

ALGEBRA/GEOMETRY INSTITUTE SUMMER 2007

SYMMETRY AND TANGRAMS

Elizabeth Evans
Riverside Elementary
6th Grade



Teaching Objectives

To use tangrams to build figures that have symmetry.

To identify line symmetry.

Instructional Activities (designed for groups of 4)

1. Build the example on the overhead. (Attachment #1)
2. **Say:** This is a tangram. A tangram is a puzzle consisting of seven polygon-shaped pieces that can be rearranged to make various figures or shapes.
3. **Ask:** What shape is this? A square
4. Have students identify the seven polygons shown in this tangram. *five triangles, one square, and one parallelogram*
5. Give each group 4 sets of tangram pieces. Have students identify their tangram pieces. (They should have the same number of pieces shown in diagram.)
6. Cover the diagram on the overhead and tell students to use their pieces to build the square. Show the diagram again. Discuss with students.
7. **Say:** Today, we are going to build figures with tangrams and find their line(s) of symmetry using a mira.
8. Give each group four miras.
9. Demonstrate how to use the mira. Point out the beveled edge and its purpose.
10. **Say:** A figure or an object has line symmetry if it can be folded or reflected so that the two parts of the figure match, or are exactly the same (congruent).
11. Give each student a sheet of copying paper. Have students fold the paper in half. (Demonstrate how to fold the paper for the students.)
12. Explain how this fold creates a line of symmetry. Fold the paper in the other direction and explain. **Ask:** How many lines of symmetry have we found so far for this sheet of paper? 2
13. Ask if there are any more lines of symmetry for the sheet of paper. Some students may assume that all diagonal lines are lines of symmetry. Experiment with the sheet of paper to disprove this idea.
14. Have students refer back to their tangram (the square). Have them trace the outline of the shape on copying paper. (*Symmetry is based on the outline of each shape only.*)
15. Show students how to use the mira to find the lines of symmetry of their square. Allow time to experiment. Have students discuss findings in their group and record their answer on the chart. (Attachment #2)
16. **Ask:** How many lines of symmetry did you find for your square? 4
17. When students finish this activity, have one of them explain and demonstrate their solution. (Use Attachment #3 for demonstration and see Attachment #4 for solutions)

18. **Ask:** How do you know that a shape has line symmetry? Because it has two parts that are congruent
19. Have students construct objects 1-7.
20. Repeat steps 15-17 with each object. (See Attachment #4 for solutions)

Materials

Tangrams – one overhead set for teacher; set per student

Mira – one per student

Copying paper- 6 sheets per student (use front and back for exercises)

Chart (teacher made) – one per student

Copy of objects on transparencies – to be used during demonstrations

Attachment #1 – transparency for demonstration only

Attachment #2 (teacher made) – transparency of solutions; student copy – one per student

Attachment #3 (teacher made) – transparency for demonstrations

Attachment #4 (teacher made) – teacher use only

Attachment #5 (teacher made) – one per student

Resources

Burton, Grace M. & Maletsky, Evan M., et. al. *Math Advantage Middle School I Teacher's Edition*. Harcourt Brace and Company, 1999, pgs. 182-183.

Hansen, John. *Buckle Down! Mississippi MCT 6 Mathematics*. Buckle Down Publishing, 2005, pgs. 74-87.

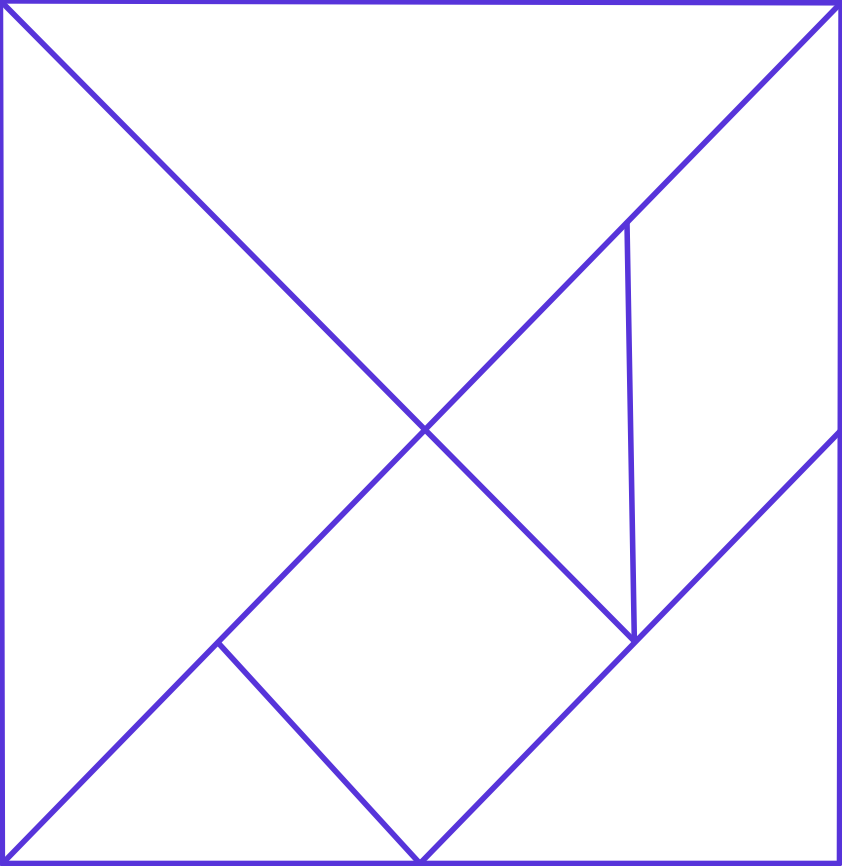
Shapes were constructed through Geometer's Sketchpad.

