Geometry

Set 1: Transformations

Instruction

Goal: To provide opportunities for students to develop concepts and skills related to understanding transformations

Common Core Standards

Geometry

Understand congruence and similarity using physical models, transparencies, or geometry software.

8.G.1. Verify experimentally the properties of rotations, reflections, and translations:

a. Lines are taken to lines, and line segments to line segments of the same length.

b. Angles are taken to angles of the same measure.

c. Parallel lines are taken to parallel lines.

8.G.3. Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.

Student Activities Overview and Answer Key

Station 1

Students will draw a figure on the coordinate plane. They will then perform a variety of transformations, keeping track of the new coordinates along the way. They use the knowledge they gained to predict the new coordinates of another figure that underwent a transformation.

Answers: Answers will vary; answers will vary; answers will vary; (–2, 1), (–1, 7) and (1, 3)—you need to subtract 3 from the *x*-coordinate

Station 2

At this station, students practice translations by leading a dot through a maze. Then need to explain each translation and give the new coordinates. They then describe their strategies.

Answers: New coordinates—(1, –5), (6, –5), (6, –9), (2, –9), (2, –14), (11, –14), (11, –10), (14, –10); answers will vary

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Station 3

Students draw a figure on the coordinate plane. They then perform dilations and draw how that affects their figures. They also state the coordinates of their new figures.

Answers: Answers may vary; answers may vary; answers may vary; you multiply the coordinates by whatever the dilation factor is

Station 4

At this station, students look at reflection. They reflect two images and then have the opportunity to create their own. Finally, they reflect on an effective strategy for finding the coordinates of a reflection.

Answers: Answers will vary—possibly counting away from the *y*-axis

Materials List/Setup

Station 1 enough rulers for all group members

Station 2 none

Station 3 none

Station 4 none

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Discussion Guide

To support students in reflecting on the activities and to gather some formative information about student learning, use the following prompts to facilitate a class discussion to "debrief" the station activities.

Prompts/Questions

1. What is an example of a real-life situation where we use dilations?
2. How does a reflection over the *x*-axis affect the coordinates of a figure?
3. What is an example of a reflection in real-life?
4. Is a translation more like doing the Electric Slide or being on a merry-go-round? Explain.

Think, Pair, Share

Have students jot down their own responses to questions, then discuss with a partner (who was not in their station group), and then discuss as a whole class.

Suggested Appropriate Responses

1. many possibilities—pictures
2. It changes the sign of the *y*-coordinates
3. many possibilities—the right and left hand
4. Electric Slide—slide is in the name

Possible Misunderstandings/Mistakes

- Reflecting over the wrong line
- Confusing dilation—only changing one coordinate or dividing instead of multiplying by the factor of dilation
- Having trouble with negative coordinates

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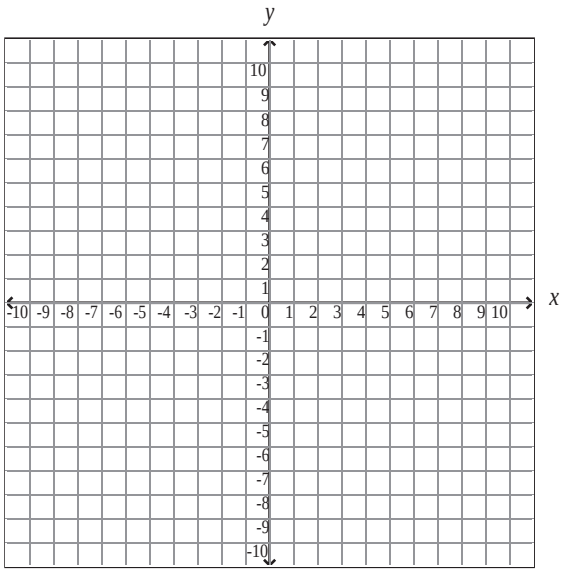
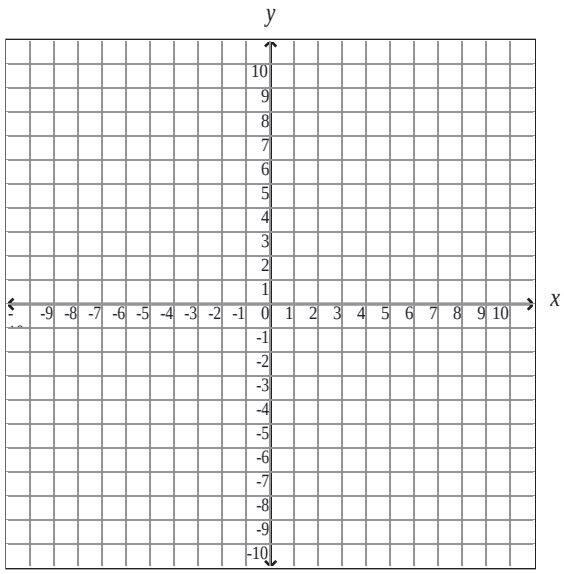
Station 1

At this station, you will be performing various transformations. As a group, agree on what you'll do.

