



Math Virtual Learning

Grade 8

Geometric Transformations: Reflections

April 16, 2020



Math 8

Lesson: April 16, 2020

Objective/Learning Target:

I can describe the effect of reflections of two-dimensional figures using coordinates.

Warm Up

Reflections are everywhere ... in mirrors, glass, and here in a lake.
... what do you notice ?



Every point is the **same distance from the central line !**

... and ...

The reflection has **the same size** as the original image

Can you come up with a real-world example? Where have you seen reflections in your life? Can you find one right now around you?

Warm Up *continued*

Some more real life examples of translations are:



- the symmetry of your face
- the wings of a butterfly
- an airplane
- flipping images on computers

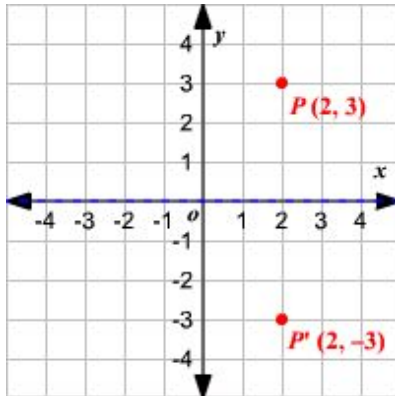
Define: Reflection

Reflections are mirror images. Think of "folding" the graph over the x-axis or y-axis.

Reflection Across the X-Axis

For every coordinate pair (x,y) of the pre-image, the new coordinates of the image can be found by using the formula:

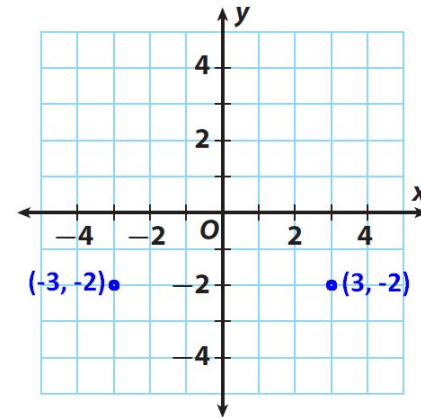
$$(x,y) \rightarrow (x,-y)$$



Reflection Across the Y-Axis

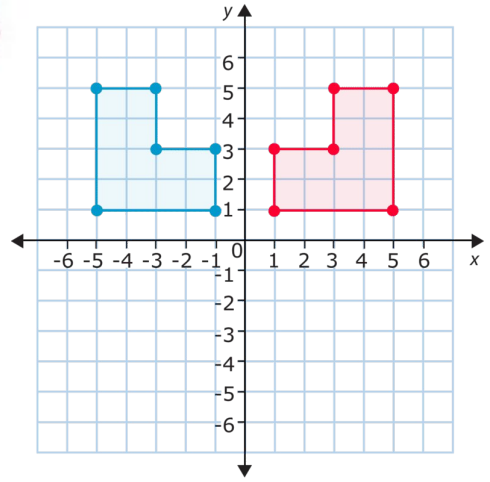
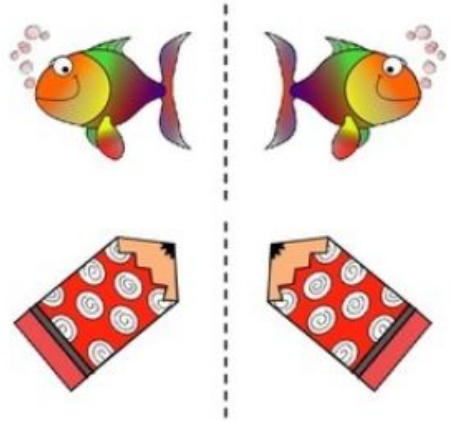
For every coordinate pair (x,y) of the pre-image, the new coordinates of the image can be found by using the formula:

$$(x,y) \rightarrow (-x,y)$$



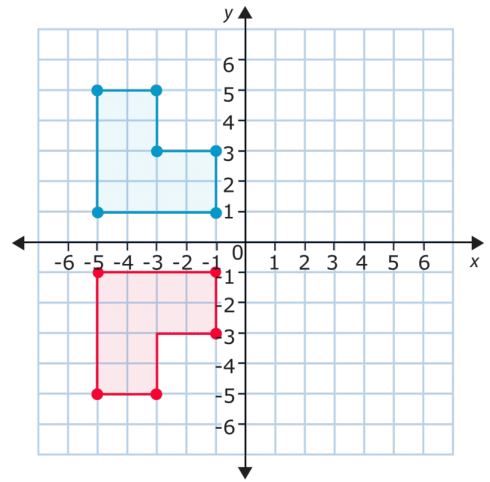
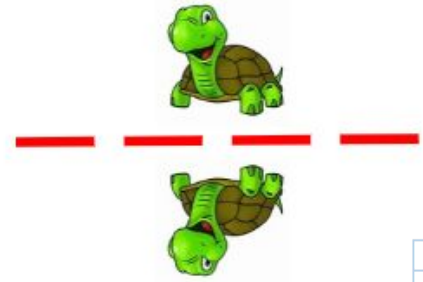
Reflection over the y-axis

$$(x, y) \rightarrow (-x, y)$$



Reflection over the x-axis

$$(x, y) \rightarrow (x, -y)$$



Video: Reflections

Watch [this video](#) on how to do reflections.

