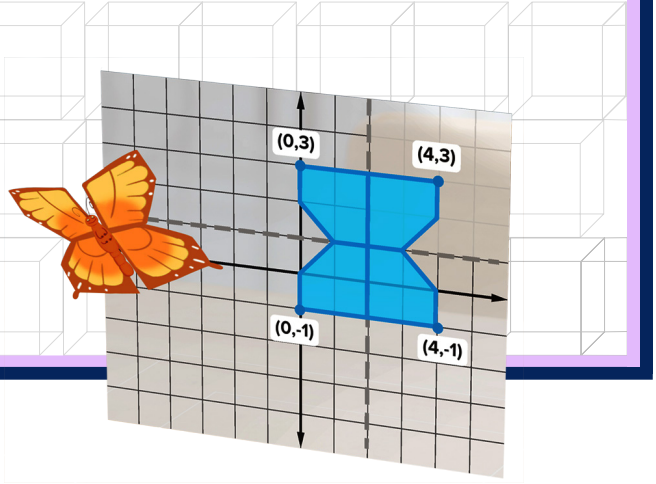
Mc Graw Hill AR



Reflections

Overview

In this activity, students will explore lines of reflection in the augmented reality environment. They will manipulate the line of reflection and observe its impact on the reflected image.

Objectives

Upon completion of the activity, students will be able to identify the coordinates of shapes which are reflected across a line of reflection.

Launch

Scanning The device needs a variety of perspective information to understand the space.

- Slowly move the camera throughout the space.
- View surfaces at an angle.
- Aim the camera at multiple points throughout the space.

Exploration

- Move the phone closer in to increase the size of the objects in AR.
- Move the phone around the objects to view them from different angles.
- Touch the screen to select and drag objects.

Environment Ideal spaces for AR should feature the following:

- a flat open space
- a surface with non-patterned visual texture and contrast
- a matte or minimally reflective surface
- a static environment, where nothing in the space is in motion
- a well-lit space, where detail is visible in the darkest and brightest parts of the space

Duration of Activity

15-20 minutes

Materials

- Smartphone or tablet with the McGraw Hill AR Application installed,
- flat, non-patterned surface

Standards

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

verizon | Mc Graw Hill

During the Activity

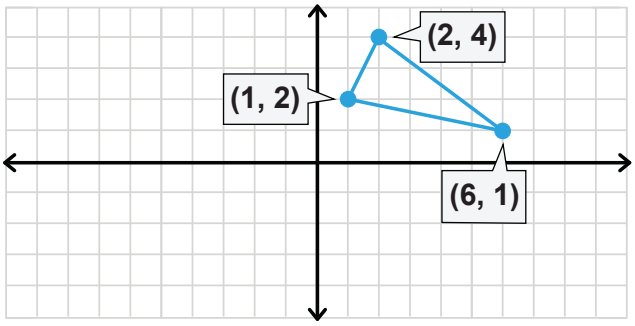
Teacher Tips

- Make sure students understand that the line of symmetry is equidistant from each point and its corresponding reflection point.
- Point out the relationship between the *x*-coordinates of the corresponding reflection points and the *x*-coordinate of the vertical line of reflection.
- Discuss how a reflection across both axes impacts the coordinates and shapes.

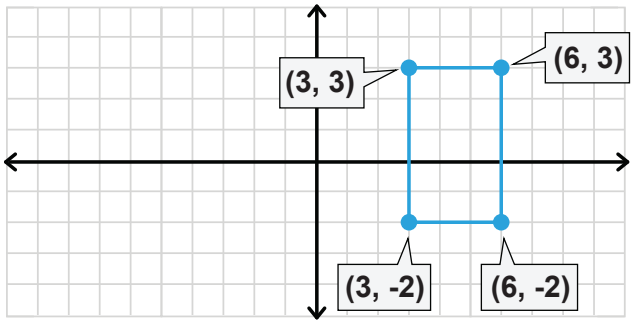
Evaluate

- Students will be presented with five randomly selected exercises from the following exercise set.

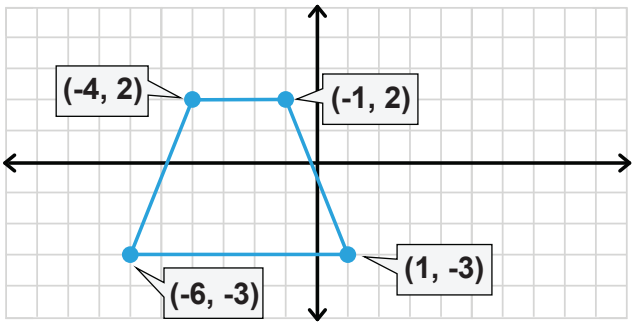
Identify the coordinates of the reflection of the triangle across the x-axis.



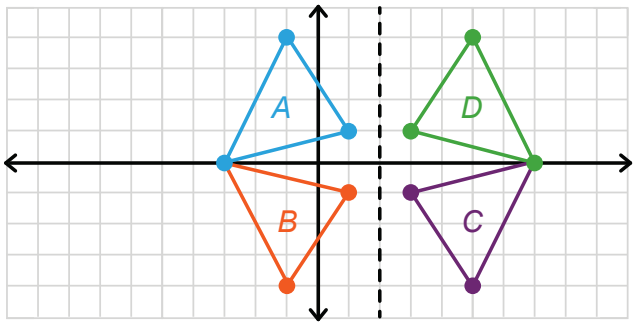
Identify the coordinates of the reflection of the rectangle across the y-axis.



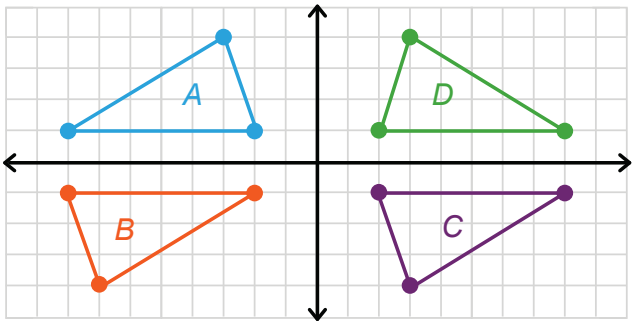
Identify the coordinates of the reflection of the trapezoid across the y-axis.



