

Coordinate Geometry and Transformations

Mid-Winter Recess Assignment

8th Grade Mathematics

Mr. Hunt

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Name: _____

Due Date: February 24th, 2014

*Graph paper is available to download and print on the school website, <http://www.harborcharterschool.org>.

Coordinate Graphing / Geometry Project

The purpose: The following activities allow students to demonstrate their understanding of the coordinate system and apply that knowledge to various geometric concepts. This portfolio will enable the student to apply, analyze, evaluate and create a product demonstrating their understanding of middle school math and bring it into the next level, High School Geometry.

Goals: This project addresses the following curriculum standards for 8th grade. Transitioning the Honor student's learning, from middle school through high school Geometry using basic algebraic skills.

- 8.G.1 Verify experimentally the properties of rotations, reflections, and translation:
 - Lines are taken to lines, and line segments to line segments of the same length.
 - Angles are taken to angles of the same measure.
- 8.G.2 Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.
- 8. G.3 Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.
- 8.G.4 Understand the a two-dimensional figure is similar to another it the second can be obtained from the first by a sequence of rotations, reflections, translations and dilations, given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.

Procedure: The student will complete all 10 activities. They must graph all activities on regular sized graph paper and answer all questions connected with each activity. Answers must be complete sentences and in appropriate mathematical terms. Each graph must be drawn using a ruler or straight edge and must be colored.

Grade: This packet will be graded in two parts according to the grade sheet included in the packet. It will also be submitted in two parts. This portfolio will count as 2 major grades for the student. There will be a 10 point deduction for each late school day.

Parts one and two are due on Monday, February 24th, 2014.

Parent Signature: _____ **Date** _____

Student Signature: _____ **Date** _____

Name: _____ Graphing Project Date _____

Key for how your project will be graded:

- Questions: 3 points – Answered all questions accurately.
 2 points – Answered more than half of the questions.
 1 point – Answered less than half of the questions or did not answer them at all.
- Accuracy: 3 points – Points were graphed correctly.
 2 points – Points were graphed partially accurate.
 1 point – Points were graphed incorrectly.
- Color: 3 points – Colored all geometric figures and used a straight edge.
 2 points – Only outlined all geometric figures and used a straight edge.
 1 point – Only outlined all geometric figures and did not use a straight edge.

Part 1

	Questions	Accuracy	Color	Total
King Tut (Dilation)				
Cube (Dilation)				
Your Own (Dilation)				
Slides (Translation)				
Your Own (Translation)				
Trapezoid (Reflection)				
Your Own (Reflection)				
Arrow (Rotation)				
Your Own (Rotation)				

Part 1- Subtotal

Part 2

Essay (Content)	Has an introductory paragraph, body and conclusion. Paper has good flow with no grammar errors. 5	Has an introductory paragraph, body and conclusion. Paper has good flow with many grammar errors 4	Has an introductory paragraph, body and conclusion. Paper has no flow and many grammar errors 3	
Essay (World Connection)	Has an introductory paragraph, body and conclusion. Paper has good flow with no grammar errors 5	Has an introductory paragraph, body and conclusion. Paper has good flow with many grammar errors 4	Has an introductory paragraph, body and conclusion. Paper has no flow and many grammar errors 3	
5 points turned project in on time		0 points did not turn project in on time		
5 points overall presentation (in order)		0 overall presentation (not in order)		
Part 2 – Subtotal				

Total Points _____
 Letter Grade _____

Dilation – Activity 1: King Tut

1. Use the graph paper vertically. Put the origin in the center.
2. Plot and label these points:
 $A = (1, 5)$ $B = (7, -2)$ $C = (4, -3)$ $D = (-4, -3)$ $E = (-1, -2)$
3. Make solid lines \overline{AB} , \overline{AC} , \overline{BC} , \overline{CD} and \overline{AD} .
4. Make dashed lines \overline{AE} , \overline{DE} and \overline{EB} .
5. Dilate each coordinate of A, B, C, D, E by a scale factor of 2 to get new points A', B', C', D' and E'. Remember $(x, y) = (2x, 2y)$.

Record coordinates here: $A' = (\quad , \quad)$ $B' = (\quad , \quad)$ $C' = (\quad , \quad)$ $D' = (\quad , \quad)$ $E' = (\quad , \quad)$

6. Plot and label A', B', C', D' and E' on the same graph.
7. Make solid lines: $\overline{A'B'}$, $\overline{A'C'}$, $\overline{B'C'}$, $\overline{C'D'}$ and $\overline{A'D'}$.
8. Make dashed lines: $\overline{A'E'}$, $\overline{D'E'}$ and $\overline{E'B'}$.
9. How do the two graphs compare?
10. What did the scale factor of 2 do to the original image?
11. Are the images proportional? Explain.
12. Are the images similar? Explain.