Take notes on your own piece of paper.

Example 1: Find the coordinates of the point $(3, -5)$ after a reflection across the y -axis.

Think about it....

- If we are reflecting across the y -axis, the x -value changes!

$(3, -5)$ ← Original Point

$(-3, -5)$ The opposite value for x

$= (-3, 5)$ ← New Point

Try these: On a separate sheet of paper, find the coordinates of each point after a reflection across the y -axis. Answers on the next page.

A. $(0, 5)$

B. $(-2, -3)$

C. $(4, -1)$

Solution:

Find the coordinates of each point after a reflection across the y -axis. (Notice this would be the opposite x value.)

A. $(0, 5)$

B. $(-2, -3)$

C. $(4, -1)$

$(0, 5)$ Original point

$(-0, 5)$

The opposite of 0 is 0.

$= (0, 5)$ Solution

$(-2, -3)$ Original point

$(- -2, -3)$

$= (2, -3)$ Solution

$(4, -1)$ Original point

$(- -4, -1)$

$= (4, -1)$ Solution

Example 2: Find the coordinates of the point $(3, -5)$ after a reflection across the x -axis.

Think about it....

- If we are reflecting across the x -axis, the y -value changes!

$(3, -5)$ ← Original Point

$(3, - -5)$ The opposite value for y

= $(3, 5)$ ← New Point

Try these: On a separate sheet of paper, find the coordinates of each point after a reflection across the x -axis. Answers on the next page.

A. $(-4, 2)$

B. $(3, 0)$

C. $(7, -6)$

Solution:

Find the coordinates of each point after a reflection across the x -axis. (Notice this would be the opposite y value.)

A. $(-4, 2)$

B. $(3, 0)$

C. $(7, -6)$

$(-4, 2)$ Original point

$(3, -2)$

$= (-4, -2)$ **Solution**

$(3, 0)$ Original point

$(3, -0)$

The opposite of 0 is 0.

$= (3, 0)$ **Solution**

$(7, -6)$ Original point

$(7, --6)$

$= (7, 6)$ **Solution**

Example 3: Find the coordinates of the Figure F'G'H' after a reflection across the y-axis, given F(2,3), G(-3,6), H(1,-1).

Think about it...

- If we are reflecting across the y-axis, the x-value changes!

F(2,3) G(-3,6) H(1,-1) ← Original Points

F(- 2,3) G(- -3,6) H(- 1,-1). The opposite value for x

= F(-2,3), G(3,6), H(-1,-1). ← New Points

Try these: On a separate sheet of paper, find the coordinates of each Figure after a reflection across the **y-axis**. Answers on the next page.

A(-3, 1), B(0, 0), C(5, -3)

L(7, -6), M(0, 4), N(-2, -2), O(-8, 2)

Solution:

Find the coordinates of each Figure after a reflection **across the y-axis**. Answers on the next page. (Notice this would be the opposite x value.)

A(-3,1), B(0,0), C(5,-3)

L(7,-6), M(0,4), N(-2,-2), O(-8,2)

A(-3,1), B(0,0), C(5,-3) Pre-image

(-3,1), (0,0), (5,-3)

Special Case!

= A'(3,1), B'(0,0), C'(-5,-3)

Solution

L(7,-6), M(0,4), N(-2,-2), O(-8,2) Pre-image

(7,-6), (0,4), (-2,-2), (-8,2)

Special Case!

= L'(-7,-6), M'(0,4), N'(2,-2), O'(8,2)

Solution

Example 3: Identify the transformation if the pre-image points are $G(-3,-6)$, $H(1,2)$ and the image points are $G'(3,-6)$, $H'(-1,2)$.

Think about it...

- If we are reflecting across the x -axis, the y -value changes!
- If we are reflecting across the y -axis, the x -value changes!

Original Points

$G(-3,-6)$, $H(1,2)$

New Points

$G'(3,-6)$, $H'(-1,2)$

The x -values have changed to opposite values, so we know this is a Reflection across the y -axis!

Try these: On a separate sheet of paper, find the transformation, given the pre-image and image points. Answers on the next page.