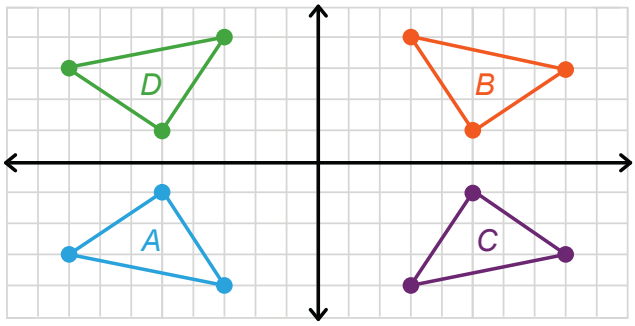
Identify the reflection of Triangle D across the line x = 2.



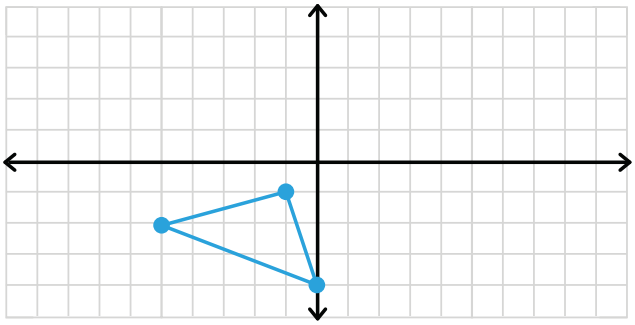
Identify the reflection of Triangle D across the x-axis.

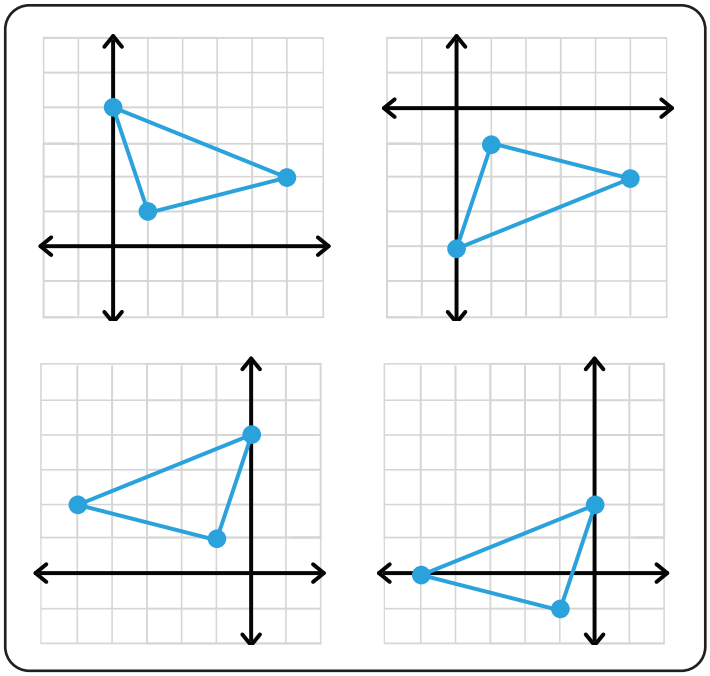


Identify the reflection of Triangle D across the y-axis.

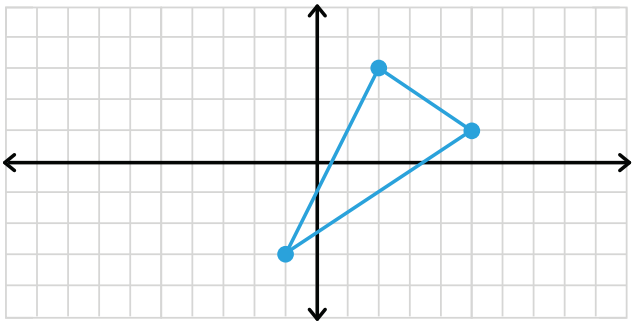


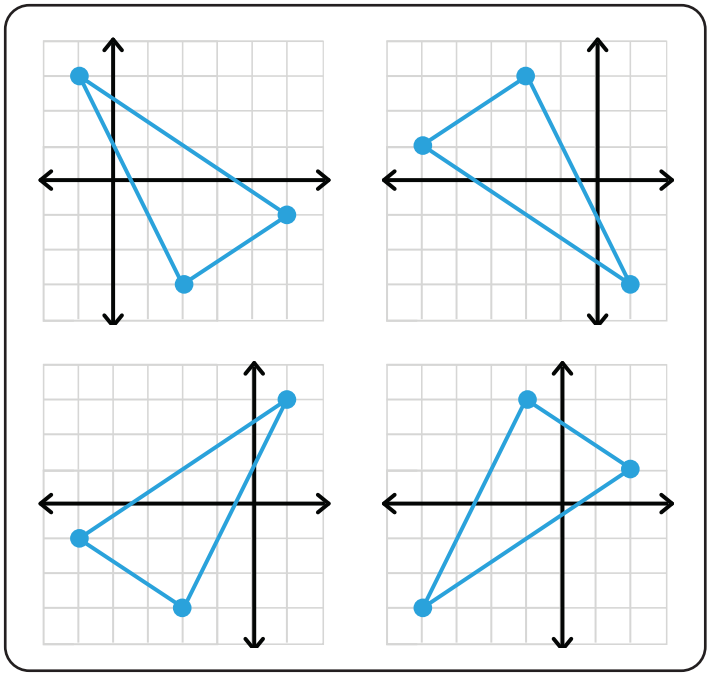
Identify the coordinates of the reflection of the triangle across the x-axis.





