Studying the Properties of Figures Created through a Dilation

Use a piece of grid paper to complete part I.

Part I:

Draw the polygon 1 whose vertices are A(1,1), B(2,3) and C(6,3), and D(5,1). Name the type of figure you just graphed.

Find the length of the sides AB, BC, CD, and DA:

AB = _____ BC = _____ CD= _____ DA = _____

Find the height between sides AB and CD: Height = _____

Find the area of polygon ABCD: Area = _____

Create polygon 2 whose vertices are A'(3,3), B'(6,9) and C'(18,9), and D'(15,3). Is polygon 1 the same shape as polygon 2?

Find the length of the sides A'B', B'C', C'D', and D'A':

A'B' = _____ B'C' = _____ C'D'= _____ D'A' = _____

Find the height between sides A'B' and C'D': Height = _____

Find the area of polygon A'B'C'D': Area = _____

What do you observe about the relationship between the corresponding sides of the two polygons?

Trace polygon 1 on a communicator. Compare the angles of polygon 1 with the angles of polygon 2. Since the corresponding sides are all in the same ratio and the corresponding angles are congruent, what is the special relationship between polygon 1 and 2?

Study the coordinates for each polygon. Can the second set of coordinates be made from the first set of coordinates by multiplying by some number? This number is called the dilation factor.

How is this dilation factor reflected in the measurements of the two polygons.

Connect the corresponding vertices of polygon 1 with those of polygon 2. Extend these lines until they intersect. Where do all these lines intersect? Label this point O. This point is called the point of dilation .

Find the length of OA, OA',OB, OB', OC, OC', OD, OD':

OA = _____OA'=_____ OB=_____ OB'= _____ OC- _____OC'=_____ OD=_____OD'= _____

How is the dilation factor related to these distances?

Polygon 2 is said to be a dilation of Polygon 1.

Part II:

Draw the polygon 3 whose vertices are A(1,2), B(1,4), C(5,4), and D(4,2).

Find the length of each side: AB= _____ BC=_____ CD= _____ DA = _____

Find the length of the height between sides BC and AD: Height = _____

Find the area of the polygon 3.

Draw a polygon 4 that is a dilation of the polygon 3, but whose sides are two times the sides of the first polygon. How do you know what the vertices should be? Name the vertices of the new polygon A', B', C', and D'. Name their coordinates:

A' = _____ B' = _____ C'= _____ D'=_____

Connect the corresponding vertices with line segments. Extend these line segments. Locate the point of dilation.

What do you notice about the relationship of the coordinates for the two polygons?

Trace polygon 3 on your communicators and compare the angles of polygon 3 with those of polygon 4. Did the angles of the polygon change? Why is this?

Part III:

Draw a polygon 5 whose vertices are A(6,3), B(15,3) and C(6,15). Find the length of the sides and the area of polygon 5.

AB= _____ BC = _____ CA = _____ Area = _____

Draw a line segment from the origin O to each vertex A, B, and C. Notice the length of these segments.

OA=_____, OB=_____, and OC=_____.

Reduce the lengths of these segments so that OA', OB', and OC' are one-third as long as they presently are OA, OB, and OC. Form this new triangle. A'B'C'. What happened to the size of the original triangle when the dilation factor was one-third?

What are the vertices of the triangle?

A' = _____ B' = _____ , and C' = _____

How are they related to the original vertices?

Find the lengths of the sides and the area of triangle A'B'C' t.

A'B'= _____ B'C' = _____ C'A' = _____ Area = _____

How do the sides of the new triangle compare to the first triangle? How does the area of the second triangle compare to the first?

Use your communicator to trace triangle A'B'C'. Compare the corresponding angle measures of the two triangles.

What is true about the two triangles?

Is the triangle a right triangle? Why or why not?

What have you learned about a dilation from these three parts of the lesson.

Part IV:

Create a quadrilateral KITE that has vertices that are on all four parts of the axes and whose vertices are all even numbers. Name the vertices.

K = _____, I = _____, T = _____, and E = _____

Find the length of each side and the area of the kite.

KI = _____, IT= _____, TE = _____, and EK = _____ Area = _____

Predict the vertices for a new pentagon that is a dilation of KITE by a factor of $1\frac{1}{2}$.

K' = _____, I' = _____, T' = _____, and E' = _____

Create this dilation.

Find the length of the sides of K'I'T'E' and the area.

KI = _____, IT= _____, TE = _____, and EK = _____ Area = _____

What happened to the length of the sides? What happened to the area?

Trace the original KITE on a communicator and compare the angles of KITE with those of K'I'T'E'. What happened to angles of the polygon?

What is true about the two figures?

Summary:

If a figure A is a dilation of figure B, what will happen with the following? .

If the dilation factor is greater than 1 what affect does the dilation have on the lengths of the sides?

If the dilation factor is greater than 1 what affect does the dilation have on the area of the polygon?

If the dilation factor is greater than 1 what affect does the dilation have on the vertices of the polygon?

If the dilation factor is less than 1 what affect does the dilation have on the lengths of the sides?

If the dilation factor is less than 1 what affect does the dilation have on the area of the polygon?

If the dilation factor is less than 1 what affect does the dilation have on the vertices of the polygon?

How can you find the point of dilation?