- $A(8,6)$, $B(-5,3)$ & $A'(-8,6)$, $B'(5,3)$
- $R(7,-2)$, $S(0,0)$, $T(-1,1)$ & $R'(7,2)$, $S'(0,0)$, $T'(-1,-1)$

Solution:

Find the transformation, given the pre-image and image points.

- $A(8,6)$, $B(-5,3)$ & $A'(-8,6)$, $B'(5,-3)$
- $R(7,-2)$, $S(0,0)$, $T(-1,1)$ & $R'(7,2)$, $S'(0,0)$, $T'(-1,-1)$

$A(8,6)$, $B(-5,3)$

$A'(-8,6)$, $B'(5,-3)$

The x-values are opposites...

= Reflection Across the Y-Axis

$R(7,-2)$, $S(0,0)$, $T(-1,1)$

$R'(7,2)$, $S'(0,0)$, $T'(-1,-1)$

*The y-values are opposites...
Except for (0,0). The opposite of 0 is 0.*

Special Case!

= Reflection Across the X-Axis

Practice 1: Complete the table below using the transformation rules.

Answer Key provided on the next page

Original Point	Reflection of point over the x-axis	Reflection of point over the y-axis .
(4, 8)	(4, -8)	(-4, 8)
(3, 2)		
(-5, 7)		
(-2, -1)		
(6, 0)		
(0, -9)		

Remember...
Reflection over the x-axis
 $(x, y) \longrightarrow (x, -y)$

Remember...
Reflection over the y-axis
 $(x, y) \longrightarrow (-x, y)$

Practice 1: Answer Key

Original Point	Reflection of point over the x-axis	Reflection of point over the y-axis.
(4, 8)	(4, -8)	(-4, 8)
(3, 2)	(3, -2)	(-3, 2)
(-5, 7)	(-5, -7)	(5, 7)
(-2, -1)	(-2, 1)	(2, -1)
(6, 0)	(6, 0)	(6, 0)
(0, -9)	(0, 9)	(0, -9)

Practice 2:

Answer Key provided on the next page

Find the coordinates of the vertices of each figure after the given transformation.

1) reflection across the x-axis

$F(4, 2), E(4, 3), D(5, 2)$

2) reflection across the y-axis

$Q(-3, 2), R(-3, 4), S(-1, 5)$

3) Triangle RST is reflected over the x-axis. The vertices are: R(4, 2), S(2, 3) and T(0,0). Which set of ordered pairs represents the vertices of R'S'T'?

A. R'' (-4, 2) S' (-2, 3), S' (0, 0)

B. R' (4, -2) S' (-2, 3), S' (0,0)

C. R' (4, -2) S' (2, -3) S' (0,0)

Write a rule to describe each transformation.

4) $D(-4, 1), C(-5, 4), B(-3, 5), A(-2, 0)$

to

$C'(-5, -4), B'(-3, -5), A'(-2, 0), D'(-4, -1)$

5) $J(-5, -4), I(-5, -1), H(-4, 0), G(-1, -4)$

to

$I'(5, -1), H'(4, 0), G'(1, -4), J'(5, -4)$

Practice 2: Answer Key

Find the coordinates of the vertices of each figure after the given transformation.

1) reflection across the x-axis

$F(4, 2), E(4, 3), D(5, 2)$

$E'(4, -3), D'(5, -2), F'(4, -2)$

2) reflection across the y-axis

$Q(-3, 2), R(-3, 4), S(-1, 5)$

$R'(3, 4), S'(1, 5), Q'(3, 2)$

3) Triangle RST is reflected over the x-axis. The vertices are: R(4, 2), S(2, 3) and T(0,0). Which set of ordered pairs represents the vertices of R'S'T'?

A. R'' (-4, 2) S' (-2, 3), S' (0, 0)

B. R' (4, -2) S' (-2, 3), S' (0,0)

C. R' (4, -2) S' (2, -3) S' (0,0)

Write a rule to describe each transformation.

4) $D(-4, 1), C(-5, 4), B(-3, 5), A(-2, 0)$

to

$C'(-5, -4), B'(-3, -5), A'(-2, 0), D'(-4, -1)$

reflection across the x-axis

5) $J(-5, -4), I(-5, -1), H(-4, 0), G(-1, -4)$

to

$I'(5, -1), H'(4, 0), G'(1, -4), J'(5, -4)$

reflection across the y-axis

Activity:

For additional practice, click on the link below.

Click Join, then click continue without signing in.

[Desmos Card Sort - Reflections](#)

Additional Resources:

[Printable Graph Paper](#)

[Reflection Lesson and Practice](#)

[Reflect and Rotate Online Practice Game](#)

[Reflections Shown](#)

[Symmetry Artist - Online Reflection Activity](#)

[Identify Transformation Activity](#)

[Video Lesson - Transformations](#)

[Virtual Graph Paper](#)