Clipart from www.popgamers.com.

Assessment

1. Each student will be given an activity sheet. Students will be asked to draw the line or lines of symmetry. They will also be asked to draw a different figure that has at least two lines of symmetry. (Attachment #5)
2. Record as a grade and share responses with students.

Attachment #1(transparency)

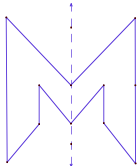
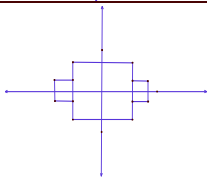
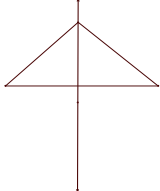
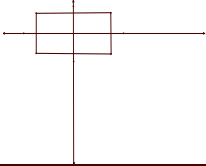

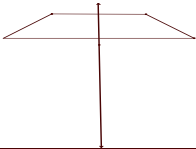
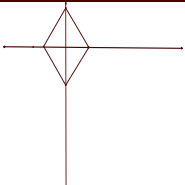


Attachment #2 (student copy)

Symmetry and Tangrams Chart

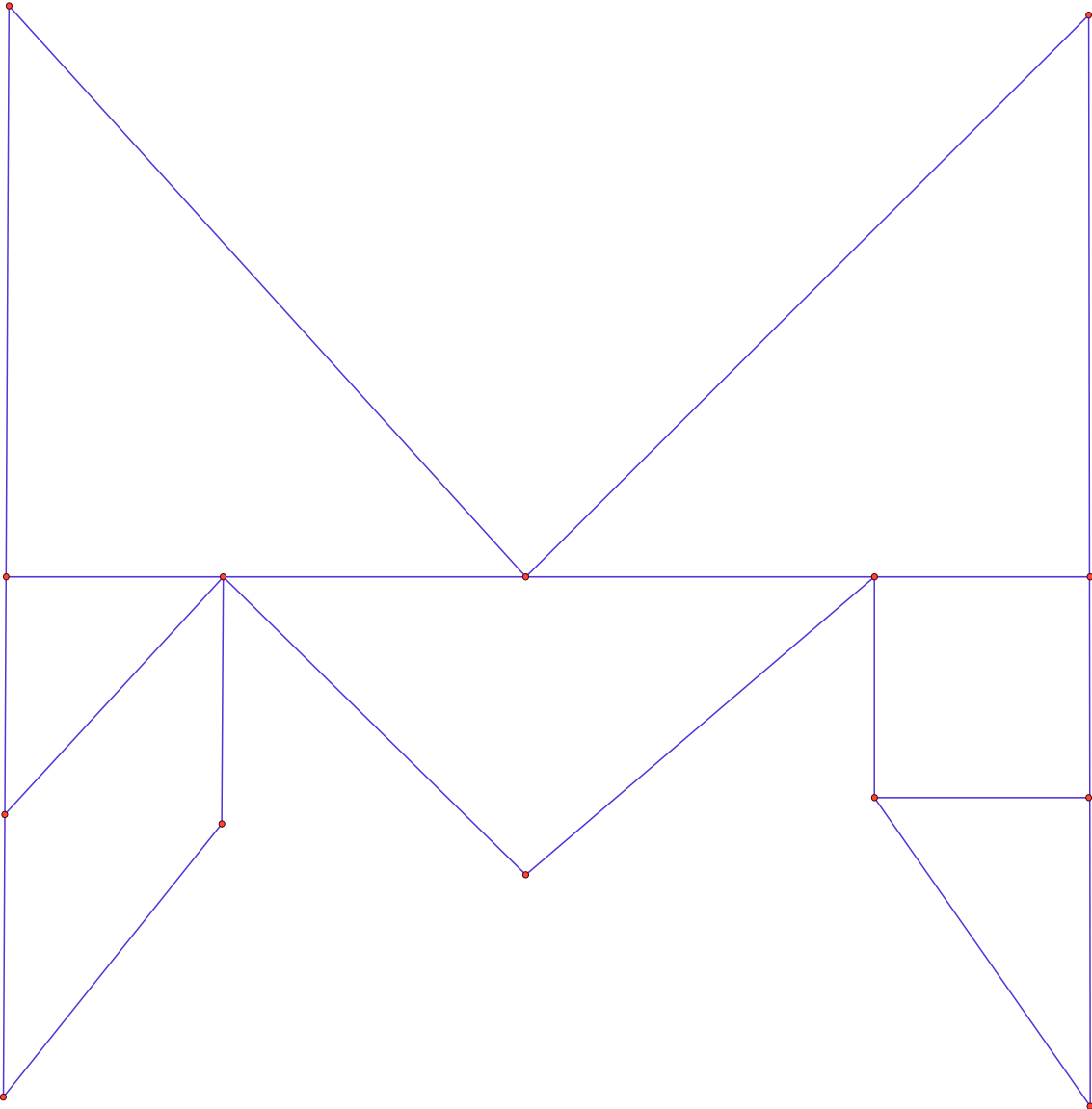
Illustration of Object w/dashed line(s) of symmetry	# of Line(s) of Symmetry

