Geometric Transformations

Math Grade 8
5 Day Unit Plan

Using:
Miras
Graphing Calculator
“Tesselmania” Computer Application

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Unit Objectives

Students will:

- Be able to describe what geometric translations and reflections are
- Be able to perform geometric translations and reflections
- Know that translations and reflections are both types of geometric transformations
- Be able to identify the pre-image and image in a geometric transformation
- Be able to identify the line of reflection in a geometric reflection
- Know that in a reflection and in a translation, the pre-image and image are congruent
- Know that in a reflection, the pre-image and image have reversed orientation
- Know that in a translation, the pre-image and image have the same orientation, i.e. not reversed
- Be able to describe what reflection symmetry is
- Be able to identify a figure with reflection symmetry
- Be able to identify a line of symmetry in a figure
- Be able to describe what a tessellation is
- Be able to describe what a fundamental region is
- Be able to create a tessellation
- Be able to design a transformation to be performed by a fellow student
- Be able to perform a transformation designed by a fellow student

Adherence to Current Pedagogy

NYS Core Curriculum Adherent Ideas for Math Grades 7-8

- **2A:** Understand, represent, and use numbers in a variety of equivalent forms (integer, fraction, decimal, percent, exponential, expanded, and scientific notation).
- **3A:** Add, subtract, multiply, and divide fractions, decimals, and integers.
- **4A:** Identify and construct two-dimensional and three-dimensional shapes.
- **4C:** Use the coordinate plane to explore geometric ideas.
- **4H:** Investigate both two- and three-dimensional transformations.
- **4I:** Use appropriate tools to construct and verify geometric relationships.
- **7A:** Recognize, describe, and generalize a wide variety of patterns and functions.
- **7H:** Explore relationships involving points, lines, angles, and planes.

Principles and Standards for School Mathematics Adherent Standards for Grades 6-8

- Understand numbers, ways of representing numbers, relationships among numbers, and number systems
- Use mathematical models to represent and understand quantitative relationships
- Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships
- Specify locations and describe spatial relationships using coordinate geometry and other representational systems
- Apply transformations and use symmetry to analyze mathematical situations
- Use visualization, spatial reasoning, and geometric modeling to solve problems
- Make and investigate mathematical conjectures
- Organize and consolidate their mathematical thinking through communication
- Communicate their mathematical thinking coherently and clearly to peers, teachers, and others

Resources

Mathematics Resource Guide with Core Curriculum. The State Education Department:The University of the State of New York, 1999.

Principles & Standards for School Mathematics. Reston, VA: The National Council of Teachers of Mathematics, Inc, 2000.

Usiskin, Z., Feldman, C.H., Davis, S., Mallo, S., Sanders, G., Witonski, D., Flanders, D., Polonsky, L., Porter, S., Viktora, S.S. Transition Mathematics. Illinois: Scott Foresman and Company, 1995.

Materials and Equipment Needed

1. One class set of straightedges
2. One class set of TI-83+ graphing calculators
3. One TI-83+ graphing calculator with overhead view screen output jack
4. One graphing calculator overhead view screen
5. One overhead projector
6. One overhead screen
7. Graph paper
8. One class set of Miras
9. One medium-sized wall mirror
10. One class set of scissors
11. One class set of index cards
12. White paper
13. Tape
14. One class set of colored markers
15. “Tesselmania” computer application
16. One overhead projection unit for computer video output
17. One large Television monitor (optional to the projection unit)

Unit Overview

1) **Lesson 1: Translations**
   a) The students draw a triangle on graph paper to review coordinate graphing.
   b) The teacher introduces relevant terms: translation, pre-image, image, and congruent.
   c) The students, led by example from the teacher, perform translations on their graphing calculator.
   d) The teacher leads a discussion on translations with the students.

2) **Lesson 2: Reflections**
   a) The students investigate what happens to objects when viewed through a mirror.
   b) The teacher introduces relevant terms: reflection, and line of reflection (mirror).
   c) The students use miras to reflect their names on a piece of paper.
   d) The students use miras to do a reflection of a raccoon face.
   e) The teacher leads a discussion on reflections with the students.

3) **Lesson 3: Reflection Symmetry**
   a) The teacher introduces relevant terms: reflection symmetry, line of symmetry, and symmetric.
   b) The students investigate the reflection symmetry in a rhombus using miras.
   c) In pairs or triples, the students investigate the lines of symmetry in various shapes using miras.
   d) The teacher leads a discussion on reflection symmetry and how it relates to reflections.

4) **Lesson 4: Tessellations**
   a) The students watch a slideshow of animated tessellations in the “Tesselmania” software application.
   b) The teacher introduces relevant terms: tessellation, and fundamental region.
   c) The students create a tessellation of a dog, led by the teacher through example.
   d) The students use their dog fundamental region to fill a plane (piece of paper).

5) **Lesson 5: Creating & Performing Transformations**
   a) In the form of an assessment, the students design (using the template provided) a transformation to be performed by another student.
   b) The students then give their transformation to another student to perform.

NOTES

- This unit plan uses the textbook entitled, Transition Mathematics (see Resources section of this document).
- The unit is centered around lessons 8-5, 8-6, 8-7, and 8-8 from this textbook.
- Unless noted otherwise, any references to pages in the textbook will refer to this textbook.

Math Grade 8: Geometric Transformations Day 1 (Translations)

Objectives, students will:

- Be able to describe what a geometric translation is
- Be able to perform a geometric translation
- Be able to identify the pre-image and image of a translation
- Know that the pre-image and image of a translation are congruent

Opening Activity:

The teacher asks the students about polygons and coordinates in order to get them thinking about geometry:

1. What is a polygon? An enclosed figure with any number of sides.
2. A polygon is made up of points. How do we describe a point, or coordinate? By an x-value and a y-value.

To practice plotting points, the students will graph the following points on their graph paper and connect the points, using a straightedge, to make a triangle:

```
A (2, 2)
B (6, 2)
C (7, 5)
```

3. The three-sided polygon we created is called what? A triangle.

Developmental Activity:

The teacher introduces the definition of a translation (slide) and discusses with the students its implications on polygons.