In the coordinate plane below, draw a simple figure. Try to go through points when possible. You must pass through at least five whole number points and label them on your graph (for example, (3, 1), and so on).



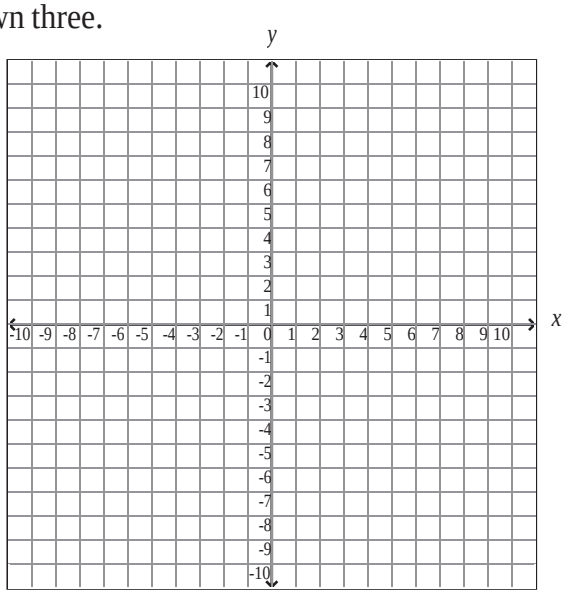
Reflect your figure over the *y*-axis.



What are the new coordinates? Did everyone come up with the same coordinates? Why or why not?

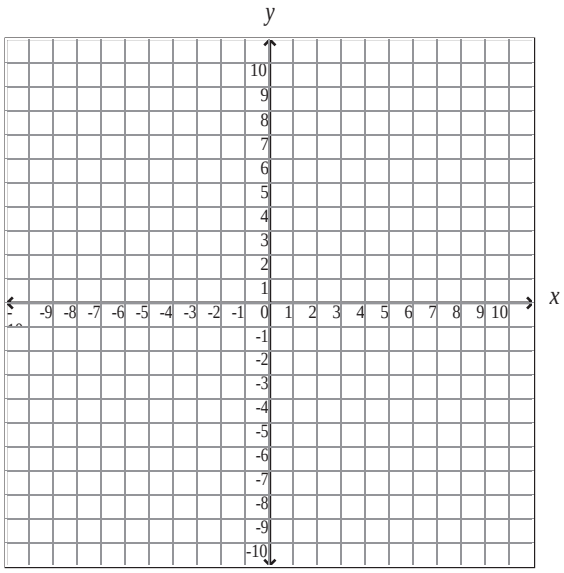
continued

Now move your figure down three.



What are the new coordinates? Did everyone get the same coordinates? Why or why not?

Finally, rotate your figure 180 degrees.



What are the new coordinates? Did everyone get the same coordinates? Why or why not?

If there was a triangle with coordinates of (1, 1), (2, 7) and (4, 3), and you wanted to shift it three units to the left, what would the new coordinates be? Explain how you arrived at your answer.

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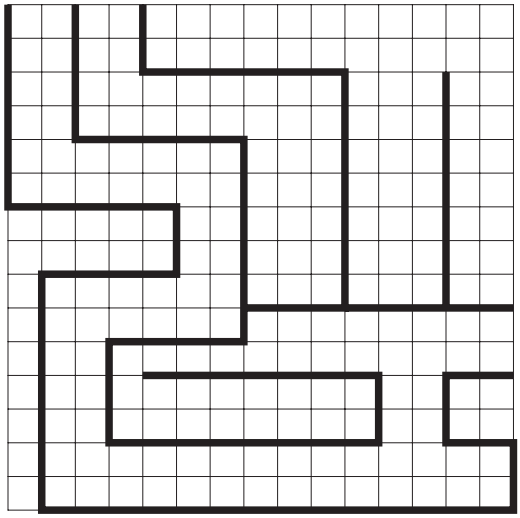
Station 2

At this station, you will lead a dot through a maze by explaining the necessary translations (e.g., slides, flips).

Below is a maze. Imagine a dot at the beginning. Your group's goal is to get to the bottom right where there is a break in the graph. Imagine that the top left corner is (0, 0).



Discuss the steps. In the table below, list the translation in words and the coordinates of the new point where the dot will be after each move.