Symmetry and Tangrams Chart

Illustration of Object w/dashed line(s) of symmetry	# of Line(s) of Symmetry
	1
	2
	1
	2
	0
	1
	2

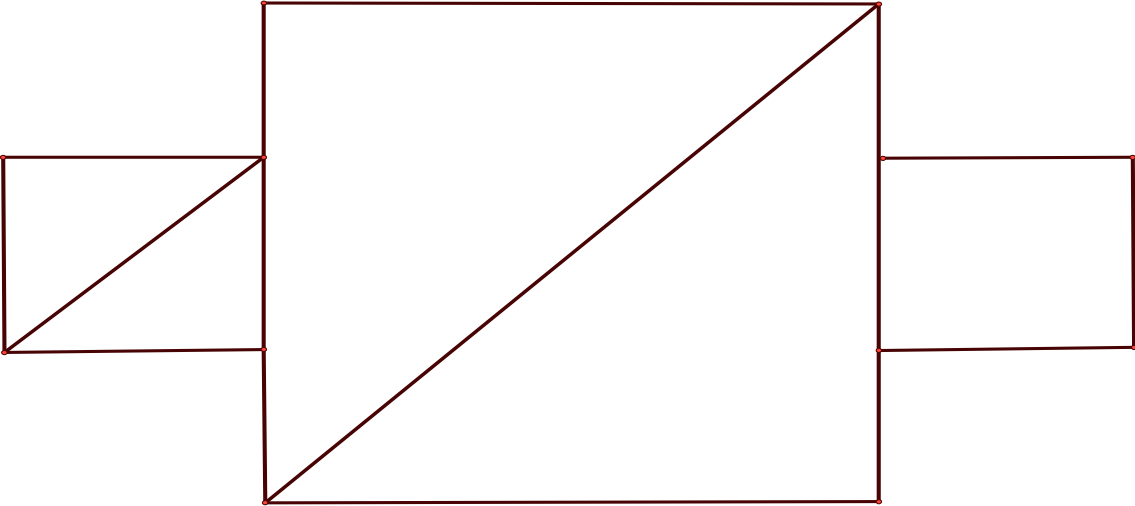
Attachment #3 (transparency for demonstrations)