Translation: adding (or subtracting) the same number to (from) the coordinates of a figure

In the process, the teacher uses the terms pre-image, image and congruent.

Pre-image: the figure *before* the translation

Image: the figure *after* the translation

Congruent: having the same size and shape

It may be helpful for some students to make a table and perform the translation arithmetically before showing the translation geometrically. Subsequently, the teacher will lead the students in graphing the triangle from above on their calculator using the overhead view screen and projector to show the entire class. Then, using their calculators, the students perform the translations:

```
(x,y) -> (x + 2, y + 4)
(x,y) -> (x - 10, y - 8)
```

(see **Teacher's Notes** below)

Closing Activity:

The teacher presents various translations to the students (see diagrams on teacher's page 436 and 437) asks the students to describe the translation.

Questions:

1. Is the bottom of a figure still the bottom of a figure after a translation? Yes.
2. Are the pre-image and image congruent? Yes.
3. If we began with the letter M, could we make a letter W using a translation? No.

Equipment:

- A straightedge, one sheet of graph paper, and a TI-83+ graphing calculator will be provided to each student.
- One TI-83+ graphing calculator with overhead view screen output jack
- One graphing calculator overhead view screen
- One overhead projector
- One overhead screen

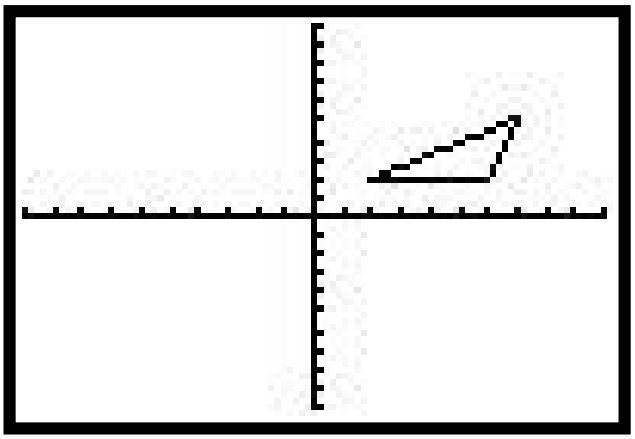
Assignment:

Read pp. 435 – 436 in textbook
Questions pp. 437 – 438: 1-5,11,12,14 (answers are provided in the teacher's edition of the textbook).

Teacher's Notes:

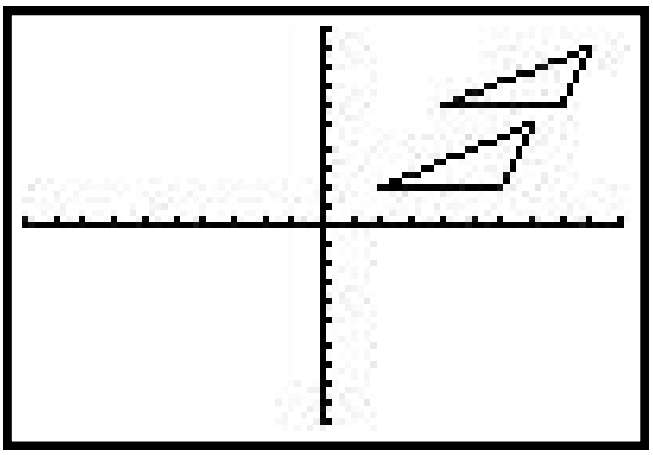
TI-83 entry sequence for graphing the triangle A (2, 2) B (6, 2) C (7, 5):

STAT
Edit
In **L1** put the following numbers **2 6 7 2**
In **L2** put the following numbers **2 2 5 2**
2nd
STAT PLOT
1
Turn **Plot1** On
Select the second **Type** (Line Graph)
Xlist:L1
Ylist:L2
Mark: .
ZOOM 6
GRAPH



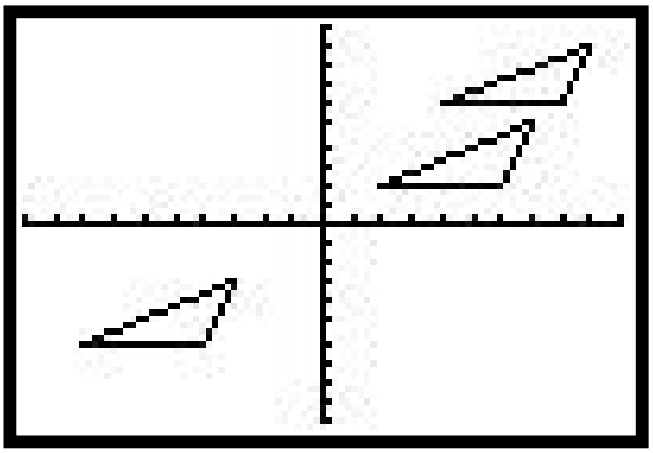
TI-83 entry sequence for graphing the translation `(x,y) -> (x + 2, y + 4):`

STAT
Edit
Position cursor over **L3** and type **L1 + 2**
ENTER
Position cursor over **L4** and type **L2 + 4**
ENTER
2nd
STAT PLOT
2
Turn **Plot2** On
Select the second **Type** (Line Graph)
Xlist:L3
Ylist:L4
Mark: .
GRAPH



TI-83 entry sequence for graphing the translation `(x,y) -> (x - 10, y - 8)`

STAT
Edit
Position cursor over **L5** and type **L1 – 10**
ENTER
Position cursor over **L6** and type **L2 – 8**
ENTER
2nd
STAT PLOT
3
Turn **Plot3** On
Select the second **Type** (Line Graph)
Xlist:L5
Ylist:L6
Mark: .
GRAPH



Math Grade 8: Geometric Transformations Day 2 (Reflections)

Objectives, students will:

- Be able to describe what a reflection is
- Be able to perform a geometric reflection
- Be able to identify the pre-image and image of a reflection
- Be able to identify the line of reflection in a reflection
- Know that the pre-image and image of a reflection are reversed, but congruent
- Know that translations and reflections are both types of transformations

Opening Activity:

- The teacher reviews translations by asking the students to orally answer the assigned questions from Day 1.
- The teacher introduces the term reflection as what happens to one's image when looked at in a mirror. One student carries a medium-sized wall mirror around the room so that each student may look into the mirror and observe the results. The teacher prompts the students to describe what happens to one's face when looked at in a mirror. In addition, students should hold up, say, a textbook to observe what happens to the textbook. The students spend some time investigating what happens to an object when they are viewed in a mirror.