Identify the reflection of this triangle across the y-axis.





Triangle *ABC* has coordinates *A* (-2, 0), *B* (3, 1), *C* (1, 6).
Identify the coordinates of the reflection of *ABC* across the line $x = 4$.

Triangle *ABC* has coordinates *A* (5, 5), *B* (9, 1), *C* (2, 7).
Identify the coordinates of the reflection of *ABC* across the line $y = 3$.

Triangle *ABC* has coordinates *A* (-3, 4), *B* (-6, 5), *C* (-8, 2).
Identify the coordinates of the reflection of *ABC* across the *y*-axis.

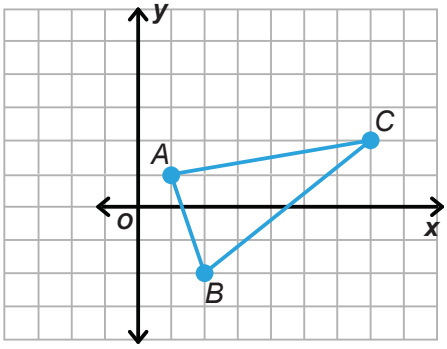
Triangle *ABC* has coordinates *A* (8, 4), *B* (3, 1), *C* (1, 6).
Identify the coordinates of the reflection of *ABC* across the *x*-axis.

After the Activity

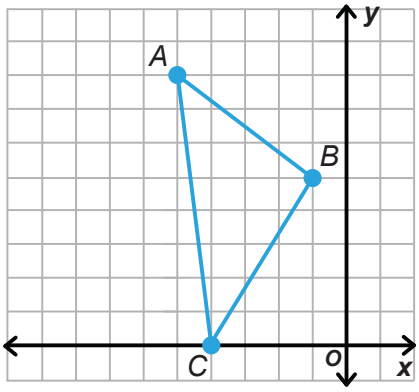
Additional Exercises

These are additional exercises that can be assigned after the activity.

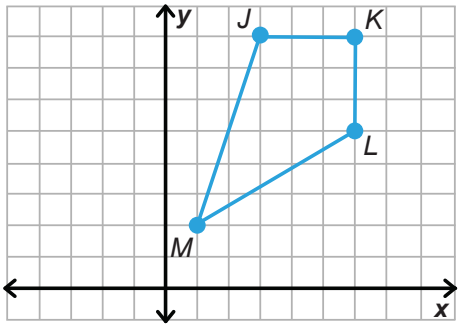
1. Graph the reflection across the line $x = 3$.



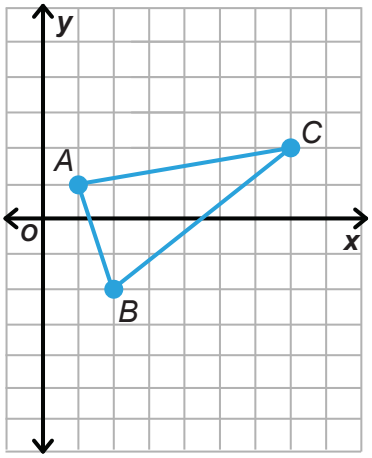
2. Graph the reflection across the line $y = 4$.



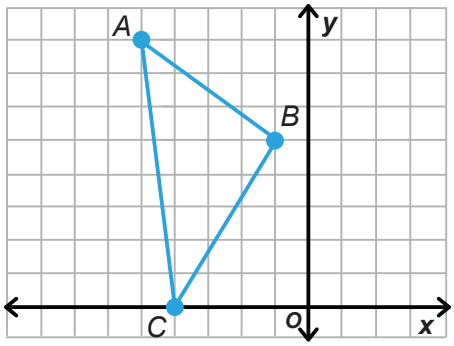
3. Graph the reflection across the line $x = 1$.



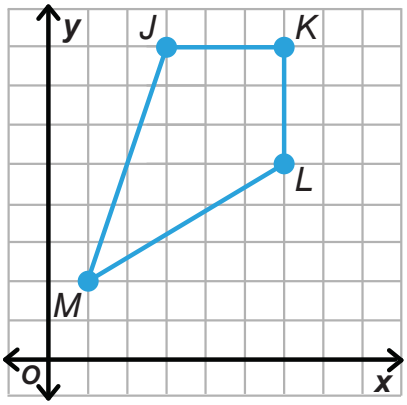
4. Graph the reflection across the line $y = -2$.



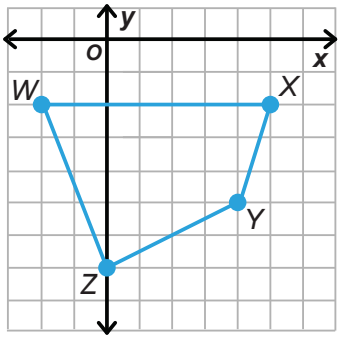
5. Graph the reflection across the line $x = -1$.



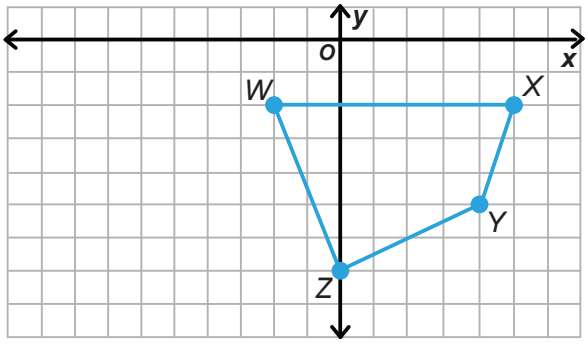
6. Graph the reflection across the line $y = 4$



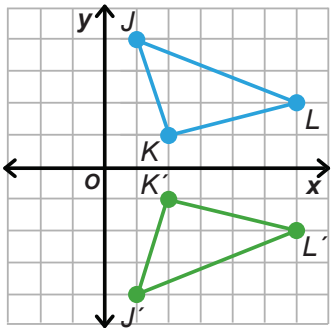
7. Graph the reflection across the line $y = -4$.



