

Topic 5: Reflections in the Coordinate Plane

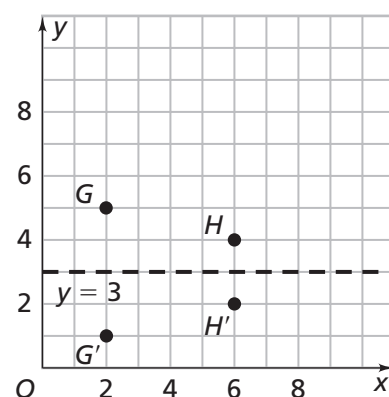
for use after **Shapes and Designs** Investigation 4

A **reflection** is a transformation that flips an image over a line called the **line of reflection**. If you hold your open hand against the edge of a mirror so that your thumb is facing in your direction, every detail of your real hand appears as a reflected image in the mirror. The edge of the mirror is the line of reflection.

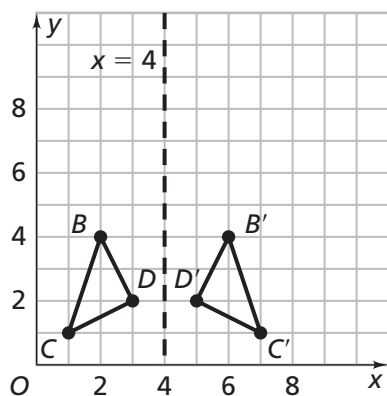
Problem 5.1

- A.** The reflection of two points across the line $y = 3$ is shown. Point G' (gee-prime) is the reflection of point G . Point H' is the reflection of point H .

1. What is the shortest distance from G to the line of reflection?
2. Compare your answer to the distance from G' to the line of reflection.
3. Does the same comparison hold true for H and H' ?
4. Write a rule for reflecting a point across a line.



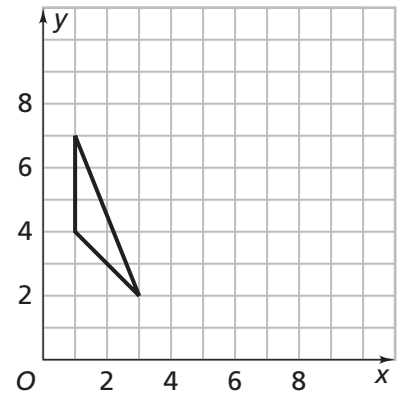
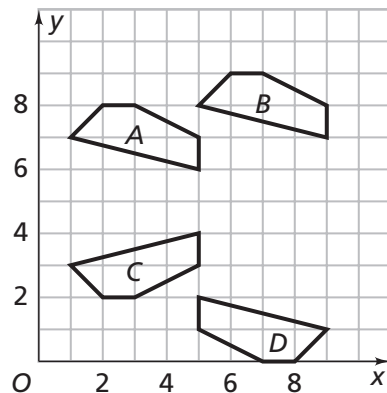
- B.** The reflection of a triangle across the line $x = 4$ is shown below.



1. Fold the graph all the way over along the line $x = 4$. What are you looking at?
2. What do you notice when you compare the distance from vertex B to the line for $x = 3$ with the distance from vertex B' to the same line?
3. Make the same type of comparison for the remaining vertices.
4. How can you expand the rule you wrote in Problem A to cover the reflection of a polygon across a line?

Exercises

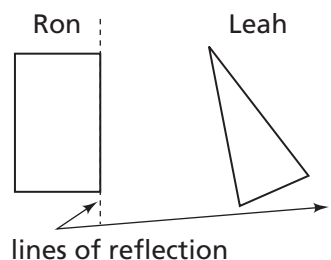
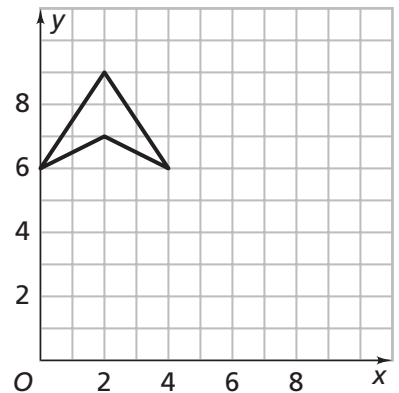
- Copy the figure on graph paper and graph its image after a reflection across the line for $x = 3$.
- Evie was asked to draw three different reflections of figure A. Only one of her reflections is correct.



- Which figure is the reflection?
 - What is the line of reflection?
- Two of the pairs of letters represent a reflection.

