Math Virtual Learning

8th Grade Math
Geometric Transformations: Reflections on a Graph
April 17, 2020

8th Grade Math
Lesson: April 17

Learning Target:
Student will describe the effect of reflections of two-dimensional figures using coordinates.

Lesson Includes:
1) Review - Reflections: Algebraically
2) Reflections: Graphically

Warm Up Activity 1

On a piece of paper: Match the vocabulary work to the appropriate definition.

1) Image

2) Line of Reflection

3) Translations

4) Pre-Image

5) Rotation

6) Dilation

7) Reflection

A) is a transformation that produces an image that is the same shape as the original, but is a different size.

B) a transformation that turns a figure about a fixed point called the *center of rotation*.

C) moves ("slides") an object a fixed distance in a given direction without changing its size or shape, and without turning it or flipping it.

D) can be thought of as folding or "flipping" an object over the line of reflection.

E) The original object (before geometric transformations)

F) a line that the shape reflects across

G) The object after geometric transformation(s) have occurred. The image is usually labeled using a prime symbol, such as A'B'C'

Warm Up Activity 1 Answers

Review the questions from the previous slide.

1) Image

2) Line of Reflection

3) Translations

4) Pre-Image

5) Rotation

6) Dilation

7) Reflection

A) is a transformation that produces an image that is the same shape as the original, but is a different size.

B) a transformation that turns a figure about a fixed point called the *center of rotation*.

C) moves ("slides") an object a fixed distance in a given direction without changing its size or shape, and without turning it or flipping it.

D) can be thought of as folding or "flipping" an object over the line of reflection.

E) The original object (before geometric transformations)

F) a line that the shape reflects across

F) The object after geometric transformation(s) have occurred. The image is usually labeled using a prime symbol, such as A'B'C'

Warm Up Activity 2

On a piece of paper: State the image's coordinates after the given reflection.

Reflection across the x-axis

Pre-Image:

F (-3, -4) R(-1, -1) N(0, -5)

Image:

F(-3, -4) → F' (,   )

R(-1, -1) → R' (,   )

N(0, -5) → N' (,   )

Reflection across the y-axis

Pre-Image:

V(-4, 1) E(-5, 5) F(-2, 5) M(-2, 3)

Image:

V(-4, 1) → V' (,   )

E(-5, 5) → E' (,   )

F(-2, 5) → F' (,   )

M(-2, 3) → M' (,   )

Warm Up Activity 2 Answers

Review the questions from the previous slide.

Reflection across the x-axis

Pre-Image:

F (-3, -4) R(-1, -1) N(0, -5)

Image:

F(-3, -4) → F' (-3, 4)

R(-1, -1) → R' (-1, 1)

N(0, -5) → N' (0, 5)

Reflection across the y-axis

Pre-Image:

V(-4, 1) E(-5, 5) F(-2, 5) M(-2, 3)

Image:

V(-4, 1) → V' (4, 1)

E(1, -2) → E' (-1, -2)

F(3, 0) → F' (-3, 0)

M(5, -2) → M' (-5, -2)

The reflection of the point (*x,y*) across the *x*-axis is the point (*x,-y*).

The reflection of the point (*x,y*) across the *y*-axis is the point (*-x,y*).

Instruction: Reflections

Definition: A **reflection** can be thought of as folding or **"flipping"** an object over the line of reflection. An object and its reflection have the **same shape and size**, but the figures face in **opposite directions**. The object appear as if they mirror reflections, with right and left reversed. The original object is called the **pre-image**, and the object after the reflection is called the **image**.
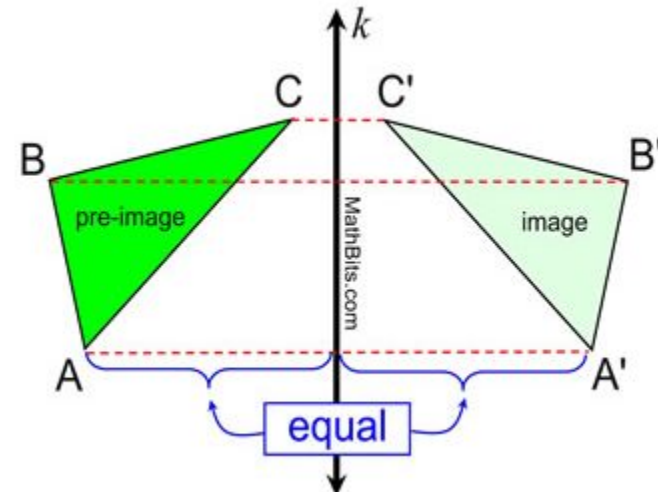
Diagrams

Reflection in Water

Reflection in a Mirror

Reflection in Shiny Surface

Reminder: Reflections are FLIPS!!