8. Graph the reflection across the line $x = -2$.

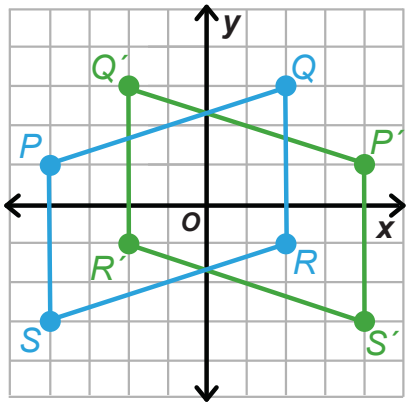


9. Identify the line of reflection in the graph.



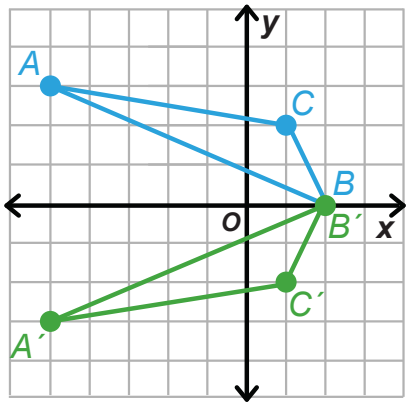
y = 0

10. Identify the line of reflection in the graph.



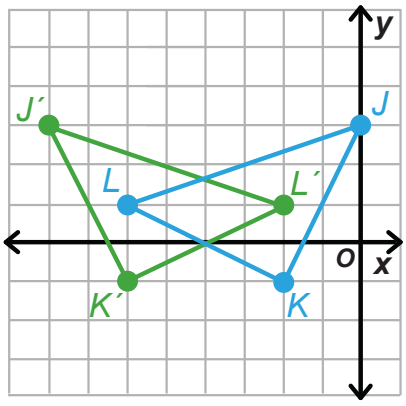
***x* = 0**

11. Identify the line of reflection in the graph.



***y* = 0**

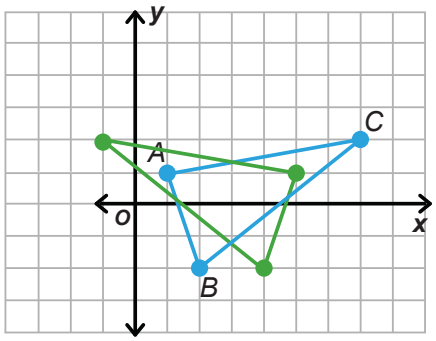
12. Identify the line of reflection in the graph.



***x* = 4**

Answers for 1-8:

1.



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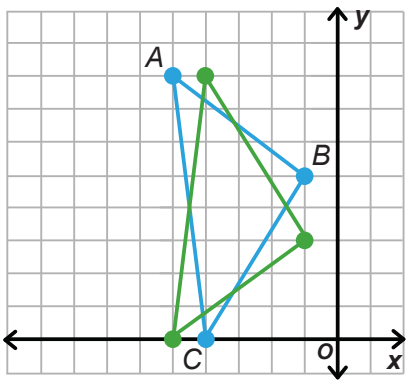

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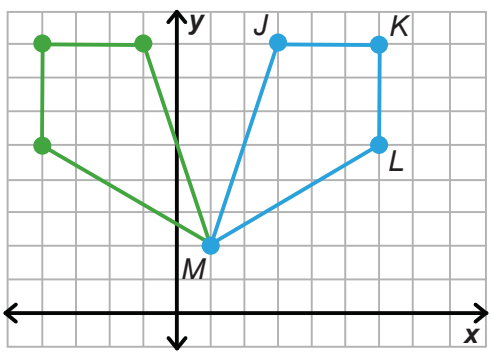

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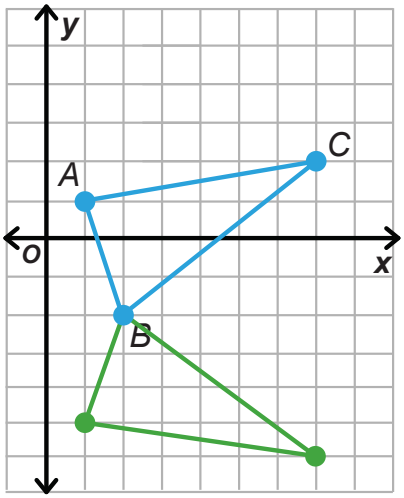

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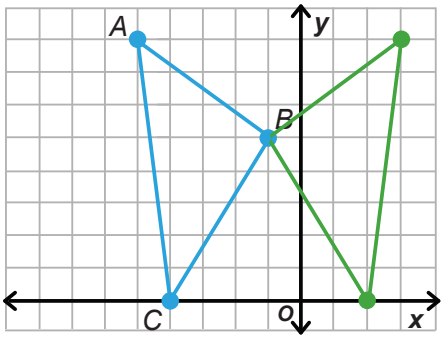
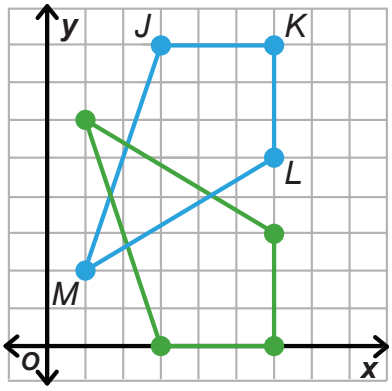
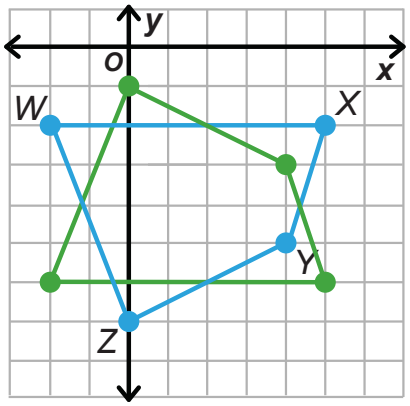