JJ JJ }

- Which pair does not represent a reflection?
 - Can any letter be flipped across a line of reflection?
 - Flip your printed name over a line of reflection.
- Tiara reflected the figure at the right and Deena translated it. Their new figures ended up in exactly the same location. Draw Tiara's reflected figure.
 - Ron and Leah wanted to show a reflection over a line by tracing a flat shape then flipping it over the line and tracing it again. Whose reflection will be more difficult to draw?



Topic 5: Reflections in the Coordinate Plane

PACING 1 day

Mathematical Goals

- Identify reflections used to move a polygon from one location to another in the coordinate plane.
- Explain how reflections affect the location of a polygon in the coordinate plane.

Guided Instruction

Once students understand the reflection of a point across a line, as presented in the first problem, the notion of reflecting a figure across a line by reflecting vertices and then connecting them should come fairly easily. Some students may have the mistaken impression that a line of reflection has to pass through at least one line of an original and reflected image so that the two images are touching. Problem B and Exercise 2 provide examples of reflections in which this is not the case.

The main emphasis in the lesson is the reflection of a geometric figure across a horizontal or vertical line in the coordinate plane. Although this lesson restricts itself to the first quadrant, you should use your judgment with regard to presenting examples of reflections across the x - and y -axis. If you do so, remind students to find reflected points simply by counting units between points and the line of reflection.

After Problem 5.1 A ask:

- *How do you think you could reflect a line segment across a line of reflection?* (Reflect the endpoints of the line segment and connect the two reflected points.)

After Problem 5.1 B ask:

- *Does the line of reflection have to be touching a figure and its reflected image?* (No)
- *How far away from a line of reflection can a figure and its reflected image be?* (There is no mathematical limit.)
- *What is the procedure for drawing the reflection of a triangle across a line that runs through the triangle?* (It is the same procedure as for a line of reflection exterior to the triangle: reflect the vertices across the line, then connect the reflected vertices.)

You will find additional work on transformations in the grade 8 unit *Kaleidoscopes, Hubcaps, and Mirrors*.

Vocabulary

- reflection
- line of reflection

Materials

- Labsheet
- 5ACE Exercises

ACE Assignment Guide for Topic 5

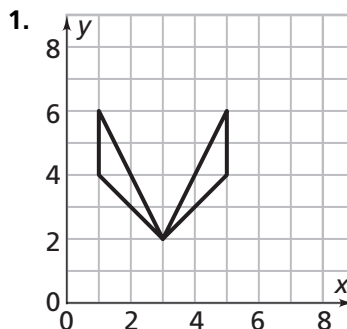
Core 1–5

Answers to Topic 5

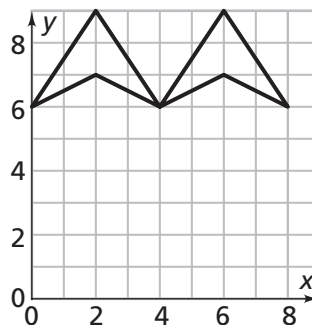
Problem 5.1

- A. 1. 2 units
2. G' is also 2 units from the line of reflection.
3. Yes
4. Answers may vary. Sample: To reflect a point across a line, plot a point on the opposite side of the line that is the same distance from the line as the original point.
- B. 1. You would only see one triangle because the one triangle would be perfectly positioned over the other on.
2. The two distances are the same.
3. Points C and C' are the same distance from the line, as are points D and D' .
4. Answers may vary. Sample: To reflect a polygon across a line, for each vertex plot a point on the opposite side of the line that is the same distance from the line as the original vertex. Connect the plotted points to form the reflected polygon.

Exercises



2. a. C
b. $y = 5$
3. a. (2)
b. yes
c. Check students' work.
4. Answers may vary. Sample:

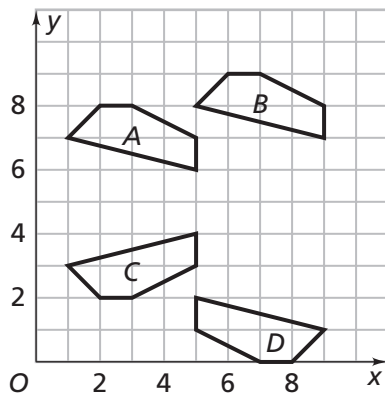


5. It will be more difficult for Leah because Ron's line of reflection is right up against a side of the rectangle, but Leah does not have that guidance, so the triangle could swivel when it is flipped and the vertices of the flipped image will not lie opposite the vertices of the original figure.

Labsheet 5ACE Exercises

Topic 5

1.



4.