Instruction: Reflections

Read through steps. Then review the examples on the next 4 slides. If you are confused look back at the previous slide and watch the videos.

Steps: Writing new points

1) **Identify** the line that you are reflecting over. Highlight this line.

2) **Graph** the pre-image, if needed.

3) For each point of the figure (pre-image), **count** the distance away from the line of the reflection (ex. 4 units away).

4) **Reflect** (mirror) & **graph** each point across the line of reflection. Each point is the same distance away from line as what the pre-image was.

5) **Write** the ordered pair for each point of the image. Do not forget the prime symbol.
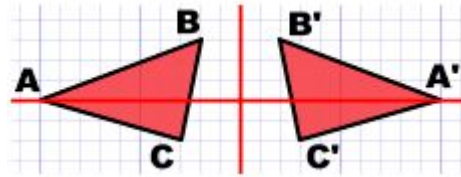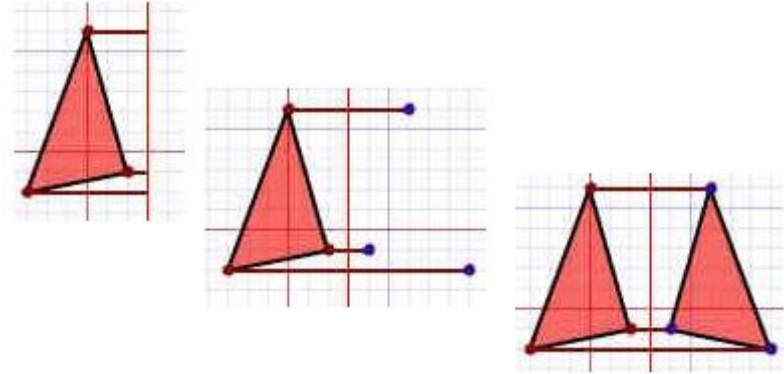
To see an example of how this work go here. There is an animated tool that will allow you to see a reflection of a shape.

Instruction: Reflections

Review the examples. Directions: Graph the image using the reflection given, then state the image's coordinates.

Step 1:

Reflect the shape over the X axis.

Pre-Image

Step 2:
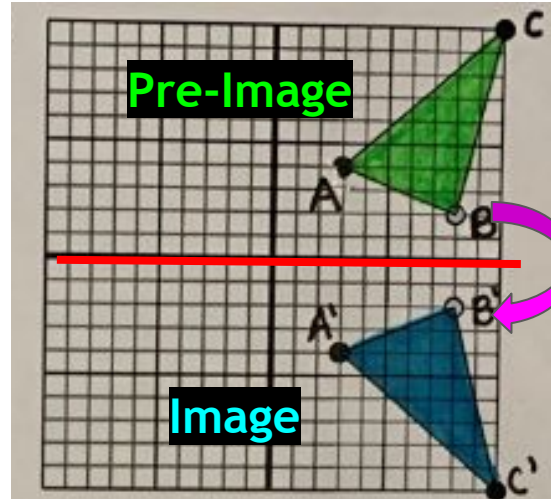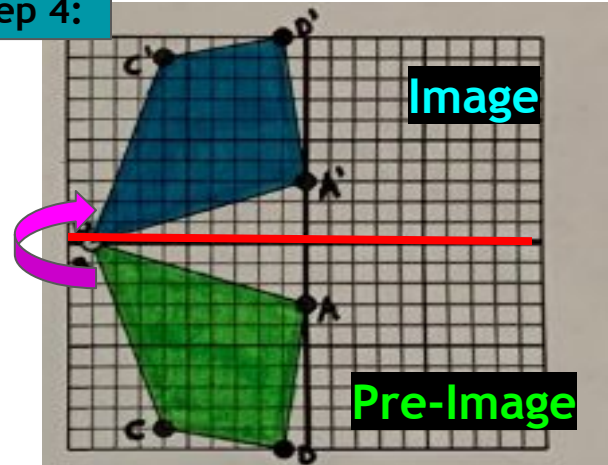
Count the distance between line of reflection and pre-image.

x-axis

Step 3:

A is 4 units away from the x-axis.
B is 2 units away from the x-axis.
C is 10 units away from the x-axis.

Pre-Image

Step 4:

Image

The shape above has the following coordinates:

Step 5:

A. $(3,4) \longrightarrow A' (3,-4)$
B. $(8,2) \longrightarrow B' (8,-2)$
C. $(10,10) \longrightarrow C' (10,-10)$

Reflect the shape over the X axis.

Notice it is reflecting across the x-axis....