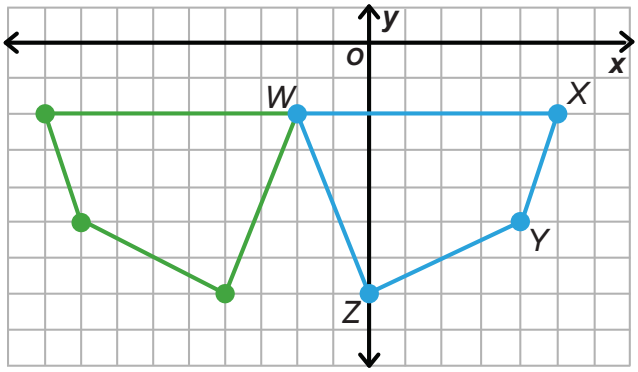
6.



7.



8.

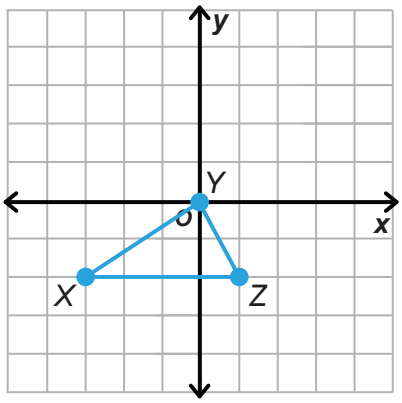


Extension

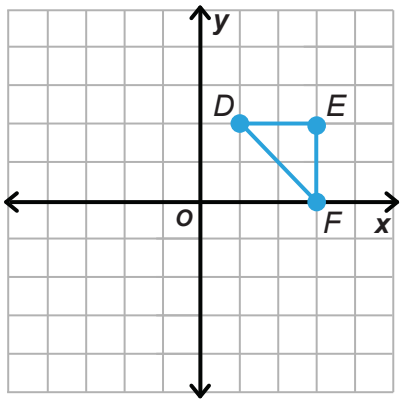
These are more challenging exercises to extend the activity.

Reflect each image across both the *x*- and *y*-axis.

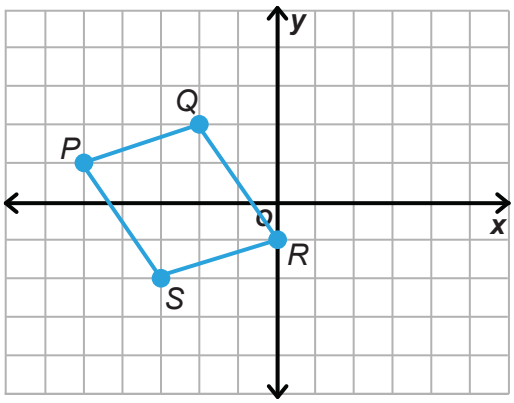
1.



2.



3.

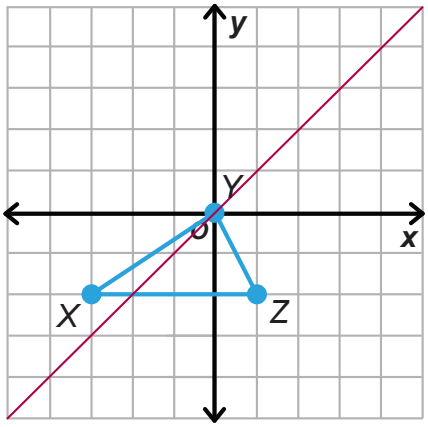


4. Summarize the relationship between the coordinates of an image and its reflected image across both the *x*- and *y*-axis.

Sample answer: When an image is reflected across both the *x*- and *y*-axis, the *x*- and *y*-coordinates are negated. $(x, y) \rightarrow (-x, -y)$

Reflect each image across the line $y = x$.

5.



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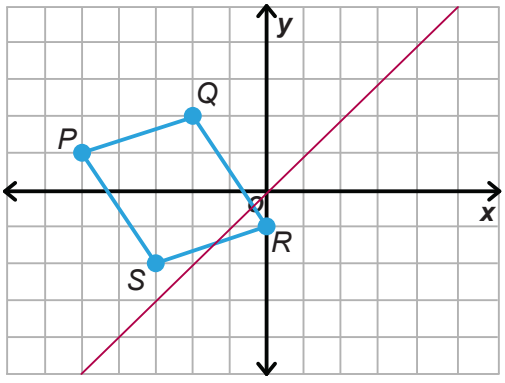

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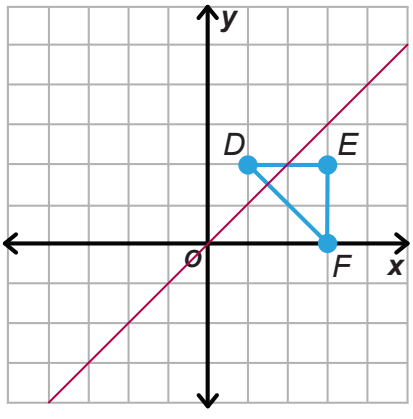

