt{c^2}$

$c=5.8$

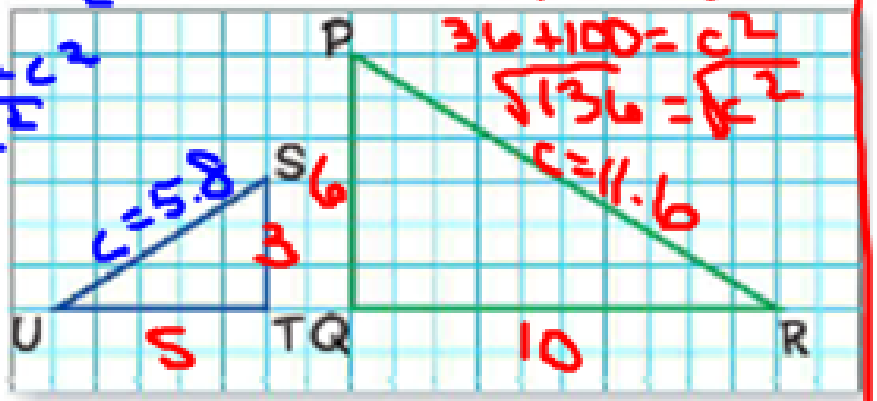
$6^2+16^2=c^2$

$36+100=c^2$

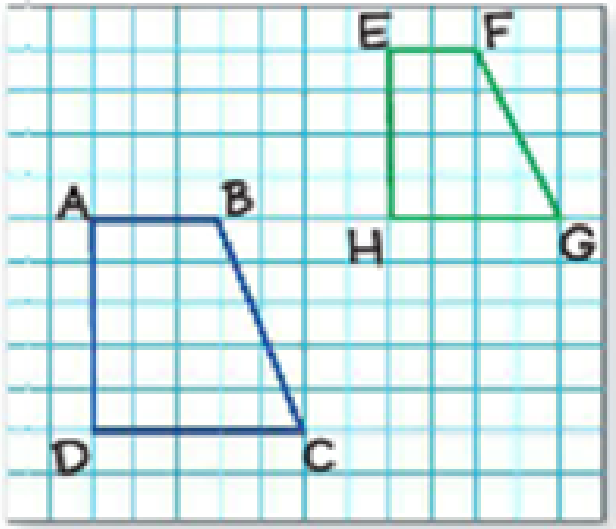
$\sqrt{136}=\sqrt{c^2}$

$c=11.6$

a.



b.



$\frac{\Delta PQR}{\Delta STU}$

$\frac{PQ}{ST}=\frac{6}{5}=\frac{12}{10}$

$\frac{QR}{TU}=\frac{10}{5}=\frac{12}{6}$

$\frac{PR}{SU}=\frac{11.6}{5.8}=\frac{12}{6}$

Similar and have a scale factor of $\frac{12}{10}$

$\frac{EFGH}{ABCD}$

$\frac{EF}{AB}=\frac{2}{3}$

$\frac{EH}{AD}=\frac{4}{5}$

Not Similar

Use the Scale Factor

Similar figures have the same shape, but may have different sizes. The sizes of the two figures are related to the scale factor of the dilation.

If the scale factor of the dilation is ...	then the dilated figure is ...
between 0 and 1	smaller than the original
equal to 1	the same size as the original
greater than 1	larger than the original

Example

Tutor

3. **Ken enlarges the photo shown by a scale factor of 2 for his webpage. He then enlarges the webpage photo by a scale factor of 1.5 to print. If the original photo is 2 inches by 3 inches, what are the dimensions of the print? Are the enlarged photos similar to the original?**

Multiply each dimension of the original photo by 2 to find the dimensions of the webpage photo.

2 in. × 2 = 4 in. 3 in. × 2 = 6 in.

So, the webpage photo will be 4 inches by 6 inches. Multiply the dimensions of that photo by 1.5 to find the dimensions of the print.

4 in. × 1.5 = 6 in. 6 in. × 1.5 = 9 in.

The printed photo will be 6 inches by 9 inches. All three photos are similar since each enlargement was the result of a dilation.

old • scalefactor = new

$\frac{AB}{YZ}$ $YZ = 4\text{cm}$

$k = 2.5$

$4 \cdot 2.5 = 10\text{cm}$

$AB = 10\text{cm}$

#1 on Hwk

$\frac{PQRS}{CDEF}$ $\frac{PQ}{CD} = \frac{8}{16} = \frac{1}{2}$