The y-coordinate changes, meaning the rule still applies:
(x, -y)

Instruction: Reflections

Review the examples. Directions: Graph the image using the reflection given, then state the image's coordinates.
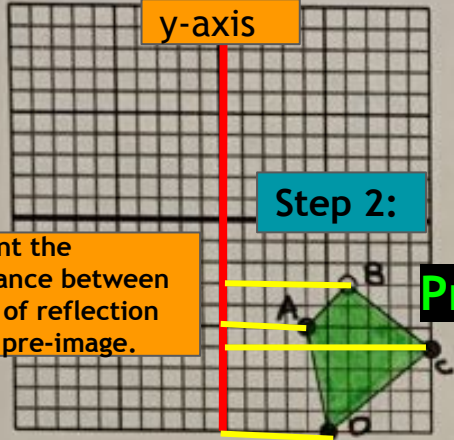
Step 1:

Reflect the shape over the X axis.

Count the distance between line of reflection and pre-image.

x-axis

Pre-Image
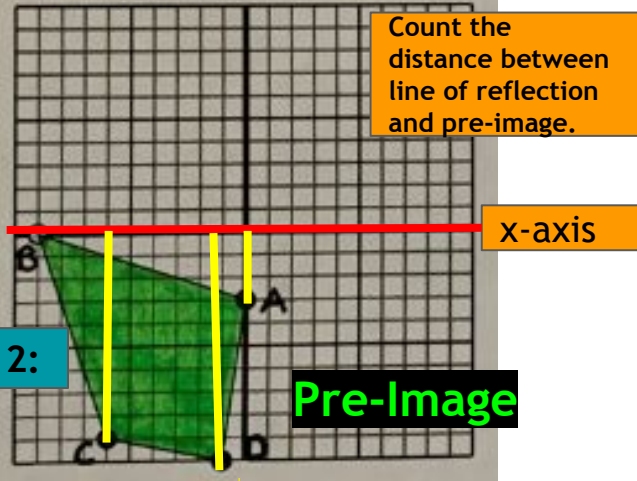
Step 2:

Step 3:

A is 3 units away from the x-axis.
B is 0 units away from the x-axis.
C is 9 units away from the x-axis.
Dis 10 units away from the x-axis.

Step 4:

Image

Pre-Image

The shape above has the following coordinates:

A. $(0,-3) \rightarrow$ A' $(0,3)$
B. $(-9,0) \rightarrow$ B' $(-9,0)$
C. $(-6,-9) \rightarrow$ C' $(-6,9)$
D. $(-1,-10) \rightarrow$ D' $(-1,10)$

Reflect the shape over the X axis.

Step 5:

Notice it is reflecting across the x-axis....

The y-coordinate changes, meaning the rule still applies:
(x, -y)

Instruction: Reflections

Review the examples. Directions: Graph the image using the reflection given, then state the image's coordinates.

Step 1:

Reflect the shape over the Y axis.

y-axis

Step 2:

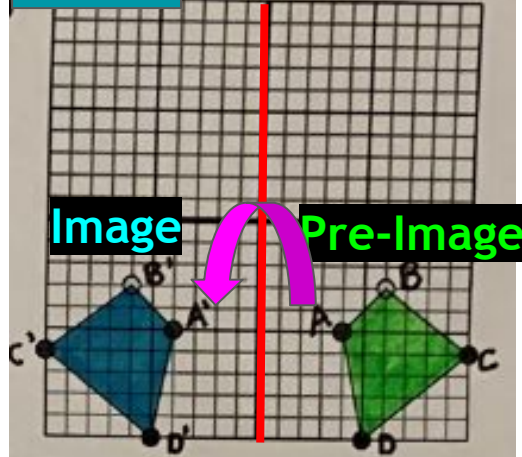Count the distance between line of reflection and pre-image.

Pre-Image

Step 4:

Image | Pre-Image

The shape above has the following coordinates:

A. (4,-5) → A' (-4,-5)
B. (6,-3) → B' (-6,-3)
C. (10,-6) → C' (-10,-6)
D. (5,-10) → D' (-5,-10)

Step 3:

A is 4 units away from the y-axis.
B is 6 units away from the y-axis.
C is 10 units away from the y-axis.
D is 5 units away from the y- axis.

Step 5:

Notice it is reflecting across the y-axis....

The x-coordinate changes, meaning the rule still applies:
(-x, y)

Instruction: Reflections

Review the examples. Directions: Graph the image using the reflection given, then state the image's coordinates.

Step 1:

Reflect the shape over the Y axis.

y-axis

Step 2:

Count the distance between line of reflection and pre-image.

Pre-Image

Step 3:

A is 2 units away from the y-axis.
B is 9 units away from the y-axis.
C is 10 units away from the y-axis.