Developmental Activity:

The teacher introduces the relevant terms:

Reflection (flip): the transformation that takes place when using a mirror

Line of reflection: the mirror over which the reflection takes place

Transformation: either a translation or reflection, so far (dilations and rotations are other types of transformations that will not be discussed in this unit).

Each student is provided a mira and a blank sheet of paper. The teacher has the students write their name on the piece of paper. The teacher then demonstrates how to use the mira to "see" the reflection of one's name. Students then reflect their name on the sheet of paper using the mira. Once completed, the teacher introduces the face reflection sheet and (see **Teacher's Notes**), then explains that their task is to reflect half of the raccoon face to make a complete raccoon face using a mira (i.e. line of reflection is the y-axis). The teacher will provide support to the students as needed while the students work on this task. The rubric is provided to each student so that they will be informed of the type of assessment that will be used for this task. The teacher should talk with the students about the rubric before the task is complete. Students include the rubric with their face reflection at completion time.

Closing Activity:

Questions:

1. Are the pre-image and image congruent? Yes.
2. How are the pre-image and image different in a reflection? They are reversed.
3. Is the left of a figure still the left of a figure after a reflection? It depends on the reflection. If it is a horizontal reflection, left will still be left.
4. When will the left of a figure still be the left of a figure after a reflection? When the line of reflection is a horizontal line.
5. If we began with the letter M, could we make a letter W using a reflection? Yes.
6. How? Put the mirror, or line of reflection, as a horizontal line below the letter M.

Equipment:

- A medium-sized wall mirror for the class will be used with each student.
- A mira will be provided to each student.

Assignment:

Read pp. 440- 442 in textbook
Questions pp. 442 – 444: 1-6, 15-18 (Answers are provided in the teacher's edition of the textbook)

Teacher's Notes:

The following pages include:

1. The rubric and worksheet to distribute to the students for the face reflection.
2. The answers and sample student work for the worksheet.
3. The raccoon face reflection worksheet.

Student Name _____ Date _____

Grading Rubric for Face Reflection

Grading Rubric

Student Task	*Earned Points*	*Possible Points*
Appropriate reflection of face across line of reflection		**20**
Five points labeled on pre-image		**10**
Finding the coordinates of points from pre-image		**15**
Five corresponding points labeled on the image		**13**
Finding the coordinates of points from image		**15**
Label line of reflection		**7**
Follow-up problem #1		**10**
Follow-up problem #2		**10**
Student Total		**100**

Student Work

Points from pre-image

Point	x-value	y-value
A		
B		
C		
D		
E		

Points from image

Point	x-value	y-value
A'		
B'		
C'		
D'		
E'		

1. Describe how the reflection changed the x and y values of the corresponding reflected points (e.g. How did A' change from A?).

2. Is it possible to make the same transformation using a translation (i.e. Can you make the face look right using a translation instead of a reflection)? Why or why not?

KEY

Student Name _____ Date _____

Grading Rubric for Face Reflection

Grading Rubric

Student Task	*Earned Points*	*Possible Points*
Appropriate reflection of face across line of reflection		**20**
Five points labeled on pre-image		**10**
Finding the coordinates of points from pre-image		**15**
Five corresponding points labeled on the image		**13**
Finding the coordinates of points from image		**15**
Label line of reflection		**7**
Follow-up problem #1		**10**
Follow-up problem #2		**10**
Student Total		**100**

Student Work

Points from pre-image

Point	x-value	y-value
A	*1*	*12*
B	*3*	*5*
C	*3*	*-9*
D	*10*	*-11*
E	*11*	*12*

Points from image

Point	x-value	y-value
A'	*-1*	*12*
B'	*-3*	*5*
C'	*-3*	*-9*
D'	*-10*	*-11*
E'	*-11*	*12*