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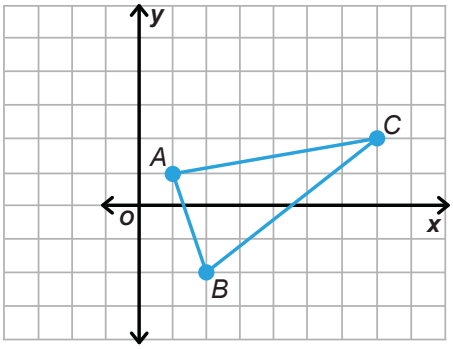
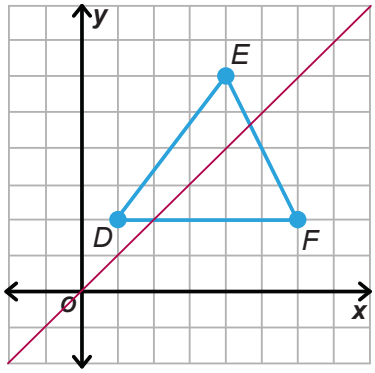
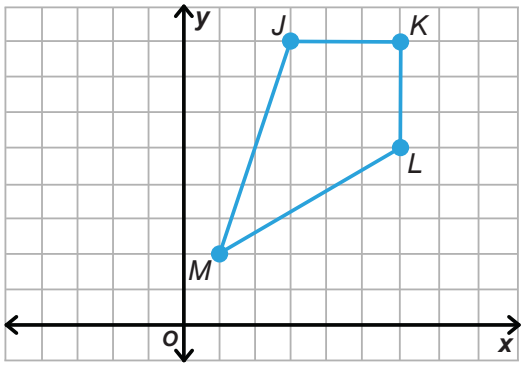


9.



10.

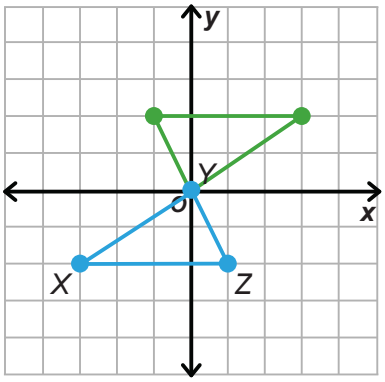


11. Summarize the relationship between the coordinates of an image and its reflected image across the line $y = x$.

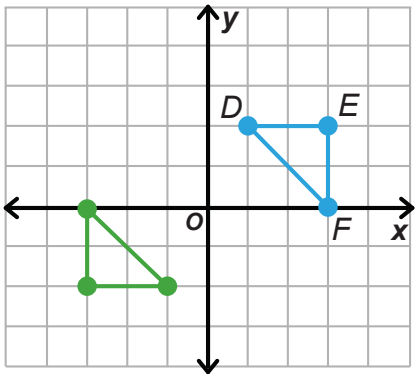
Sample answer: When an image is reflected across the line $y = x$, the x- and y-coordinates are switched. $(x, y) \rightarrow (y, x)$

Answer Graphs:

1.



2.



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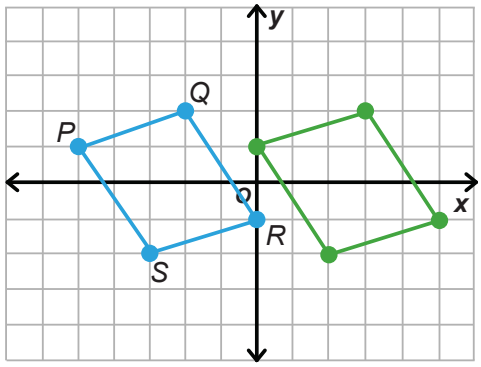

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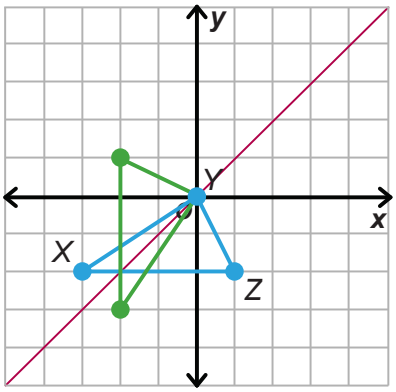
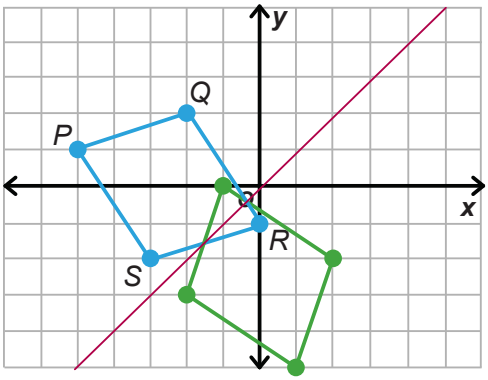
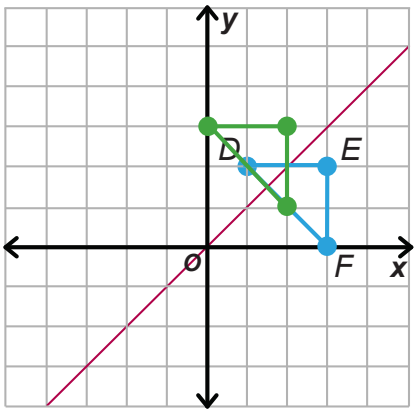


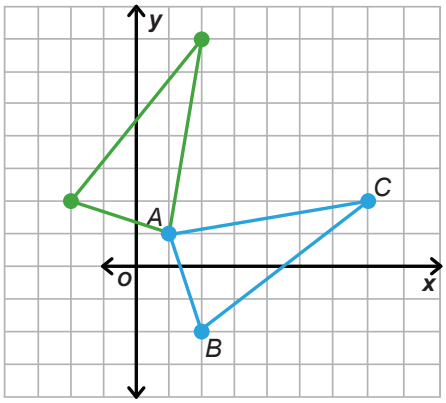
5.



6.



8.



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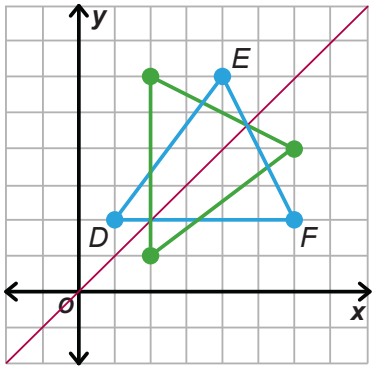
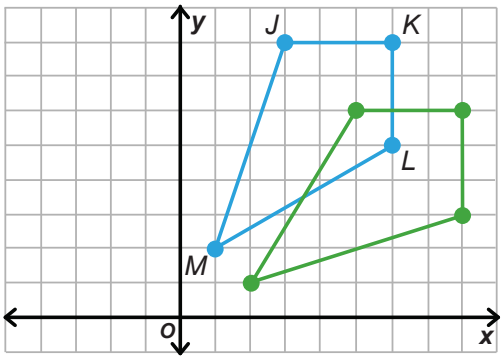


10.