Step 4:

Image   Pre-Image

Step 5:

The shape above has the following coordinates:

A. $(2,4) \rightarrow$ A' $(-2,4)$

B. $(9,3) \rightarrow$ B' $(-9,3)$

C. $(10,7) \rightarrow$ C' $(-10,7)$

Notice it is reflecting across the y-axis....

The x-coordinate changes, meaning the rule still applies:
(-x, y)

Practice: Reflections

On graph paper (virtual or paper): Graph the image using the reflection given, then state the image's coordinates.

Reflect the shape over the X axis.
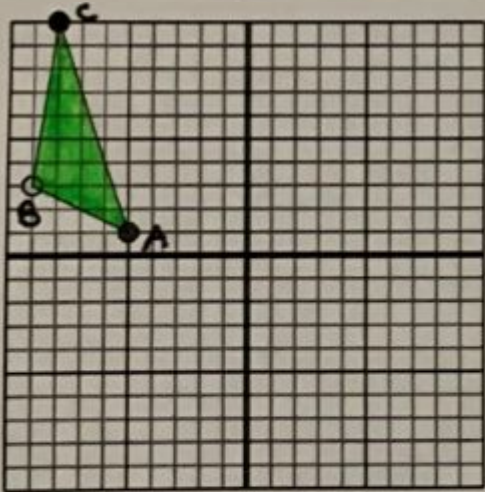
The shape above has the following coordinates:

A. (-5,1)

B. (-9,3)

C. (-8,10)

Reflect the shape over the Y axis.
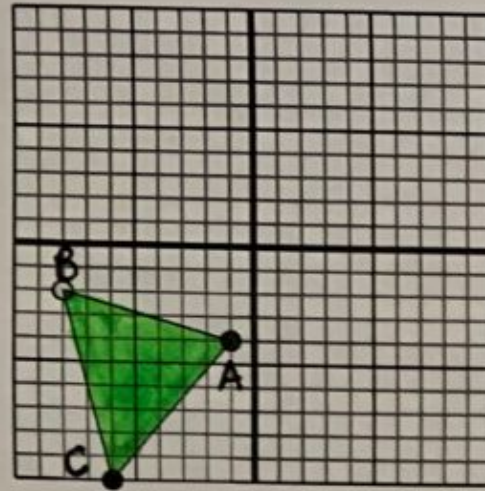
The shape above has the following coordinates:

A. (-1,-4)

B. (-8,-2)

C. (-6,-10)

Practice: Reflections Answers

Check your work from the previous slide. Additional practice linked on the last slide.

Reflect the shape over the X axis.
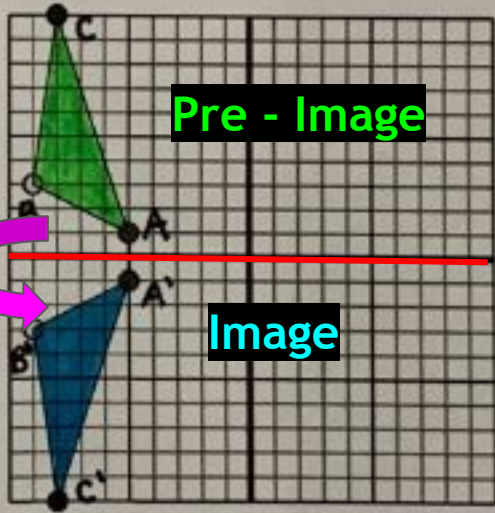
Pre - Image

Image

The shape above has the following coordinates:

A. (-5,1) →A'(-5,-1)
B. (-9,3) →B'(-9,-3)
C. (-8,10) →C'(-8,-10)

A is 1 unit away from the x-axis.

B is 3 units away from the x-axis.

C is 10 units away from the x-axis.

Reflect the shape over the Y axis.
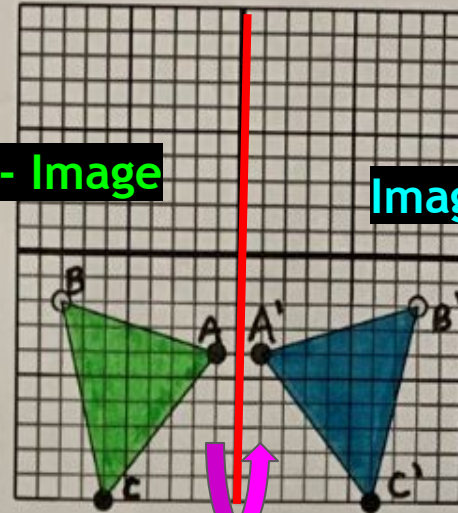
Pre- Image

Image

The shape above has the following coordinates:

A. (-1,-4) → A' (1,-4)
B. (-8,-2) → B'(8,-2)
C. (-6,-10) → C'(6,-10)

A is 1 unit away from the y-axis.

B is 8 units away from the y-axis.

C is 6 units away from the y-axis.

