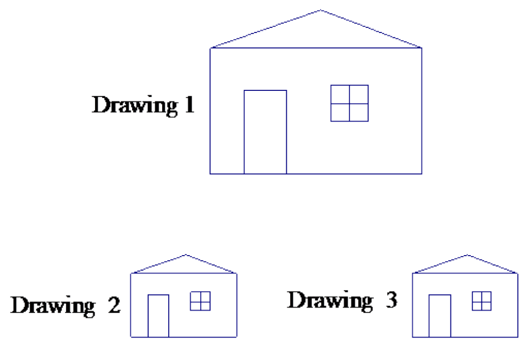
☐ **DO NOW – Geometry Regents Lomac 2014-2015 Date ____. due ____.** **Dilations from different centers (composition)** **5.8**

(DN) Copy each notation and write out what each means:
(a) $D_{O,7}(\triangle SEV)$
(b) $D_{L,3/4}(M)$
(c) $T_{\overline{ZH}}(\overline{OP})$

Name ______________________________**Per**______
LO: I can describe and demonstrate the qualities of a composition of dilations and identify the scale factor and location of the center of a single dilation that will produce the same result as the composition.

☐ (1) ruler **Dilating from different centers, mapping image to image**

Drawing 3 and Drawing 2 are both scale drawings of Drawing 1.

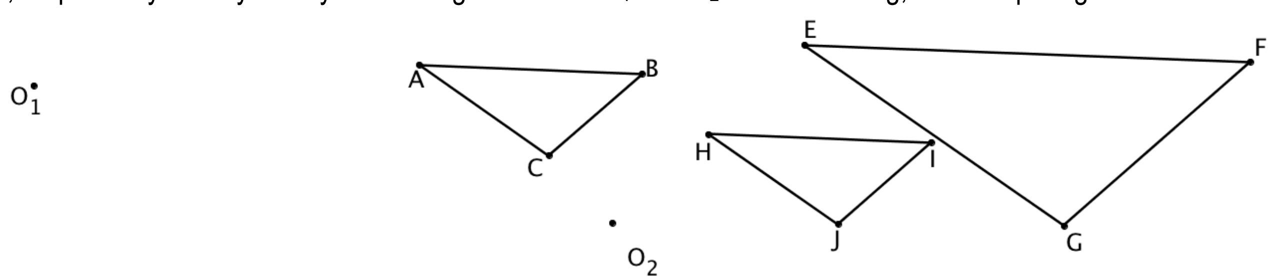


(a) Determine the scale factor and center for each drawing.

(b) Is there a way to map Drawing 2 onto Drawing 3 or map Drawing 3 onto Drawing 2?

☐ (2) ruler **Dilating from different centers, do the images always map that way?**

Triangle EFG has been dilated with scale factor ½ from centers O_1 and O_2 resulting in image triangles ABC and HIJ, respectively. Verify this by connecting vertices to O_1 and O_2 and measuring, and comparing ratios.



Use a pink highlighter and a straightedge to draw segments O_1O_2, AH, BI, and CJ.

What can you say about segments O_1O_2, AH, BI, and CJ? How can $\triangle ABC$ map to $\triangle HIJ$?

☐ (3) **Composition of Dilations (https://tube.geogebra.org/student/m824351)**

Go to the website above and use it to explore what happens when a dilation is dilated. On the website, the gray shape is the original. The gray shape is dilated by the scale factor noted as Adilation about center A to the red shape. The red shape is then dilated by the scale factor noted as Bdilation about center B to the green shape. This is a composition of dilations because the green figure is a dilation of a dilation. Answer the prompts below.

(1) Drag center point B around and observe what happens. Describe what you observe.

(2) Drag center point A around and observe what happens. Describe what you observe.

(3) What was different between what you observed in #1 and what you observed in #2. Why do you think that happened?

(4) Select the box for “Dilation lines for composition” and you will see black lines that intersect in a black point that is the center of dilation for the composition. Drag center point A and/or center point B around to several locations. Describe the location of the black point with respect to points A and B.

(5) Move the red and green sliders to values between 0 and 5. Observe what happens as you change dilations. What happens when (a) both values are greater than 1? (b) both are between 0 and 1? (c) one is between 0 and 1 and the other is greater than 1? Does the center for the composition of dilations still stay between A and B? Does it stay on line AB?

☐ (3) cont.

