**Activity 4.1.1 Properties of Dilations**

1. On your own, list some examples of real life objects that have had an enlargement or a reduction applied to them.

2. Now share your list with a partner or group and include any additional examples to your list:

3. Dilate the figure below about the center, *P*, by a scale factor of 2.

Follow these steps:

1. Draw a ray from point *P* through vertex *G*, making sure that the ray extends past the vertex.
2. Repeat the process in (a) to form rays $\vec{PH}$ and $\vec{PJ}$ .
3. Using a compass, mark off the distance from point *P* to vertex *G*.
4. Without changing the distance on the compass, place the pointer of the compass on vertex *G* and mark the distance of the radius along the ray. Label this image point *G*’.
5. Repeat this for vertices *H* and *J*
6. Connect the three image points to form the image triangle.

****

4. Dilate quadrilateral *ABCD* about the center point, *P*, by a scale factor of 1/2 .
Follow these steps.

1. Draw a ray from point *P* through vertex *C* in the figure making sure that the ray extends beyond the vertex point.
2. Find the midpoint of segment $\overbar{PC}$. (Hint: see **Activity 2.7.6** for compass and straightedge construction, or use the Midpoint Formula.) Name this midpoint *C*′.
3. Repeat this for all vertices in the pre-image.
4. Connect the image points found to form a quadrilateral.

 ****

5. Based on what you observe in questions 3 and 4.

1. How are the pre-image and image alike?
2. How are the pre-image and image different?
3. What happens when the scale factor is greater than 1?
4. What happens when the scale factor is a positive number less than 1?

6. In the coordinate plane a dilation with center at the origin has the mapping rule:
(*x*, *y*) 🡪(*kx*, *ky*) where where *k* is the scale factor.

a. On the graph below draw the image of $∆ABC$ under a dilation with center at the origin and scale factor $\frac{1}{4}$.

b. Find the coordinates of the image vertices

Pre-image Image

*****A* (4, 8) *A’*(\_\_\_\_,\_\_\_\_)

*B* (8, 8) *B’*(\_\_\_\_,\_\_\_\_)

*C* (8, –2) *C’*(\_\_\_\_,\_\_\_\_)

c. Find these distances:

*AB = \_\_\_\_\_\_\_\_\_ A’B’ = \_\_\_\_\_\_\_*

*BC = \_\_\_\_\_\_\_\_\_ B’C’ = \_\_\_\_\_\_\_*

*AC = \_\_\_\_\_\_\_\_\_ A’C’ = \_\_\_\_\_\_\_*

Leave answers in radical form for *AC* and *A’C’*. Then find *AC* and *A’C’* to the nearest 0.01.

*AC ≈ \_\_\_\_\_\_\_\_\_ A’C’ ≈ \_\_\_\_\_\_\_*

d. How does the length of a side in the image triangle compare to the length of its pre-image?

7. a. In the space below, dilate the figure around its center point *P* with a scale factor of 3 using a compass and a straightedge.



b. What relationship do you notice between the lines containing the sides of the pre-image triangle and their images (that is between $\overleftrightarrow{GH}$ and $\overleftrightarrow{G'H'}$, etc.)

8. Summing up what you have learned:

1. True or false? Dilations only go from small sizes to big sizes.
2. True of false? Dilations always look like this:
3. What is a scale factor?
4. When a figure is dilated, what stays the same?
5. When a figure is dilated, what changes proportionally?
6. When a figure is dilated, what happens to lines that pass through the center of dilation?
7. When a figure is dilated, what happens to lines that do not pass through the center of dilation?
8. What point remains unchanged under a dilation?