Practice: Reflections

On graph paper (virtual or paper): Graph the image using the reflection given, then state the image's coordinates.

Reflect the shape over the X axis.
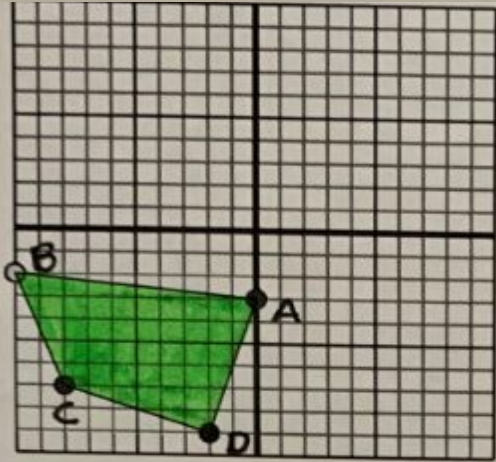
The shape above has the following coordinates:
A. (0,-3)
B. (-10,-2)
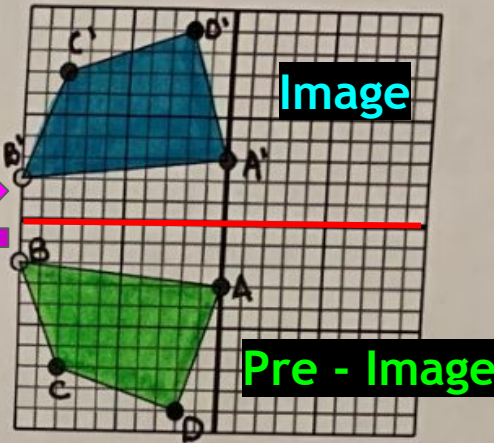C. (-8,-7)
D. (-2,-9)

Reflect the shape over the Y axis.
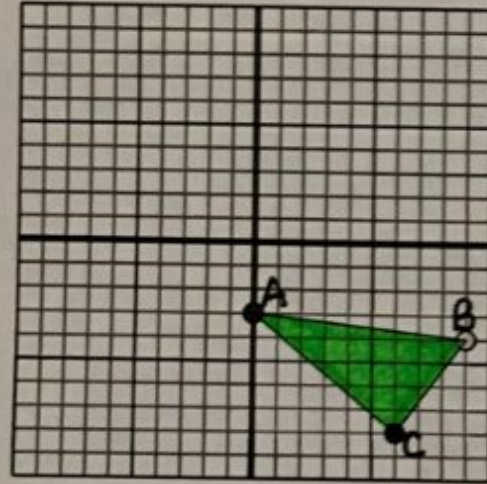
The shape above has the following coordinates:
A. (0,-3)
B. (9,-4)
C. (6,-8)

Practice: Reflections Answers

Check your work from the previous slide. Additional practice linked on the last slide.

Reflect the shape over the X axis.

The shape above has the following coordinates:

A. (0,-3) → A' (0,3)
B. (-10,-2) → B' (-10,2)
C. (-8,-7) → C' (-8,7)
D. (-2,-9) → D' (-2,9)

A is 3 units away from the x-axis.

B is 2 units away from the x-axis.

C is 7 units away from the x-axis.

D is 9 units away from the x-axis.

Reflect the shape over the Y axis.
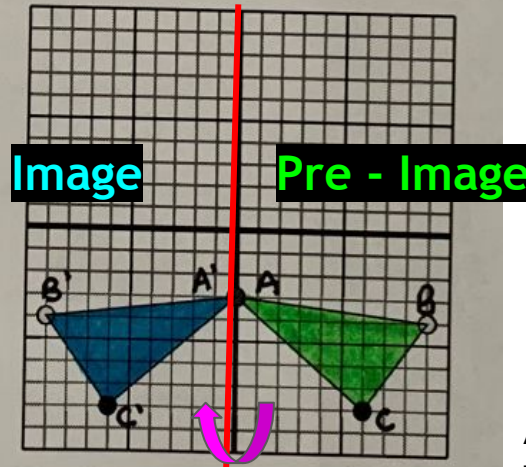
The shape above has the following coordinates:

A. (0,-3) → A' (0,-3)
B. (9,-4) → B' (-9,-4)
C. (6,-8) → C' (-6,-8)

A is 3 unit away from the y-axis.

B is 4 units away from the y-axis.

C is 8 units away from the y-axis.

Instruction: Reflections

Read through steps. Then review the examples on the next slide. If you are confused look back at slide 7 and watch the videos.