Turn	Translation in words	New coordinates
1		
2		
3		
4		
5		
6		
7		
8		

What were your strategies for going through this maze? _____

_____

_____

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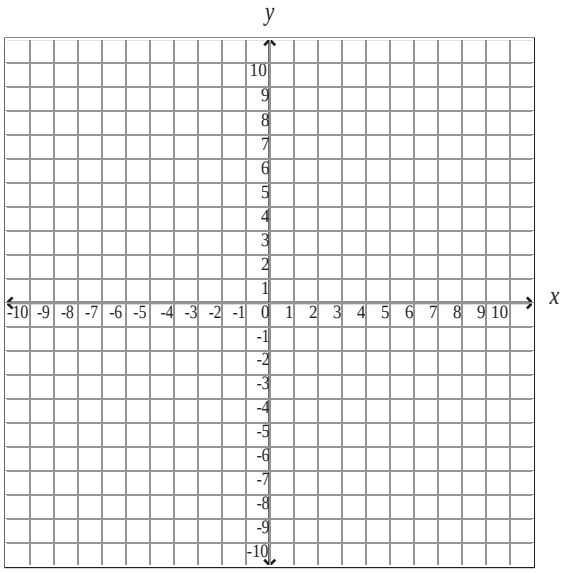
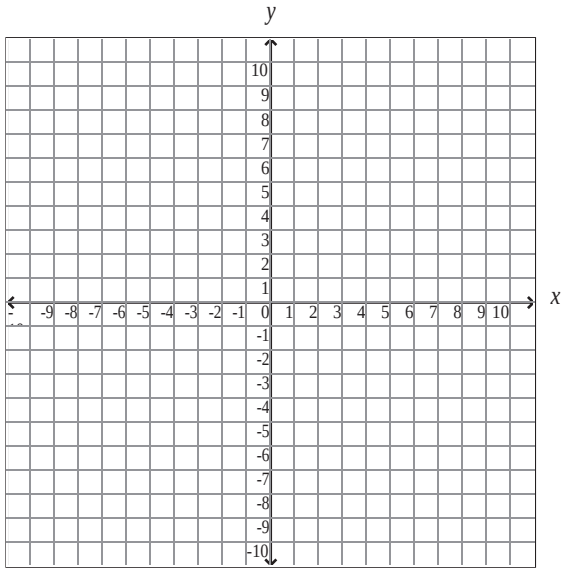
Station 3

Discuss as a group, and agree on a simple figure to draw on the coordinate plane below. It needs to intersect at least five whole number pairs of coordinates.



What are your coordinates? _____

Dilate your figure by a factor of two.



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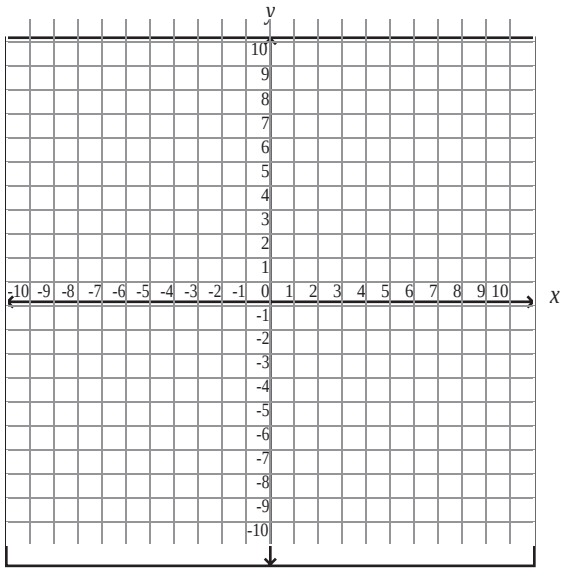
Discuss with your group. What are your new coordinates? Does everyone agree? Why or why not?

_____

_____

_____

Dilate your original figure by a factor of $\frac{1}{2}$.



Discuss with your group. What are your new coordinates? Does everyone agree? Why or why not?

_____

_____

_____

How does dilation affect the coordinates? _____

_____

_____

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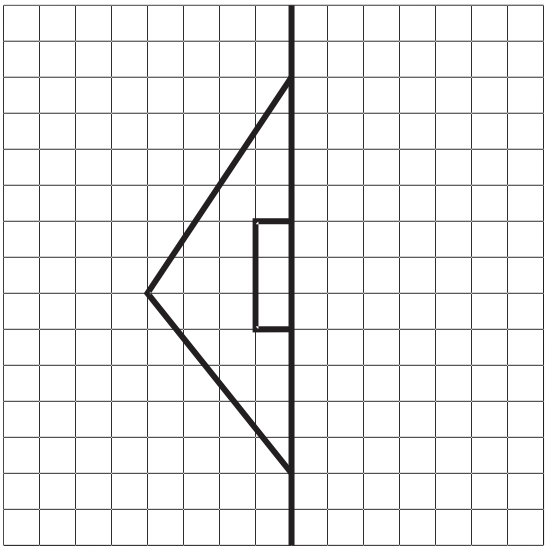
Station 4

At this station, you will find a ruler. You will use this to create various reflections.

Look at the two figures below. Draw a reflection across the *y*-axis.



Create a drawing on the grid below. Also draw the reflection.

What was your strategy for finding the reflections? Do all your reflections look the same? Why or why not?