Dilation – Activity 2: The Incredible Shrinking Cube

1. Use the graph paper horizontally. **Put the origin in the lower left-hand corner.**
2. Plot and label the following points: A= (12,12) B= (12,20) C= (20,20) D=(20,12) E=(16,24) F= (24,24) G=(24,16) H=(16,16).
3. Make **solid** lines \overline{AB} , \overline{AD} , \overline{AH} , \overline{BE} , \overline{EF} , \overline{EH} , \overline{DG} , \overline{FG} and \overline{GH}
4. Make **dashed** lines \overline{BC} , \overline{CF} and \overline{CD}
5. Dilate each coordinate of A, B, C, D, E, F, G and H by a scale factor of $\frac{1}{2}$ to get new points A', B', C', D', E', F', G' and H'. *Remember* $(x, y) = (\frac{1}{2}x, \frac{1}{2}y)$

Record coordinates here: A' = (,) B' = (,) C' = (,) D' = (,)
 E' = (,) F' = (,) G' = (,) H' = (,).

6. Plot and label A', B', C', D', E', F', G' and H'.
7. Make solid lines $\overline{A'B'}$, $\overline{A'D'}$, $\overline{A'H'}$, $\overline{B'E'}$, $\overline{E'F'}$, $\overline{E'H'}$, $\overline{D'G'}$, $\overline{F'G'}$ and $\overline{G'H'}$.
8. Make dashed lines $\overline{B'C'}$, $\overline{C'F'}$ and $\overline{C'D'}$.
9. *Using your new coordinates* of A', B', C', D', E', F', G' and H' from #5 dilate each coordinate with a scale factor of $\frac{1}{2}$ to get new points A'', B'', C'', D'', E'', F'', G'' and H''. *Remember* $(x, y) = (\frac{1}{2}x, \frac{1}{2}y)$.

Record the coordinates here:

A'' = (,) B'' = (,) C'' = (,) D'' = (,)
 E'' = (,) F'' = (,) G'' = (,) H'' = (,)

10. Make **solid** lines $\overline{A''B''}$, $\overline{A''D''}$, $\overline{A''H''}$, $\overline{B''E''}$, $\overline{E''F''}$, $\overline{E''H''}$, $\overline{D''G''}$, $\overline{F''G''}$ and $\overline{G''H''}$.
11. Make **dashed** lines $\overline{B''C''}$, $\overline{C''F''}$ and $\overline{C''D''}$.

✱ Answer the questions on the next page about Activity 2.

Dilation – Activity 2: The Incredible Shrinking Cube (*continued*)

12. Describe the size and location of the three cubes.

13. Are the three cubes proportional? Explain.

14. Are the three cubes similar? Explain.

Activity 3: Create Your Own Dilation

1. Set up an x-axis and y-axis on your graph paper.
2. Draw a design on your graph paper. (Minimum of 5 points)
3. Make a list of the ordered pairs necessary to create your design. Be sure to include directions that indicate where it is necessary to lift the pencil and where it is necessary to connect each point to the next one in the order that you have them listed.

4. Dilate your points with a reduction in size, locate and label (show your work). Your scale factor is _____.

5. Dilate your points with an enlargement, locate and label (show your work). Your scale factor is _____.

6. Color your design.

Activity 4: Translations: Sliding Trapezoids

1. Use the graph paper horizontally. Put the origin in the center. Locate these points.

$A = (-4, -2)$, $B = (-2, 2)$, $C = (1, 2)$, $D = (5, -2)$

Connect ABCD. The figure you made is called a Trapezoid.

2. Add 10 to each x-coordinate and 5 to each y-coordinate.

Record coordinates here: $A' = (\quad , \quad)$, $B' = (\quad , \quad)$, $C' = (\quad , \quad)$ and $D' = (\quad , \quad)$

3. Locate $A'B'C'D'$ and connect to make a trapezoid.

4. Draw a straight arrow from A to A' . How far over and how far up is it from A to A' ?

5. Add 10 to each x-coordinate and subtract 5 from each right-hand coordinate in the original set of points.

Record coordinates here: $A'' = (\quad , \quad)$, $B'' = (\quad , \quad)$, $C'' = (\quad , \quad)$ and $D'' = (\quad , \quad)$

6. Locate $A''B''C''D''$ and connect to make a trapezoid.

7. Draw an arrow from A to A'' . How far over and down is it from A to A'' ?

8. What type of motion will move the trapezoid ABCD onto $A''B''C''D''$?

9. Suppose you wanted to move the original trapezoid eight units to the right and twelve units up. Without drawing it, give the coordinates of the vertices.