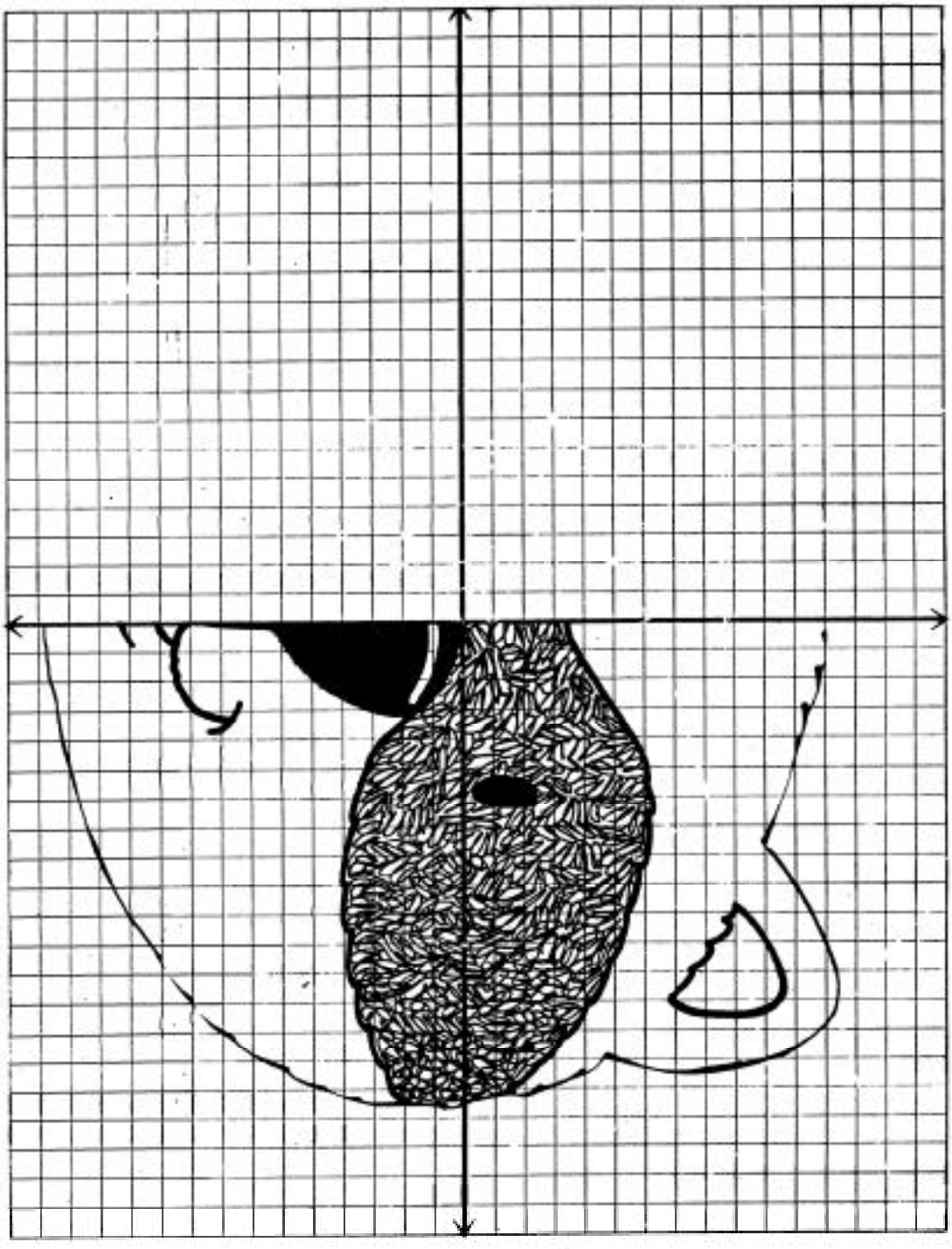
The points from the pre-image will vary among the students, but the x-values should all be positive. The y-values from the image will be the same as the y-values from the pre-image. The x-values will be the same integral value, except the sign will be reversed, i.e. they will be negative.

1. Describe how the reflection changed the x and y values of the corresponding reflected points (e.g. How did A' change from A?).

   The y-values remained the same. The x-values reversed sign, i.e. became negative.

2. Is it possible to make the same transformation using a translation (i.e. Can you make the face look right using a translation instead of a reflection)? Why or why not?

   No. A translation will never reverse an image like a reflection does, so the face will never look like a real face, but simply two half-faces.



Math Grade 8: Geometric Transformations Day 3 (Reflection Symmetry)

Objectives, students will:

- Be able to describe what reflection symmetry is
- Be able to identify a figure with reflection symmetry
- Be able to identify a line of symmetry in a figure

Opening Activity:

- The teacher reviews reflections by asking the students to orally answer the assigned questions from Day 2.
- The teacher discusses the face reflection:
  1. Is the raccoon face the same on both sides? Yes, but reversed.
  2. Where is the line of reflection? A vertical line down the middle.

Developmental Activity:

Reflection Symmetry: when both sides of a figure match with reverse orientation

Both sides of the raccoon face match, so it has reflection symmetry. The teacher asks the students how they know that both sides of the raccoon face match. Since the students reflected it themselves, the teacher should be sure that the students are convinced that reflecting causes both sides to match. Since both sides match, we say that the left side is **symmetric** to the right side and vice versa. The students are provided with a mira and the Reflection Symmetry worksheet. The students use a mira to test for reflection symmetry in rhombus PQRS on their worksheet. First they test for symmetry on line PR then line SQ. These lines provide the two lines of symmetry in the rhombus. The teacher explains to the students that in order to test for reflection symmetry in a figure, they place a mira somewhere on the figure. If the reflection in the mira of one side of the figure matches exactly with the other side of the figure, then the figure has reflection symmetry and the **line of reflection** is exactly where the mira is placed. The teacher then allows the students to try to find other lines of symmetry in the rhombus. There are no more lines of symmetry in a rhombus. Once the students are convinced of this, the teacher discusses the two following example figures on the worksheet and their lines of symmetry.

For the last activity of the worksheet, students are to draw all the lines of symmetry on the six figures provided. Allow students to work on this activity in pairs or triples. The teacher may want to ask the students to name those six figures.

Closing Activity:

Questions:

1. How is a reflection different than reflection symmetry? Answer will vary, but the important idea is to stress that a reflection is a transformation involving moving (flipping) a figure. However, reflection symmetry is a property of a figure and requires no movement implicitly, but reflections can be used to test for reflection symmetry.
2. What is the maximum number of lines of symmetry a figure may have? Infinitely many, e.g. a circle.
3. What is the minimum number of lines of symmetry a figure may have? Zero, e.g. scalene triangle.

Equipment:

- A mira will be provided to each student.

Assignment:

Read pp. 446 in textbook

Questions pp. 448 – 449: 1-5, 13-15 (Answers are provided in the teacher's edition of the textbook)

Teacher's Notes:

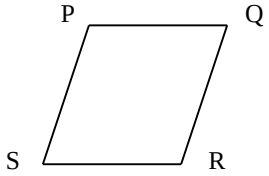
The following pages include:

1. Reflection Symmetry worksheet

2. Reflection Symmetry worksheet answers

Name: _____ Date: _____

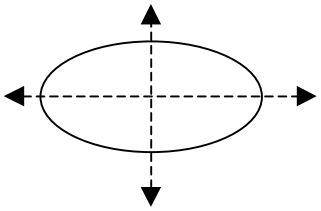
Reflection Symmetry



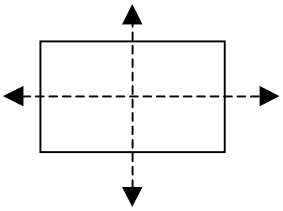
Use a mira to answer the following questions about rhombus PQRS:

1. Is PR a line of symmetry? _____
2. Is SQ a line of symmetry? _____
3. Are there any more lines of symmetry? _____

Examples of lines of symmetry in a(n):



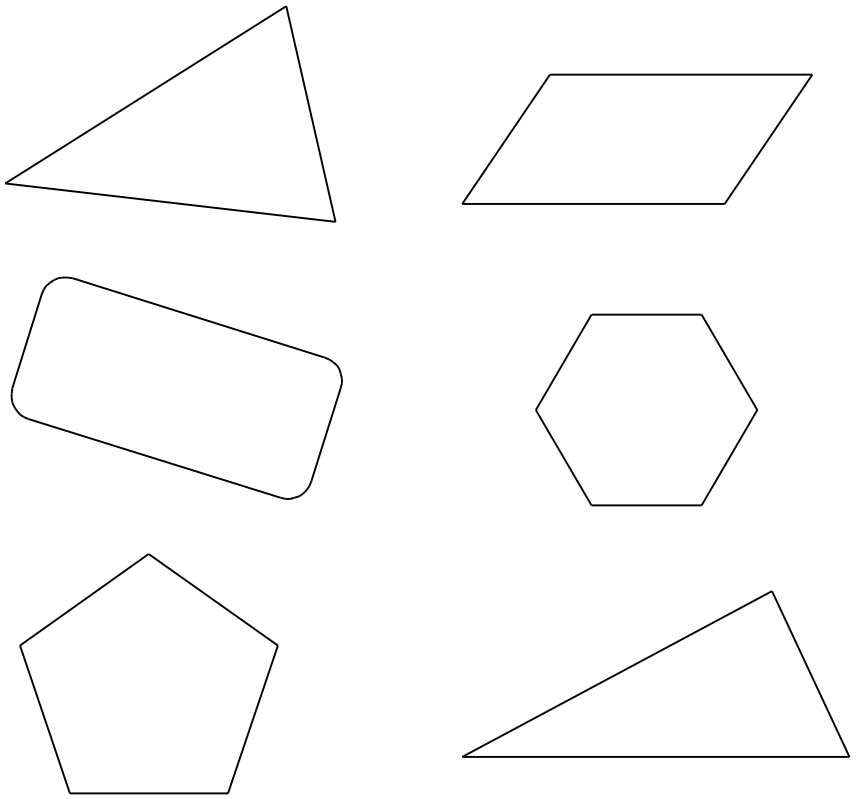
Oval



Rectangle

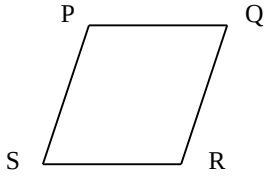
You may use a mira to verify these lines of symmetry.

Use a mira to determine and then draw in all the lines of symmetry in the following figures:



Name: _____ Date: _____

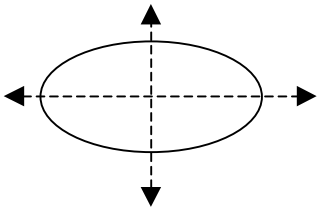
Reflection Symmetry



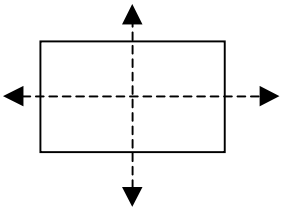
Use a mira to answer the following questions about rhombus PQRS:

1. Is PR a line of symmetry? __*yes*____
2. Is SQ a line of symmetry? __ *yes* ____
3. Are there any more lines of symmetry? __ *no* ____

Examples of lines of symmetry in a(n):



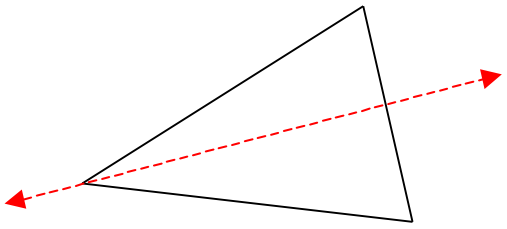
Oval

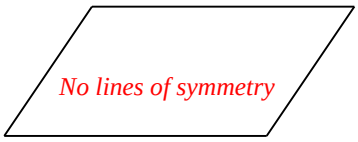


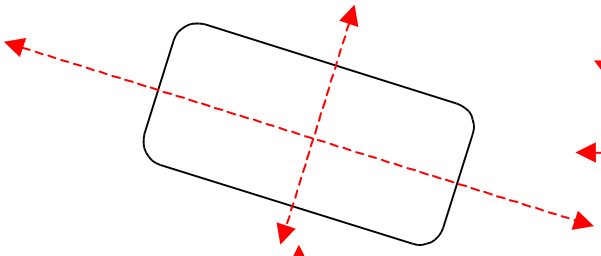
Rectangle

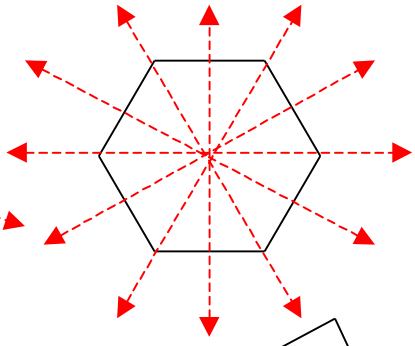
You may use a mira to verify these lines of symmetry.

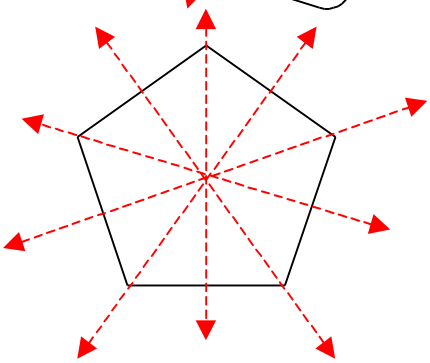
Use a mira to determine and then draw in all the lines of symmetry in the following figures:

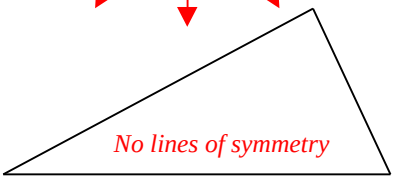












Math Grade 8: Geometric Transformations Day 4 (Tessellations)

Objectives, students will:

- Be able to describe what a tessellation is
- Be able to describe what a fundamental region is
- Be able to create a tessellation

Opening Activity:

- The teacher reviews reflection symmetry by asking the students to orally answer the assigned questions from Day 3.
- The teacher asks the students to describe translations and reflections are as they will be important in the tessellation slideshow.