(6) Uncheck the box for "Dilation lines for composition." Return the Adilation scale factor to 2 and **slowly** slide the Bdilation scale factor until the slider gets to 1. What appears to be true about the red and green images? Why do you think that happens?

(7) Continue slowly sliding the Bdilation scale factor until the slider gets to 0.5. What appears to be true about the green image and the black original? Why do you think that happens?

(8) Leave the sliders at 2 and 0.5 and drag point A to point B. Describe where the green image lies.

(9) What occurred in part 8 happens when an **inverse transformation** is applied. An **inverse transformation** maps an image back to its preimage. Because 2 times ½ is 1, the image maps to the preimage. If the gray quadrilateral was named QRST, this composition is written $D_{O,\frac{1}{2}}(D_{O,2}\,(QRST))$. Write the notation showing the composition of the described dilation and its inverse.

(a) Dilate triangle SID about center O with scale factor r = 4. ______________________________

(b) Dilate segment ZP about center O with scale factor r = ¼. ______________________________

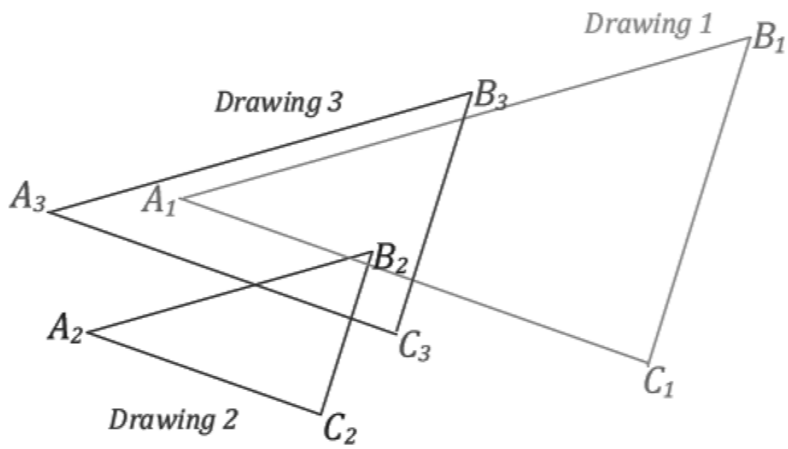
(c) Dilate point M about center O with scale factor r = 3. ______________________________

(d) Dilate triangle RAP about center O with scale factor $r = \frac{5}{7}$. ______________________________

☐ (4) **Composition of dilations: confirming what you observed about centers and scale factors**

ruler

Drawing 3 is a dilation of Drawing 2 which is a dilation of Drawing 1. Drawing 2 is a scale drawing of Drawing 1 with scale factor r_1, and Drawing 3 is a scale drawing of Drawing 2 with scale factor r_2, what is the relationship between Drawing 3 and Drawing 1?



(a) Determine the scale factor and center for each scale drawing. Take measurements as needed.

(b) What is the scale factor going from Drawing 1 to Drawing 3? Take measurements as needed.

☐ (5) **Lesson Summary**

(a) Where will the center of a composition of dilations be located?

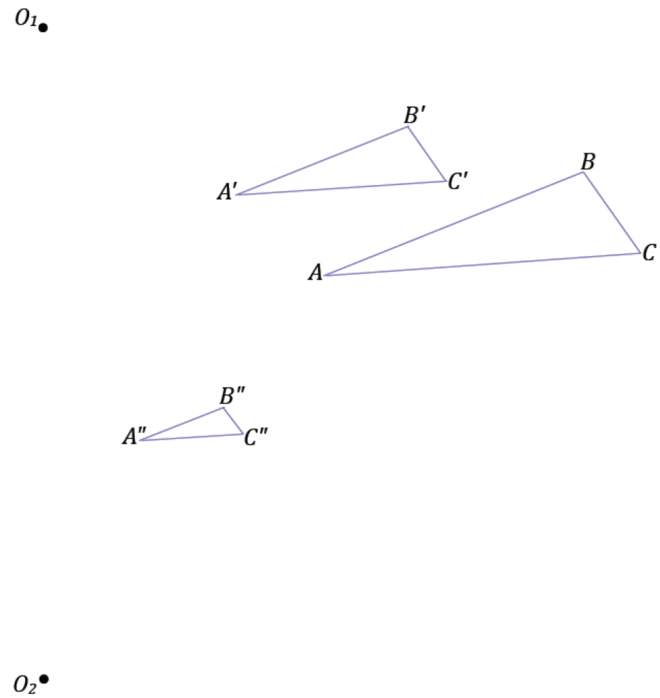
(b) How can you find the scale factor for a composition of dilations?