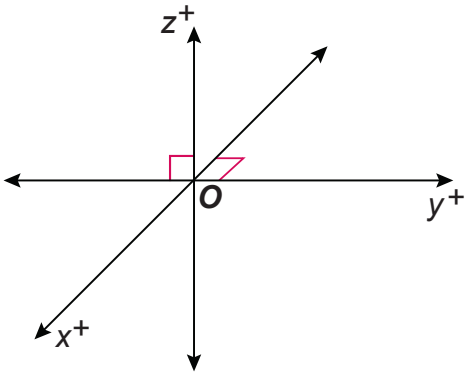


Enrichment

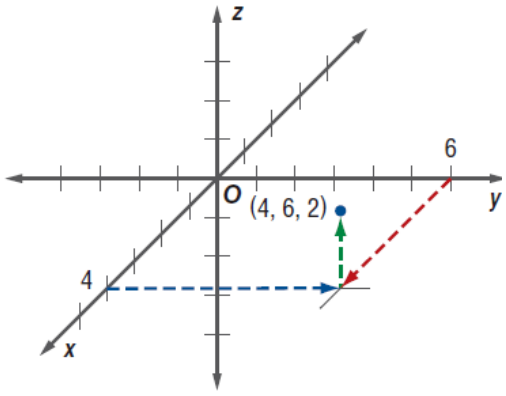
Enrichment content beyond what is learned in the activity

A three-dimensional coordinate system is used to represent a point in space.

A third axis, called the ***z*-axis**, goes through the origin and is perpendicular to the *x*- and *y*-axis. A point in space is represented by an ordered triple of real numbers (*x*, *y*, *z*).



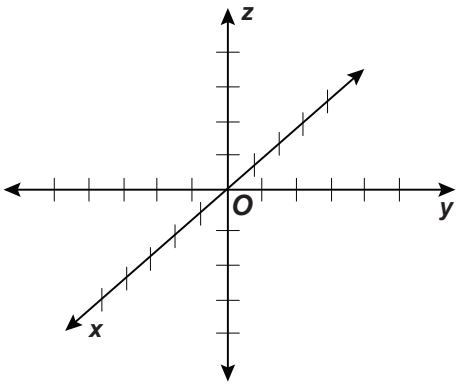
To plot a point in space, locate the point (*x*, *y*), then move up or down parallel to the *z*-axis according to the directed distance given by *z*.



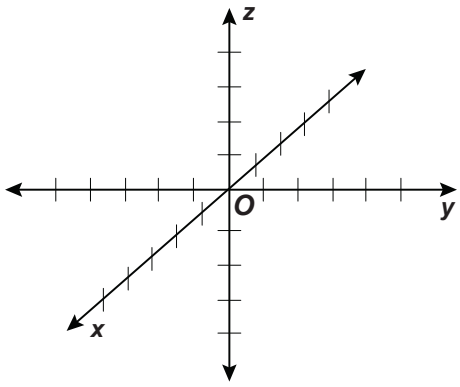
Points are reflected across *planes* in three-dimensional space. When reflecting across the *xy*-plane, negate the *z*-coordinate.

Plot each point in the three-dimensional coordinate system. Then plot the designated reflection.

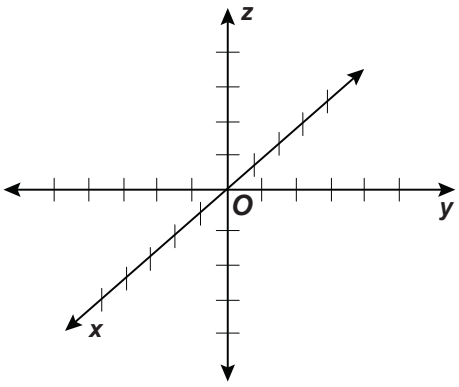
1. (-3, -4, 2)
reflected across the *yz*-plane.



2. (3, 2, -3)
reflected across the *xz*-plane.



3. (5, -4, -1)
reflected across the *xy*-plane.

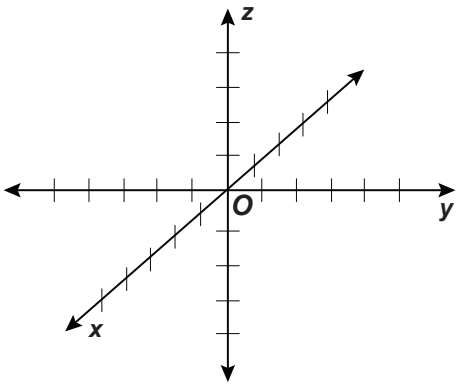


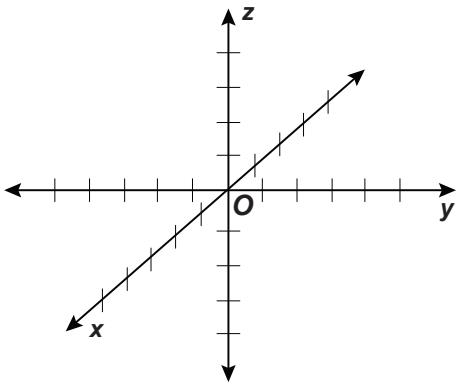
Plot each shape in the three-dimensional coordinate system.