Object #1

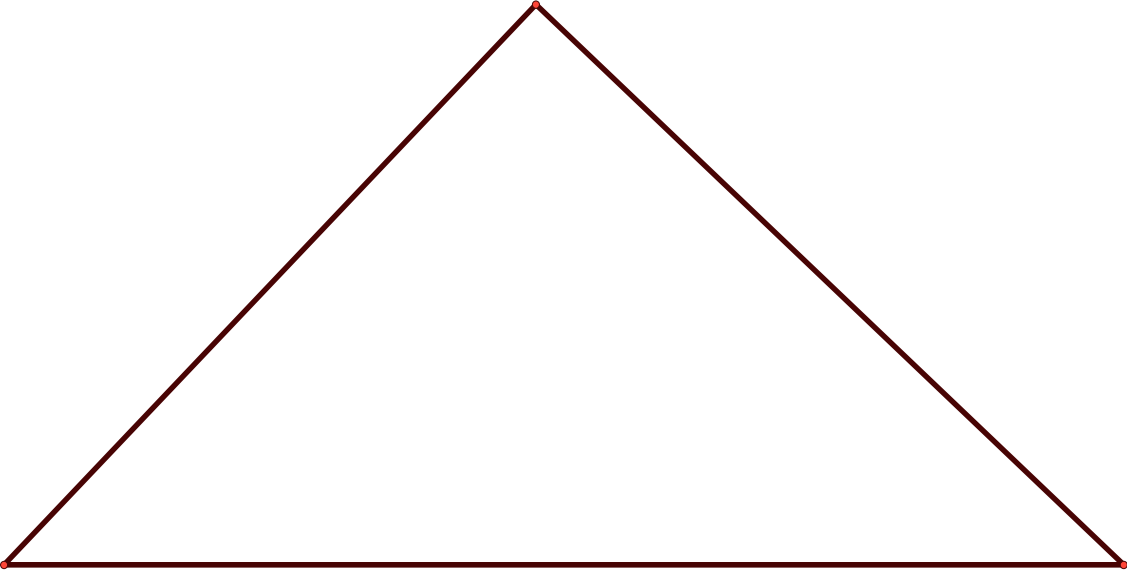


Attachment #3 continued

Object #2

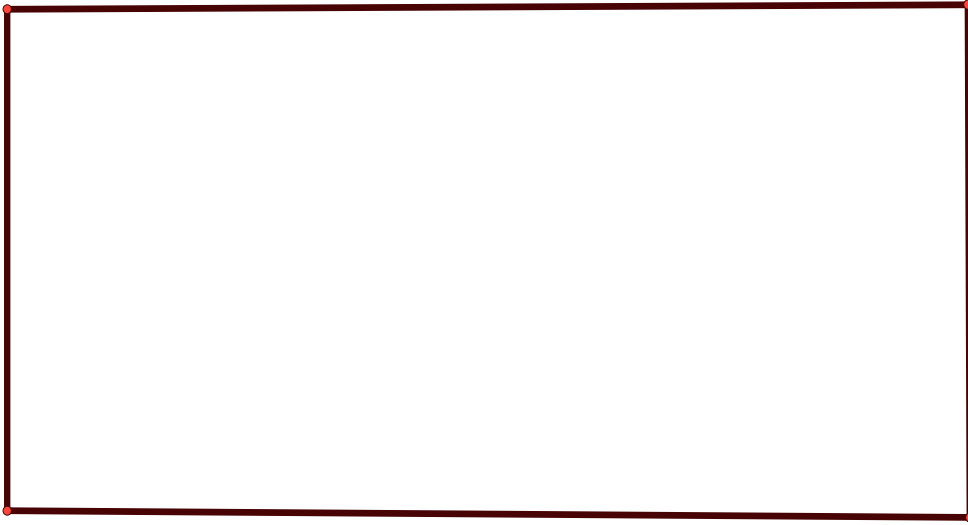


Object #3

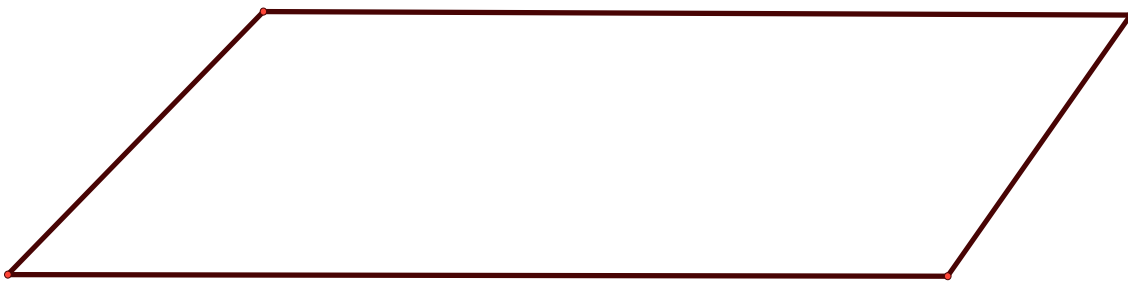