Developmental Activity:

The teacher defines tessellation for the students:

Tessellation: tiling of a region with a shape, e.g. the tiles in a bathroom, the tiled floor of a bathroom is a good example of a tessellation.

To demonstrate tessellations, the teacher runs the "Tesselmania" application software on the computer with either the computer projected onto on overhead screen or the computer video output patched into a large television screen. Tesselmania should be run in slideshow mode, showing animated examples of tessellations with ambient music. While the tessellation animations are progressing the teacher asks students what type of transformation is happening at any given point of the slideshow. Some of the tessellations involve rotations, which are not covered in this unit, but most students realize this without additional instruction. If they do not, it is not important that they recognize rotations, as they are not covered in this unit.

Once interest level of the students toward the slideshow has waned, the teacher hands out the equipment (straightedge, index card, scissors, tape, white paper, and markers) to each student. The teacher leads the process to create a dog tessellation (see p. 453 in textbook) using a blank index card (rectangle). The teacher demonstrates each step while the students follow along using their own equipment. Once the students have assembled their dog, the teacher explains that this is the fundamental region. (In the experience of the author, it proved too difficult for students to create their own fundamental regions. For this reason, it was chosen to have the entire class create the dog tessellation. A teacher may wish to allow students to create their own fundamental region in order to provide for more creativity and spark more interest).

Fundamental Region: the tile that is used in a tessellation, e.g. the dog

Now the students are free to decorate their fundamental region with markers provided. Following that, the students are to take their fundamental region and fill up the piece of white paper with it. They may use different colored markers to trace each dog a different color as they fill up their paper to create a colorful tessellation. The teacher may demonstrate the filling up and tracing on his own paper as needed. This is an excellent opportunity to involve the students in noting the dog must be translated, or possibly reflected, in order to fill up a region.

The teacher may desire to have the students hand in their tessellations for assessment. The Transformation Concepts worksheet is to be given as homework. This could optionally be used as an in-class individual assessment to encompass the concepts of the unit.

Closing Activity:

Questions:

1. What shape did we start with to make the dog? Rectangle.
2. Does every rectangle tessellate a region? Yes.
3. Does every shape tessellate a region? No.
4. Which ones do not? A circle, a pentagon.

Equipment:

- A straightedge, an index card, a pair of scissors, a piece of white paper, tape, and colored markers will be provided to each student.
- "Tesselmania" computer application

- An overhead projection unit for computer video output
- An overhead screen
- A large Television monitor (optional to the projection unit)

Assignment:

Read pp. 452 in textbook
Transformation Concepts worksheet

Teacher's Notes:

The following pages include:

1. Transformation Concepts worksheet
2. Transformation Concepts worksheet answers

Name _____ Date _____

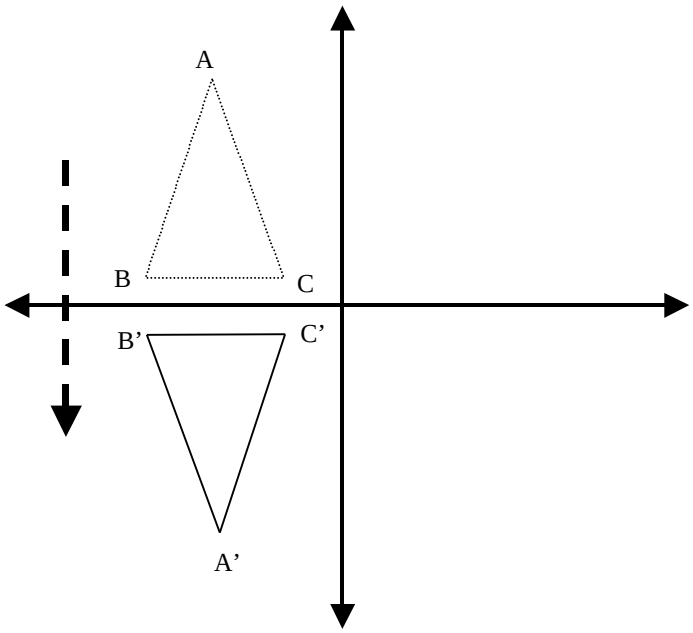
Transformation Concepts

Match the following words with their appropriate definitions.

1. Tessellation	_____	a. The figure before a transformation
2. Transformation	_____	b. Consists of an x and y value
3. Reflection	_____	c. The tile used in a tessellation
4. Fundamental Region	_____	d. Sliding a figure
5. Pre-image	_____	e. Flipping a figure
6. Coordinate	_____	f. Tiling a region
7. Image	_____	g. A translation or reflection
8. Translation	_____	h. The figure after a transformation

The figure below is a (circle one): a. Translation b. Reflection

Label the following in the figure below:
(**Note**: The large dotted arrow indicates the direction of the transformation, i.e. the top is first, then the bottom.)
Line of reflection
Image
Pre-image



