REVIEW: DILATION AND LENGTH

A dilation is a a transformation that moves each point along the ray through the point emanating from a fixed center, and multiplies distances from the center by a common scale factor.

1. What makes dilation different from the other transformations: translation, rotation and reflection?

2. If a line segment is dilated by a factor of k, how will the length of the new line segment compare to that of the original? Assume $k>0$.

3. If a given parallelogram $ABCD$ is dilated by a factor of 3, what will the effect be on the:
   a. length of side AB?
   b. length of side BC?
   c. height of the parallelogram?
   d. length of diagonal AC?
   e. perimeter?

4. We are going to be working with area in this activity. We can measure area using many different units including square inches, hectares, square meters, and acres. For this activity, we are going to define 1 trimag to be equal to the area of an equilateral triangle Magformers piece. What is the area of the hexagon?

PART 1: DILATION AND AREA

6. Take a wild guess: A given shape has an area of 10 trimags. If this shape is dilated by a factor of 3, what will the area of the new shape be?

7. Equilateral Triangle: Place one equilateral triangle Magformers piece on your desk. Use Magformers to create a triangle that could represent a dilation of the original triangle by a scale factor of 2. Sketch your creation.

Sketch of My Dilated Triangle by Scale Factor of 2

8. Record the area of your dilated triangle in the table below. Complete the remainder of the table. Remember that an equilateral triangle has an area of 1 trimag.

Area in Trimags after Dilation				
	Original Area	**Area after dilation with scale factor of 2**	**Area after dilation with a scale factor of 3**	**Area after dilation with a scale factor of 4**
Equilateral Triangle	1			

9. Make a conjecture by completing the following sentence.

When an equilateral triangle is dilated by a factor of k, with k>0, the area of the new triangle…

10. Does your conjecture hold true with other polygons? Experiment with your Magformers set to complete the table below with your group. Remember that an equilateral triangle represents an area of 1 trimag.

Area in Trimags after Dilation			
Polygon	**Original Area**	**Area after a dilation with a scale factor of 2**	**Area after a dilation with a scale factor of 3**
Rhombus			
Trapezoid			
Hexagon			

11. Write a conjecture about the effect of dilation with on the area of any given polygon.

12. Write a formal proof to show that your conjecture is true for all trapezoids.
(Hint: What is the area of a trapezoid with height h and bases b_1 and b_2?)

13. Prove that your conjecture is also true for one of the following shapes:
a generic triangle (not necessarily equilateral), a rhombus, or a regular hexagon.

PART 2: DILATION, VOLUME, AND SURFACE AREA

14. Take a wild guess: A given 3-D solid has a volume of 5 cubic units and is dilated by a scale factor of 3. What will the volume of the new solid be?

15. Write a conjecture about the effect of a dilation on the volume of a 3-D solid.

16. Test your conjecture on at least 2 different prisms made from Magformers. Which prisms did you construct? Did your results support your conjecture? If not, write a new conjecture.

17. Prove your conjecture for one of the following right prisms:
    a trapezoidal prism, a triangular prism, or a parallelogram prism.

18. Write a conjecture about the effect of a dilation on the surface area of a 3-D solid.

19. Test your conjecture on at least 1 prism and at least 1 non-prism. Which solids did you construct? Did your results support your conjecture? If not, write a new conjecture.

20. Summarize what you learned in this activity.