Attachment #3 continued

Object #4



Object #5

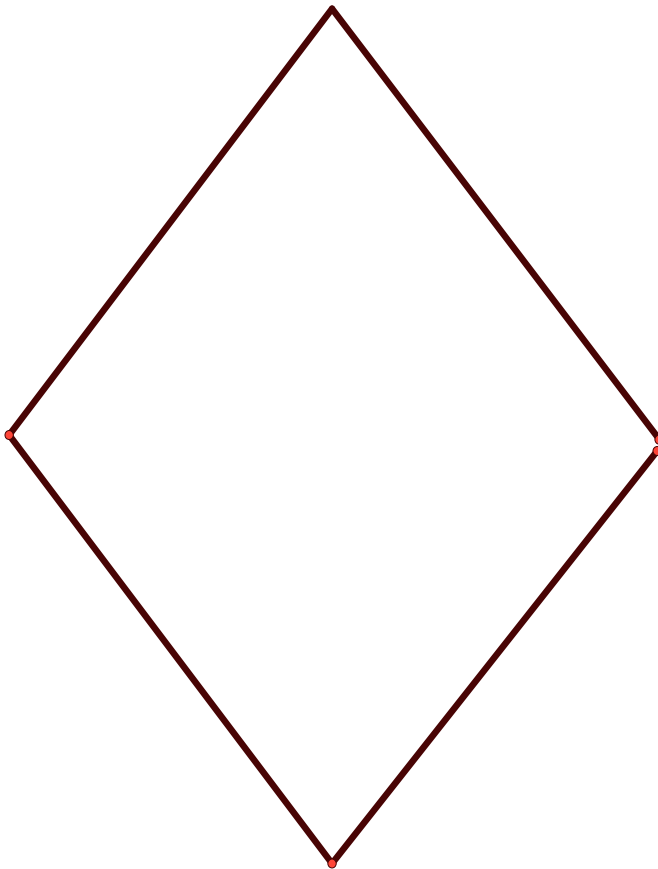


Attachment #3 continued

Object #6

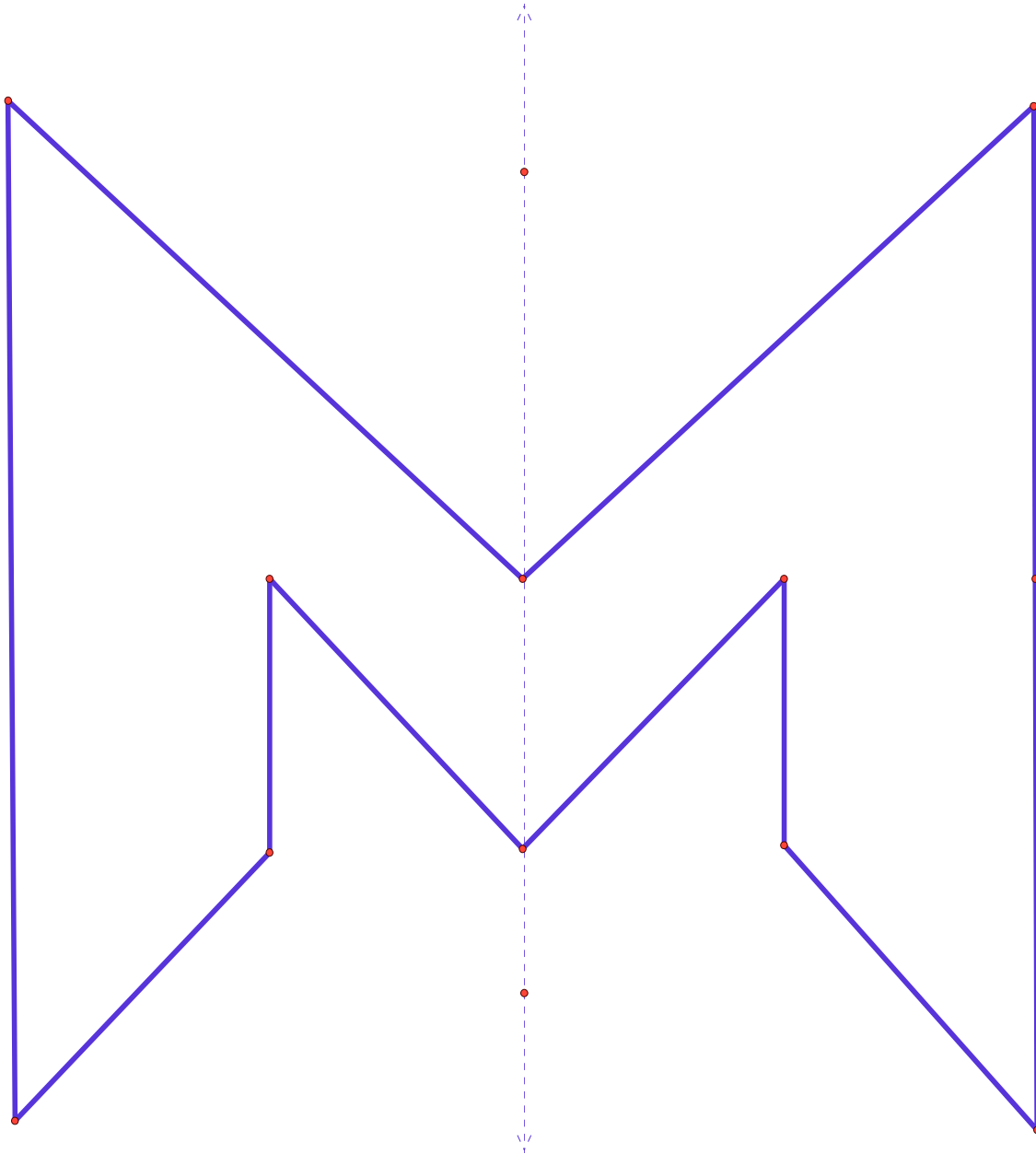