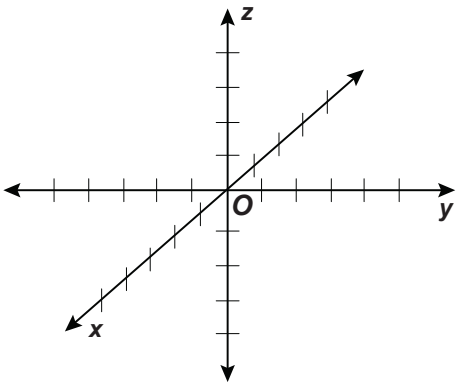
4. *A* (0, 0, 0); *B* (3, 0, 0); *C* (0, 3, 0); *D* (0, 0, 3); *E* (3, 3, 0); *F* (0, 3, 3); *G* (3, 0, 3); *H* (3, 3, 3)

5. *A* (0, 0, 0); *B* (4, 0 0); *C* (4, 0, 4); *D* (0, 0, 4); *E* (2, 2, 4); *F* (2, 2, 0)

6. *A* (0, 0, 0); *B* (0, 0, 4); *C* (5, 0, 0); *D* (5, 0, 4); *E* (0, 3, 0); *F* (0, 3, 4)







Reflect the shapes in Problems 4-6 across each designated plane.

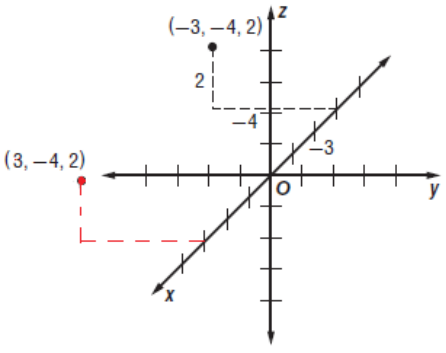
7. Reflect the shape in Problem #4 across the *yz*-plane.

8. Reflect the shape in Problem #5 across the *xz*-plane.

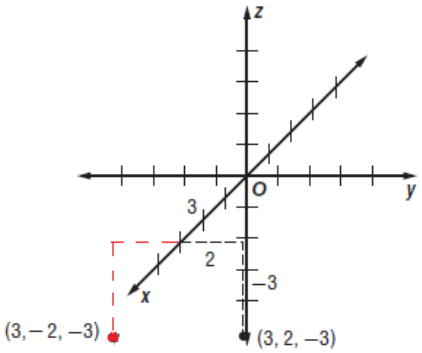
9. Reflect the shape in Problem #6 across the *yz*-plane.

Answers

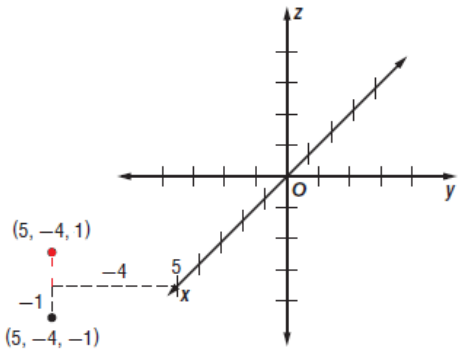
1.



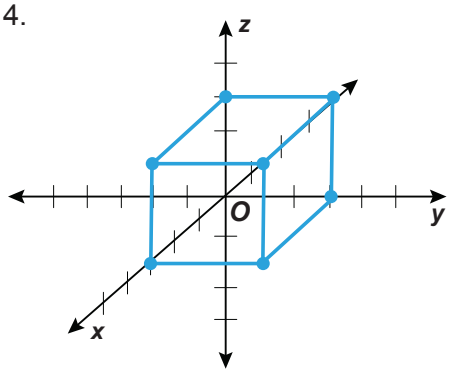
2.



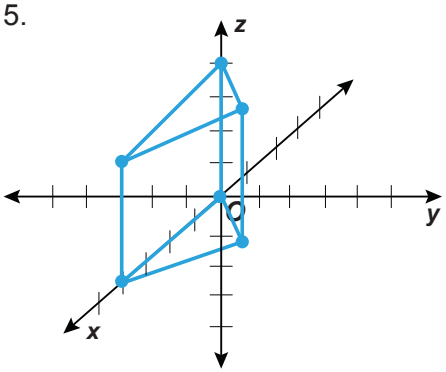
3.



4.



5.



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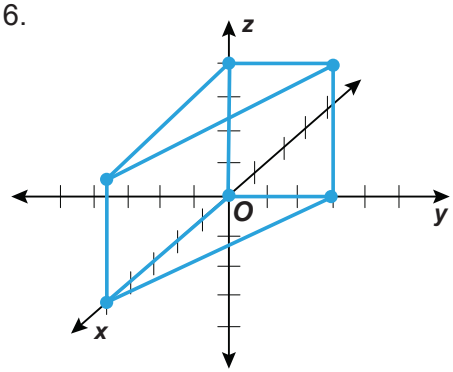
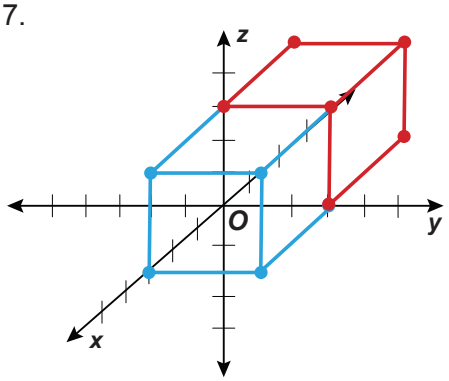
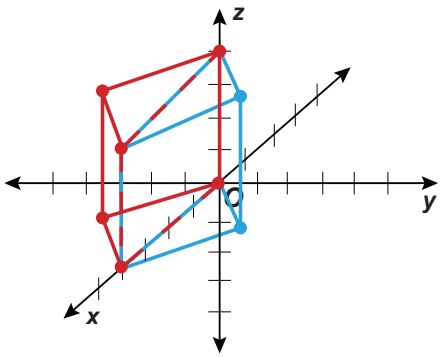


7.



8.



9.