$A''' = (\quad , \quad)$, $B''' = (\quad , \quad)$, $C''' = (\quad , \quad)$, $D''' = (\quad , \quad)$

Activity 4: Translations: Sliding Trapezoids (*continued*)

10. Are the shapes proportional? Explain.

11. Are the shapes similar? Explain.

Activity 5: Create Your Own Translation

1. Set up an x-axis and y-axis on your graph paper.
2. Draw a design on your graph paper. (minimum 5 points)
3. Make a list of the ordered pairs necessary to create your design. Be sure to include directions that indicate where it is necessary to lift the pencil and where it is necessary to connect each point to the next one in the order that you have them listed.

4. Translate your points to the right 5 units and down 3 units, locate and label (show your work).

5. Translate your points to the left 5 units and up 3 units, locate and label (show your work).

6. Color your design.

Activity 6: Reflection Trapezoid

1. Use the graph paper vertically. Put the origin in the center. Locate these points.

$$A = (3, 3), B = (5, 7), C = (8, 7) \text{ and } D = (12, 3)$$

Connect ABCD to make a trapezoid.

2. Reflect over the y-axis by changing each x-value to their opposite to get A' , B' , C' , D' .

$$A' = (\quad , \quad), B' = (\quad , \quad), C' = (\quad , \quad) \text{ and } D' = (\quad , \quad)$$

Locate these points and connect them to make a trapezoid.

How is this trapezoid related to the one you made in part 1?

3. Reflect over the x-axis by changing each y-value to their opposite to get A'' , B'' , C'' , D'' .

$$A'' = (\quad , \quad), B'' = (\quad , \quad), C'' = (\quad , \quad) \text{ and } D'' = (\quad , \quad)$$

Locate these points and connect them to make a trapezoid.

How is this trapezoid related to the one you made in part one?

4. Reflect over the origin by changing both the x- coordinate and y-coordinate in part 1 to their opposites:

$$A''' = (\quad , \quad), B''' = (\quad , \quad), C''' = (\quad , \quad) \text{ and } D''' = (\quad , \quad)$$

Locate these points and connect them to make a trapezoid.

How is this trapezoid related to the one you made in part 2?

Activity 6: Reflection Trapezoid (*continued*)

5. Are the shapes proportional? Explain.

6. Are they similar? Explain.

Activity 8: Rotations- Arrow

1. Use the graph paper vertically. Put the origin in the center of the paper.
2. Locate these points: $A = (0, 0)$, $B = (5, 10)$, $C = (5, 4)$, $D = (4, 6)$ and $E = (1, 0)$

Connect ABCDE to make an arrow.

3. Rotate 90° clockwise by switching your x-coordinate to its opposite, and then switching the places of the x and y-coordinate. Notation $(x, y) \rightarrow (y, \text{opposite } x)$

$$A' = (\quad , \quad), B' = (\quad , \quad), C' = (\quad , \quad), D' = (\quad , \quad) \text{ and } E' = (\quad , \quad)$$

4. How is this one related to the original?

5. Rotate 180° by changing your x-coordinate and y-coordinate to their opposites. Notation $(x, y) \rightarrow (-x, -y)$

$$A'' = (\quad , \quad), B'' = (\quad , \quad), C'' = (\quad , \quad), D'' = (\quad , \quad) \text{ and } E'' = (\quad , \quad)$$

6. How is this one related to the original?

7. How do you think would you rotate the figure 270° counterclockwise? (Try to graph it and analyze the two sets of points. Notation $(x, y) \rightarrow (-y, x)$

$$A''' = (\quad , \quad), B''' = (\quad , \quad), C''' = (\quad , \quad), D''' = (\quad , \quad) \text{ and } E''' = (\quad , \quad)$$

8. How is this one related to the original?

Activity 8: Rotations- Arrow (*continued*)

9. Are the shapes proportional? Explain.

10. Are they similar? Explain.

Essays – Writing Component

Reflection of concept:

You are going to write a reflection on the math content of this project and you will choose one topic, reflecting transformations throughout our world.

Content:

Compare and contrast two different types of transformations. Give your opinion on which one was more challenging and explain in detail, why it was more challenging.

Connection to Our World: (chose one topic)

Throughout time there have been many changes. Landforms have changed. Civilizations have changed through migration and through technological inventions. Consider these views and look to see where transformations exist in our world. Choose a topic and write about it, include an introductory paragraph, a body that flows and a conclusion. Below are some ideas. You may use one or create one of your own.

- ✚ In Social Studies with Mrs. Mathis-Smith, you are studying Big Businesses in the 1800's. How does business transform our society?
- ✚ In Science with Ms. Merrick, you are studying land/rocks/minerals. How does the weather over time transform our lands and their structure?
- ✚ In our society, technology is always transforming. How does technology transform our society?
- ✚ As a human, journeying through life, how have you transformed?
- ✚ How has music transformed our society?