Object #7



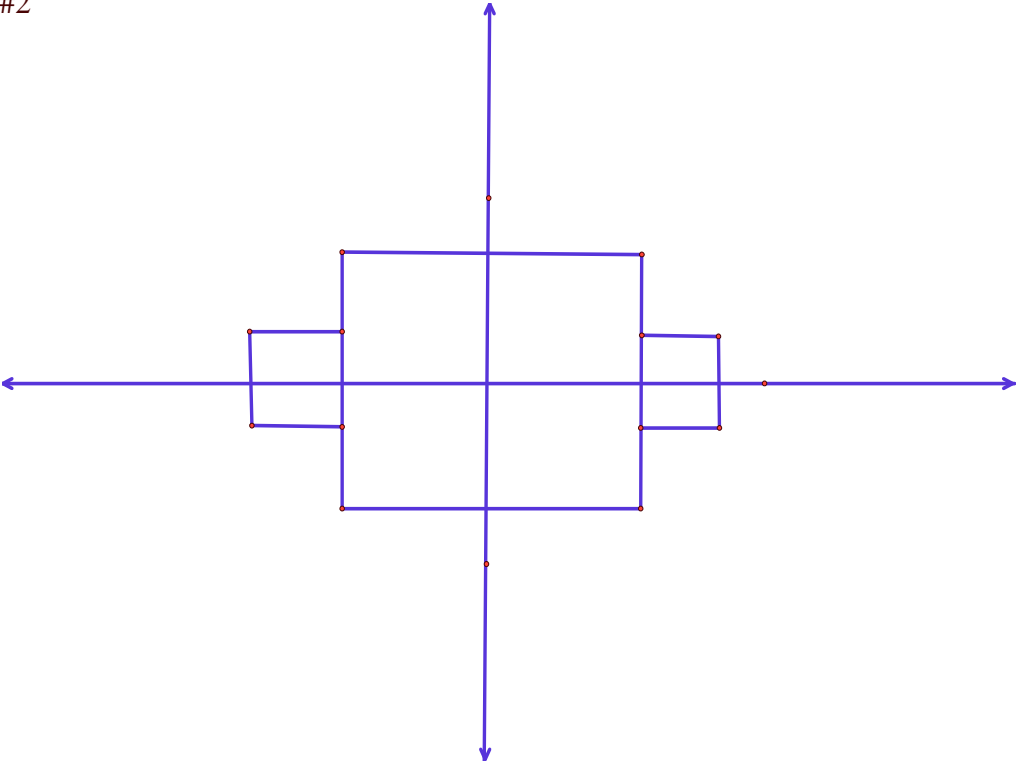
Attachment #4 (solutions to Attachment #3) **Symmetry is based on the outline of each shape only.*