☐ (6) **Exit Ticket** (Trace the diagram onto your exit ticket paper and answer the questions)

ruler, compass

(a) Locate and mark the center for the composition of transformations that maps triangle ABC to triangle A"B"C"

(b) The composition of transformations that will send triangle ABC to triangle A"B"C" is written $D_{O_1,\frac{2}{3}}\left(D_{O_2,\frac{1}{2}}\left(\triangle ABC\right)\right)$. Write the composition as a single dilation from center O_3



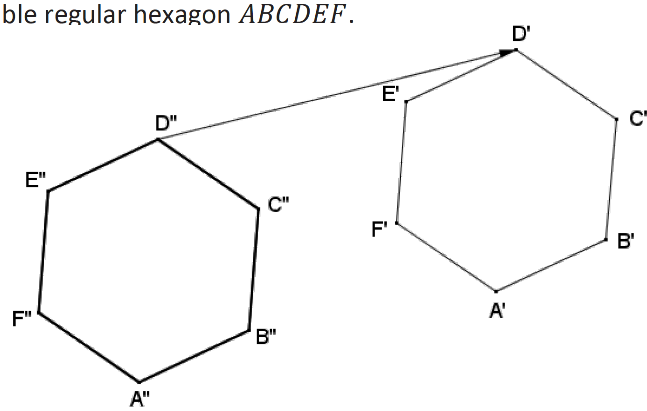
☐ (7) ruler, compass

Homework:

☐ (1) In Lesson 7, the dilation theorem for line segments said that if two different length line segments in the plane were parallel to each other, then a dilation exists mapping one segment onto the other. Explain why the line segments must be different lengths for a dilation to exist.

☐ (2)

Regular hexagon $A'B'C'D'E'F'$ is the image of regular hexagon $ABCDEF$ under a dilation from center O_1, and regular hexagon $A''B''C''D''E''F''$ is the image of regular hexagon $ABCDEF$ under a dilation from center O_2. Points A', B', C', D', E', and F' are also the images of points A'', B'', C'', D'', E'', and F'', respectively, under a translation along vector $\overrightarrow{D''D'}$. Find a possible regular hexagon $ABCDEF$.

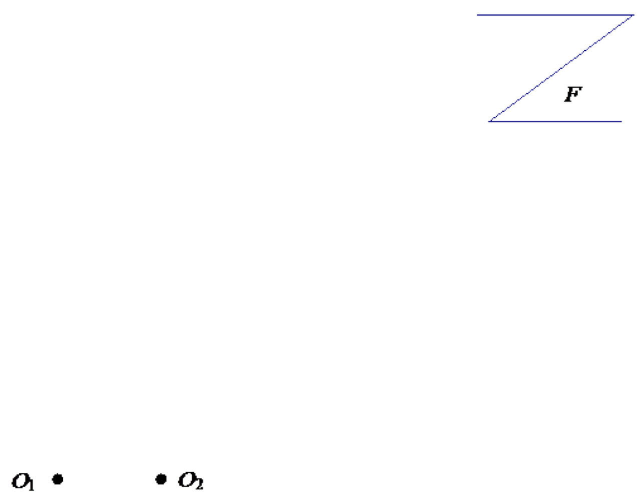


(Hint O_1O_2 must be parallel to D"D')

☐ (7) **Homework:**
cont.

☐ (3)

A dilation with center O_1 and scale factor $\frac{1}{2}$ maps figure F to figure F'. A dilation with center O_2 and scale factor $\frac{3}{2}$ maps figure F' to figure F''. Draw figures F' and F'', and then find the center O and scale factor r of the dilation that takes F to F''.



☐ (4)

If a figure T is dilated from center O_1 with a scale factor $r_1 = \frac{3}{4}$ to yield image T', and figure T' is then dilated from center O_2 with a scale factor $r_2 = \frac{4}{3}$ to yield figure T''. Explain why $T \cong T''$.

☐ (7) cont. **Homework:**

☐ (5)

A dilation with center O_1 and scale factor $\frac{1}{2}$ maps figure H to figure H'. A dilation with center O_2 and scale factor 2 maps figure H' to figure H''. Draw figures H' and H''. Find a vector for a translation that maps H to H''.