Name _____ KEY Date _____

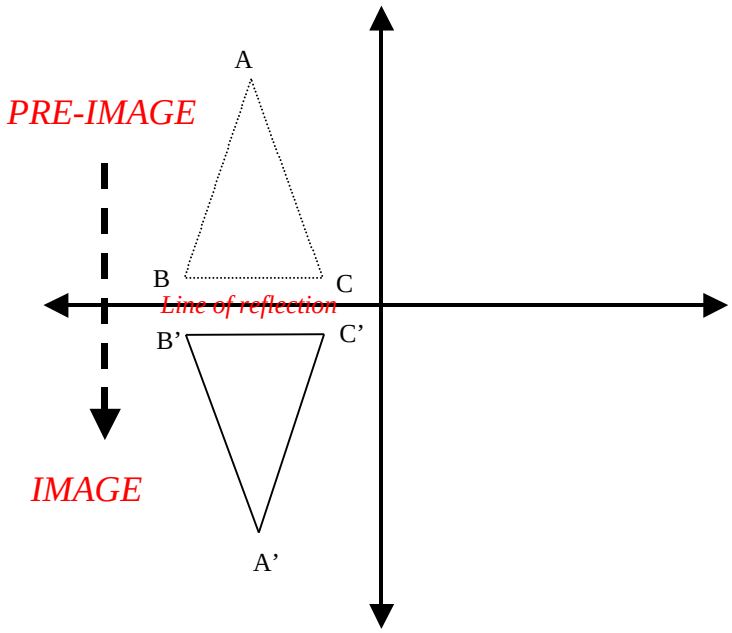
Transformation Concepts

Match the following words with their appropriate definitions.

1.	Tessellation	__f___	a. The figure before a transformation
2.	Transformation	__g___	b. Consists of an x and y value
3.	Reflection	__e___	c. The tile used in a tessellation
4.	Fundamental Region	__c___	d. Sliding a figure
5.	Pre-image	__a___	e. Flipping a figure
6.	Coordinate	__b___	f. Tiling a region
7.	Image	__h___	g. A translation or reflection
8.	Translation	__d___	h. The figure after a transformation

The figure below is a (circle one): a. Translation b. Reflection

Label the following in the figure below:
(**Note**: The large dotted arrow indicates the direction of the transformation, i.e. the top is first, then the bottom.)
Line of reflection
Image
Pre-image



Math Grade 8: Geometric Transformations Day 5 (Creating & Performing Transformations)

Objectives, students will:

- Be able to design a transformation to be done by a fellow student
- Be able to perform a transformation designed by a fellow student

Opening Activity:

- If the Transformation Concepts worksheet was given as homework, the teacher should discuss this worksheet with the students. If it was not given as homework, it could be used as additional assessment in this lesson.
- To prepare the students for the assessment, the teacher asks the following questions:
  1. What are the two types of transformations that we learned about in this unit? Translations and reflections
  2. Can you tell me what happens in each one of those transformations? In a translation, the figure is slid in some direction. In a reflection, the figure is flipped over a line of reflection (mirror).
  3. What are the pre-image and images of a transformation? The pre-image is what the figure looks like before the transformation, the image comes after.
  4. If I want to translate a figure, what additional information do I need? I need to know the direction to slide the figure and how far to slide it.
  5. If I want to reflect a figure, what additional information do I need? I need to know the line of reflection.

Developmental Activity:

The assessment for this unit will have students get into pairs. About half of the time will be devoted to students designing a transformation, while the other half will be spent on the students performing a transformation. During the first half, each student will work on the student 1 part of the assessment. During the second half, they will work on the student 2 part. Therefore, each sheet will contain work from two different students (the two students in the pair).

For student 1 part, students will first design a transformation of their choice, using the template worksheet provided below. They may choose either a translation or a reflection, and may choose any polygon with 5 or fewer points. They must also write a description of their transformation so that their partner will have enough information to perform their transformation.

Once the students are finished designing a transformation, they exchange their papers with the other student in their pair. Now students work on the student 2 part of the assessment, performing the given transformation that their partners just designed.

Each assessment worksheet will contain half of a student's work, so a rubric is provided for scoring each individual student's performance on the transformations.

Closing Activity:

Teacher assessment:

The students will anonymously write down on a sheet of paper three things they learned about transformations. Also, students will write down one thing they liked and one thing they disliked about the unit. The teacher can use these comments to adjust this unit in the future.

Equipment:

- A straightedge will be provided to each student.

Teacher's Notes:

The following pages include:

1. The assessment worksheet.
2. The assessment worksheet sample answers. The students are free to choose any shape and transformation they desire (within the scope of this course). While individual results may vary, one possibility of student work is provided.
3. The assessment rubric.

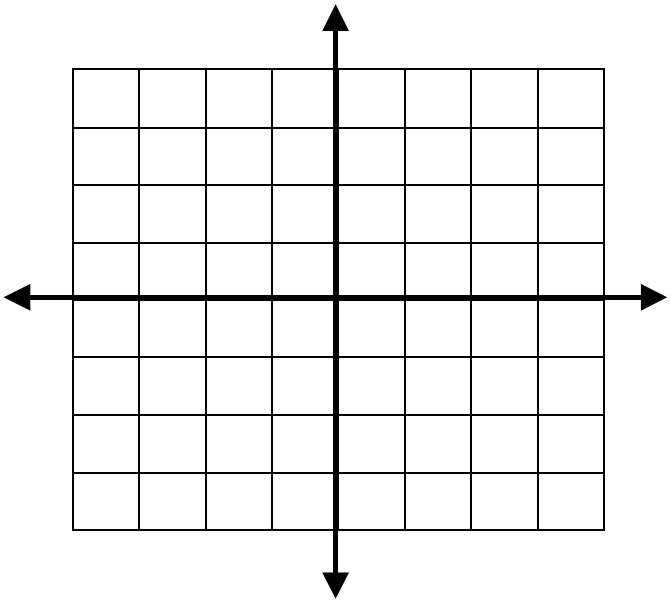
Student 1 _____ Student 2 _____

Transformations

Student 1 directions:

1. Label the x-axis and the y-axis.
2. Choose and draw your polygon on the graph provided.
3. Label the points of your polygon, example A, B, C, …
4. Write the coordinates of the points of your polygon in the table provided below.
5. Choose and write the name of the transformation that Student 2 is to perform.
6. Choose and write a description of the transformation that Student 2 is to perform.