Object #1

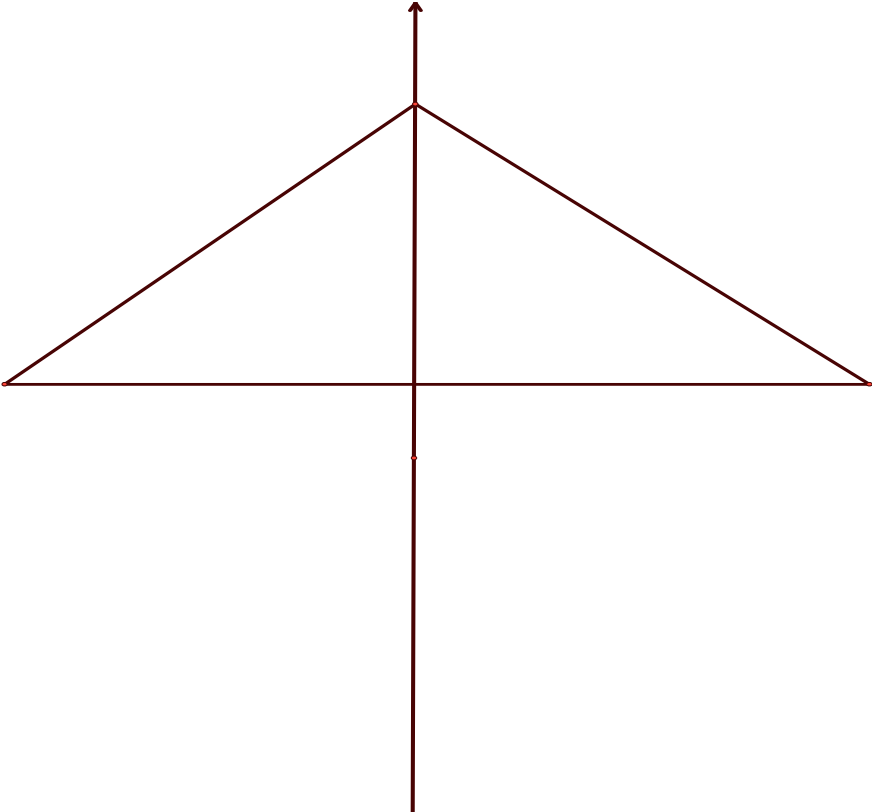


Attachment #4 continued

Object #2

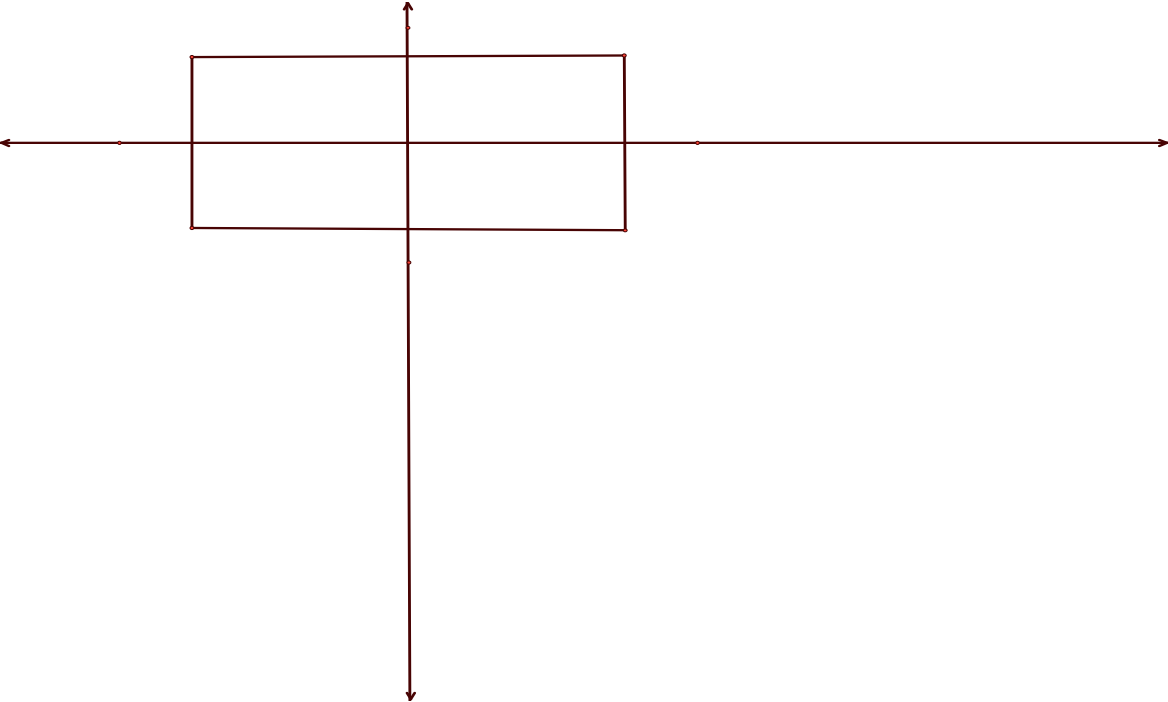


Object #3

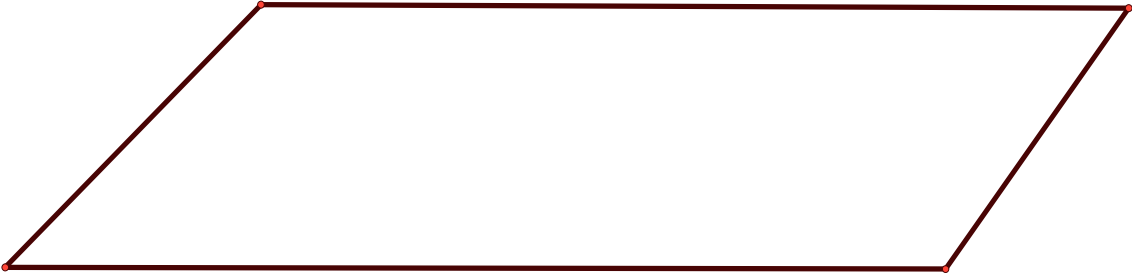


Attachment #4 continued

Object #4

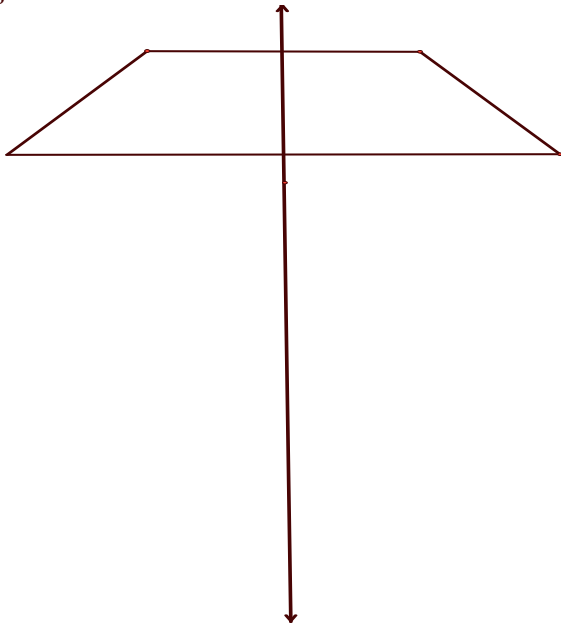


Object #5

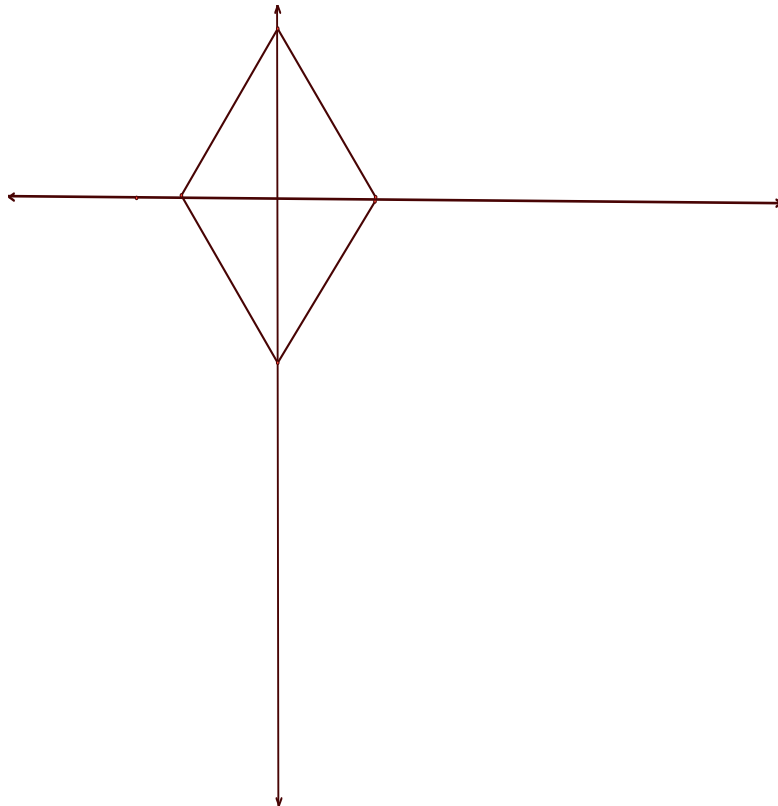


Attachment #4 continued

Object #6



Object #7

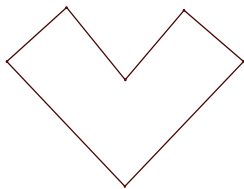


Name _____ Date _____ Section _____

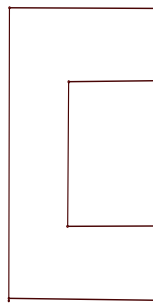
Symmetry

Part 1. Draw the line or lines of symmetry for each figure.

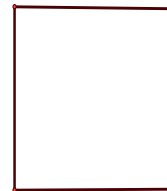
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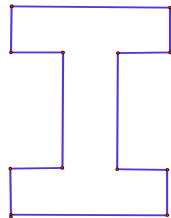
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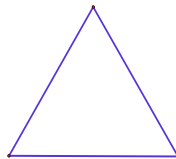
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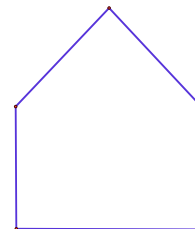
4.



5.



6.

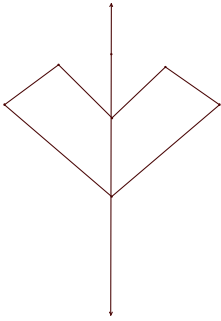


Part 2. Draw a figure that is not shown above that has at least two lines of symmetry.

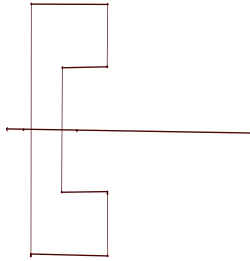
Attachment #5 (teacher copy)

Part 1

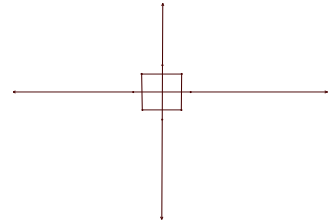
1.



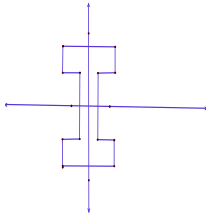
2.



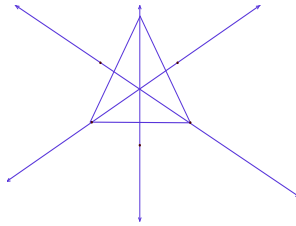
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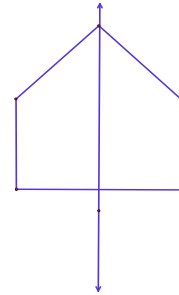
4.



5.



6.



Part 2

Check students' drawings.