Label	x	y



Transformation Name:_____

Description:_____

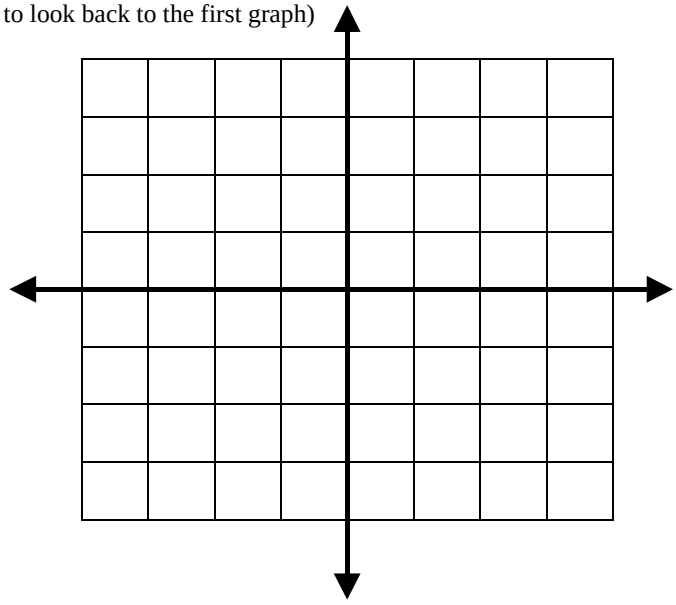
_____

_____

Student 2 directions:

1. Label the x-axis and the y-axis.
2. Write the coordinates of the points of the transformed polygon in the table provided below.
3. Draw your transformed polygon on the graph provided.
4. Label the points of the transformed polygon on the graph provided, example A', B', C', …
5. Label the pre-image and image (you will have to look back to the first graph)

Label	x	y



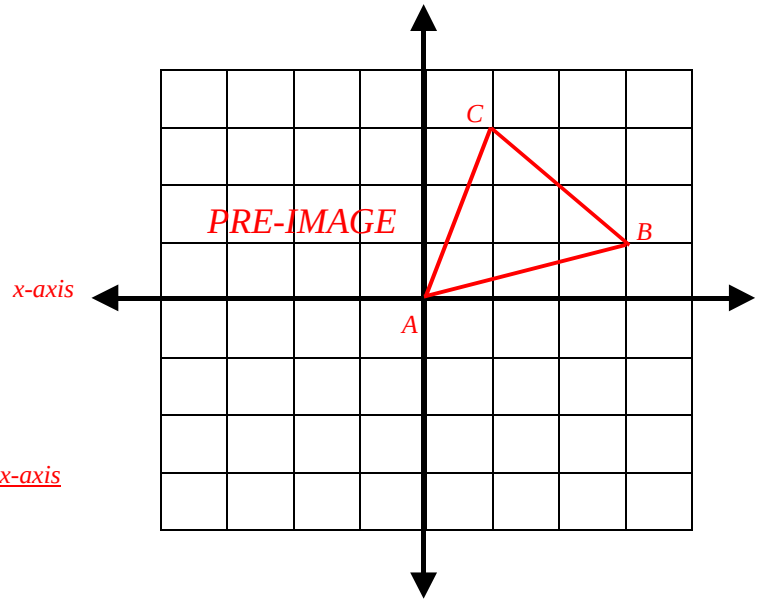
Student 1 _____ SAMPLE Student 2 _____

Transformations

Student 1 directions:

1. Label the x-axis and the y-axis.
2. Choose and draw your polygon on the graph provided.
3. Label the points of your polygon, example A, B, C, …
4. Write the coordinates of the points of your polygon in the table provided below.
5. Choose and write the name of the transformation that Student 2 is to perform.
6. Choose and write a description of the transformation that Student 2 is to perform.

Label	x	y
A	*0*	*0*
B	*3*	*1*
C	*1*	*3*



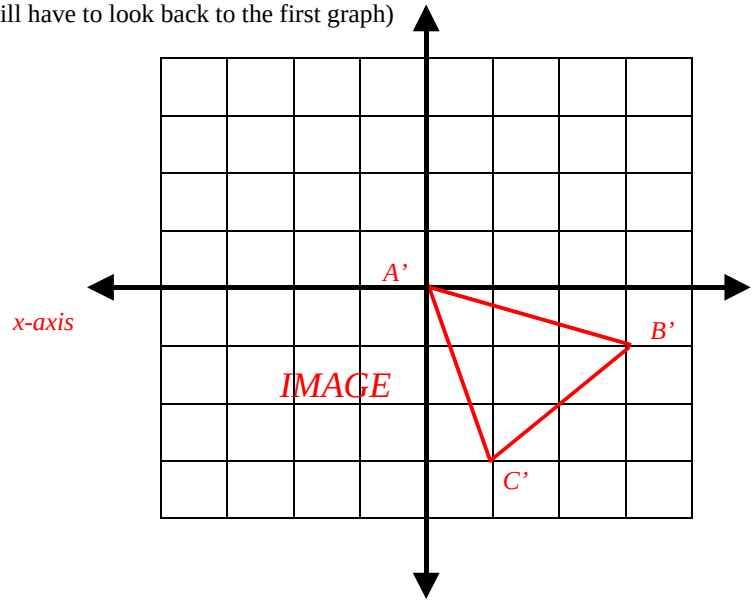
Transformation Name: *Reflection*

Description: *Reflect triangle ABC over the x-axis*

Student 2 directions:

1. Label the x-axis and the y-axis.
2. Write the coordinates of the points of the transformed polygon in the table provided below.
3. Draw your transformed polygon on the graph provided.
4. Label the points of the transformed polygon on the graph provided, example A', B', C', …
5. Label the pre-image and image (you will have to look back to the first graph)

Label	x	y
A'	*0*	*0*
B'	*3*	*-1*
C'	*1*	*-3*



Name: _____

Transformations Rubric

Section	*Earned Points*	*Possible Points*
Label pre-image axes		5
Draw pre-image polygon		10
Label points of pre-image polygon		5
Write coordinates of pre-image polygon		10
Write type of transformation		5
Write description of transformation		10
Label image axes		5
Write coordinates of image polygon		20
Draw image polygon		15
Label points of image polygon		5
Label pre-image and image		10
Student Total		**100**