Steps: Given the pre-image and image graphed, write the rule verbally and algebraically.
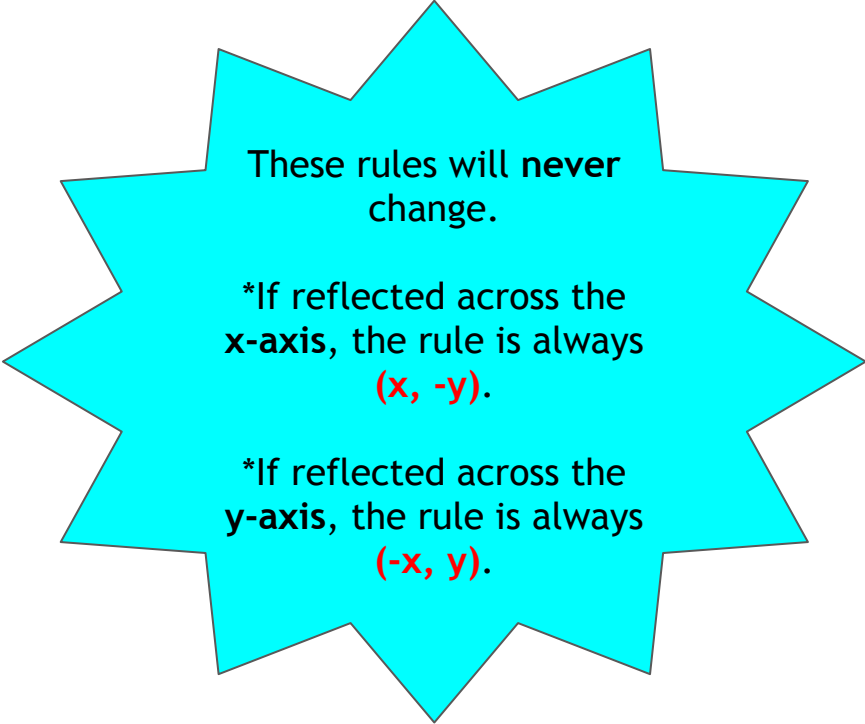
1) Identify which axis the image is reflected across.

x-axis: horizontal axis

y-axis: vertical axis

2) State the rule verbally and algebraically.

Verbally: Reflect over the x- or y-axis

Algebraically: (x,-y) or (-x,y)

These rules will **never** change.

*If reflected across the **x-axis**, the rule is always **(x, -y)**.

*If reflected across the **y-axis**, the rule is always **(-x, y)**.

Instruction: Reflections

Review the examples. Directions: Given the pre-image and image graphed, write the rule verbally and algebraically.

Image

x-axis

Pre- Image
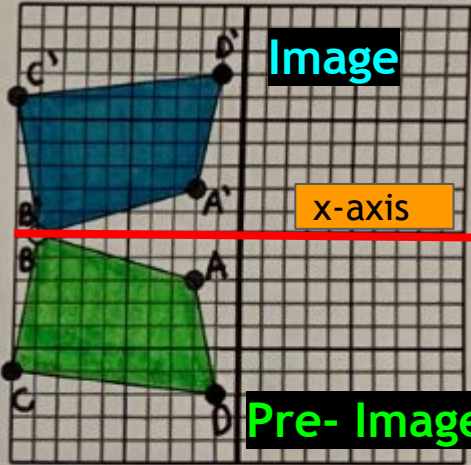
The shape above has the following coordinates:

A. (-2,-2) → A' (-2,2)
B. (-9,0) → B' (-9,0)
C. (-10,-6) → C' (-10,6)
D. (-1,-7) → D' (-1,7)

Step 1: Identify which axis it reflects across

Step 2: State the rule

Rule: Reflection across the x-axis
(x , -y)

Step 1: Identify which axis it reflects across

Step 2: State the rule

Rule: Reflection across the y-axis
(-x , y)

y-axis
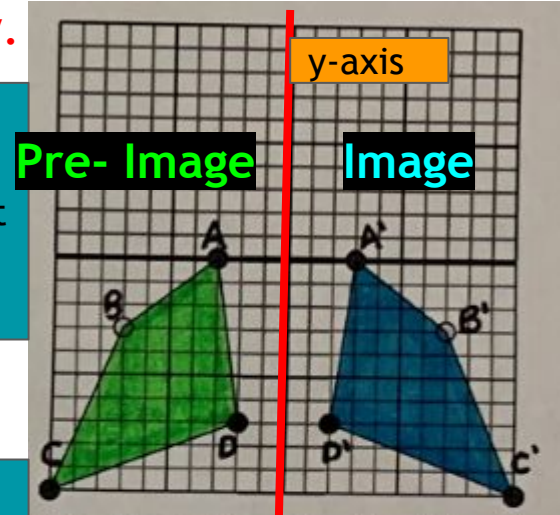
Pre- Image   **Image**

The shape above has the following coordinates:

A. (-3,0) → A' (3,0)
B. (-7,-3) → B' (7,-3)
C. (-10,-10) → C' (10,-10)
D. (-2,-7) → D' (2,-7)

Practice: Reflections
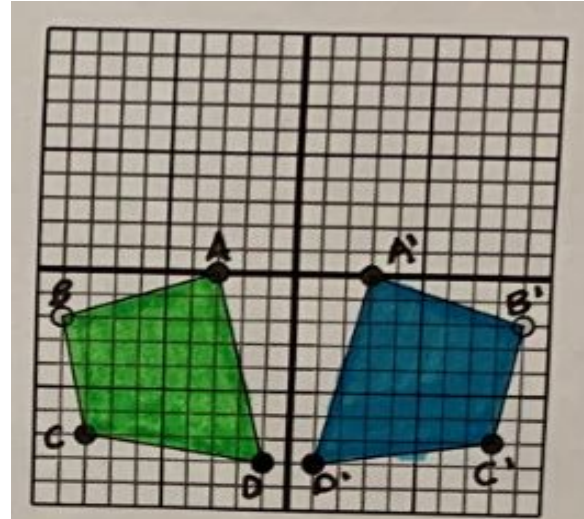
On a piece of paper: Given the pre-image and image graphed, write the rule verbally and algebraically.
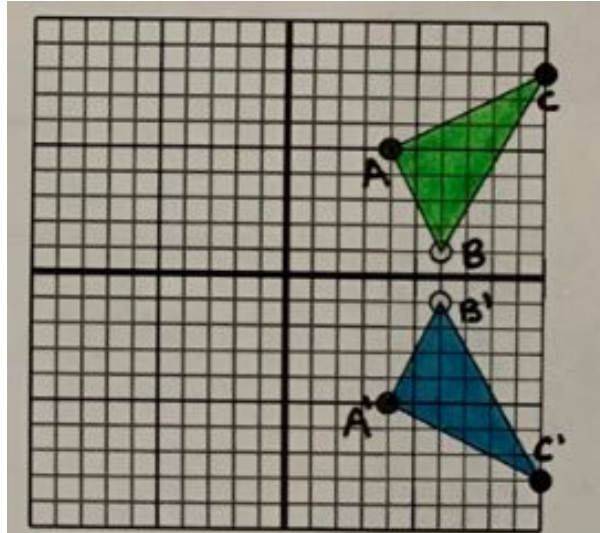
The shape above has the following coordinates:

A. (4,5) → A'(4, -5)

B. (6,1) → B' (6,- 1)

C. (10,8) → C' (10,-8)

The shape above has the following coordinates:

A. (-3,0) → A'(3,0)

B. (-9,-2) → B'(9,-2)

C. (-8,-7) → C'(8,-7)

D. (-1,-8) → D'(1,-8)

Practice: Reflections Answers

Check your work from the previous slide. Additional practice linked on the last slide.

The shape above has the following coordinates:

A. $(4,5) \rightarrow A'(4,-5)$

B. $(6,1) \rightarrow B'(6,-1)$

C. $(10,8) \rightarrow C'(10,-8)$

Pre- Image

Image

x-axis

Step 1

Step 2

Rule: Reflection across the x-axis
$(x, -y)$

The shape above has the following coordinates:

A. $(-3,0) \rightarrow A'(3,0)$

B. $(-9,-2) \rightarrow B'(9,-2)$

C. $(-8,-7) \rightarrow C'(8,-7)$

D. $(-1,-8) \rightarrow D'(1,-8)$

y-axis

Step 1

Step 2

Rule: Reflection across the y-axis
$(-x, y)$

Practice: Reflections

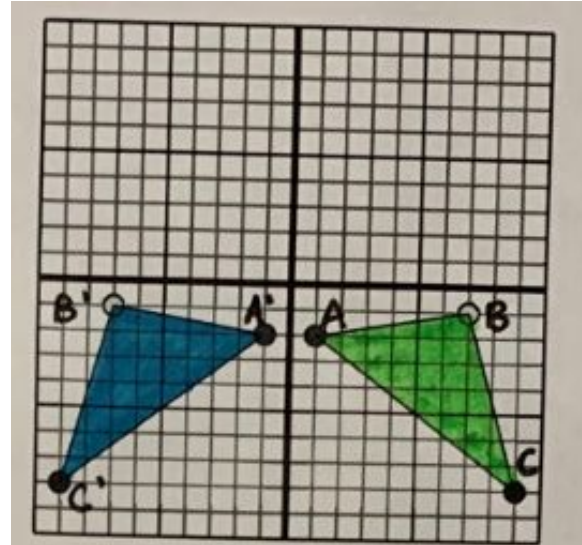On a piece of paper: Given the pre-image and image graphed, write the rule verbally and algebraically.
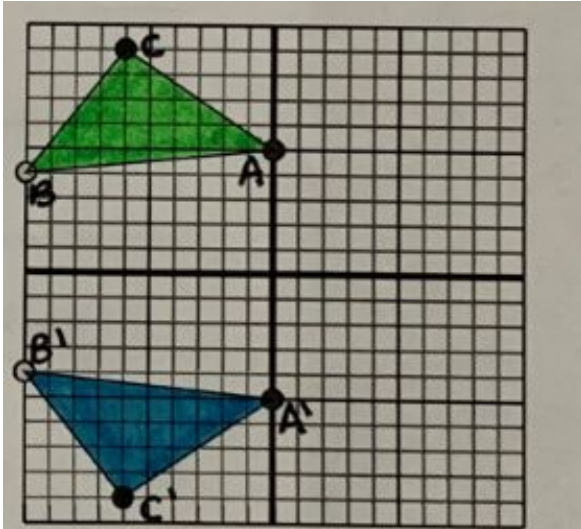
The shape above has the following coordinates:

A. $(0,5) \rightarrow A'(0,-5)$

B. $(-10,4) \rightarrow B'(-10,-4)$

C. $(-6,9) \rightarrow C'(-6,-9)$
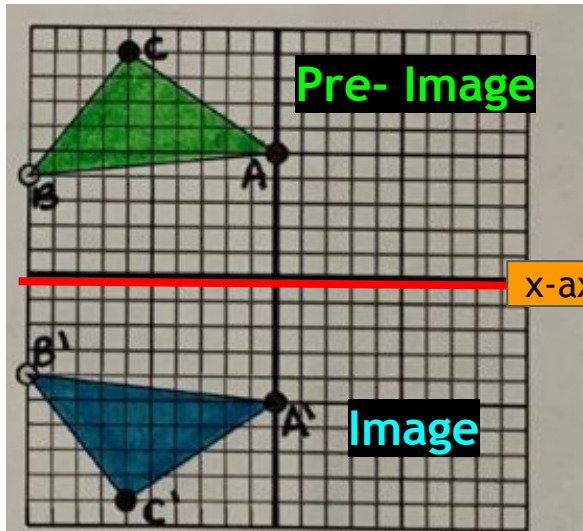

The shape above has the following coordinates:

A. $(1,-2) \rightarrow A'(-1,-2)$

B. $(7,-1) \rightarrow B'(-7,-1)$

C. $(9,-8) \rightarrow C'(-9,-8)$

Practice: Reflections Answers

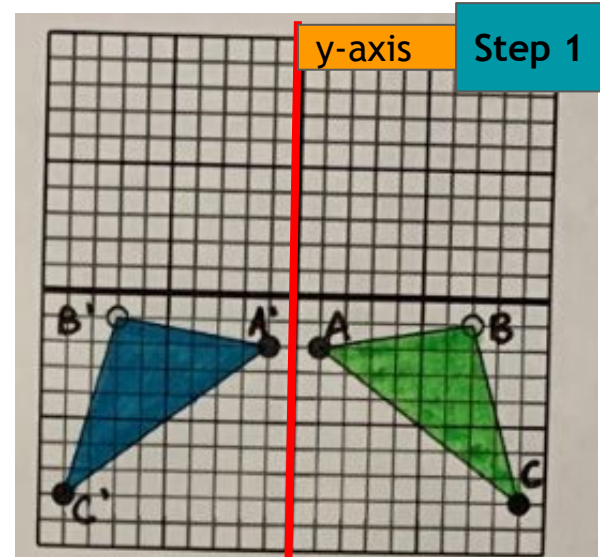Check your work from the previous slide. Additional practice linked on the last slide.

Pre-Image

Image

x-axis — **Step 1**

Step 2

The shape above has the following coordinates:

A. $(0,5) \rightarrow A'(0,-5)$

B. $(-10,4) \rightarrow B'(-10,-4)$

C. $(-6,9) \rightarrow C'(-6,-9)$

Rule: Reflection across the x-axis
$(x, -y)$

y-axis — **Step 1**

Step 2

The shape above has the following coordinates:

A. $(1,-2) \rightarrow A'(-1,-2)$

B. $(7,-1) \rightarrow B'(-7,-1)$

C. $(9,-8) \rightarrow C'(-9,-8)$

Rule: Reflection across the y-axis
$(-x, y)$

Additional Practice:

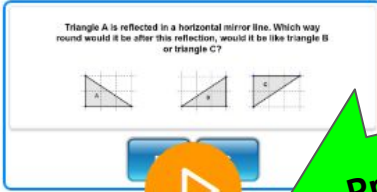Click on the links below to get additional practice and to check your understanding!

[Types of Transformations](#)

[Reflections Practice 1](#)

[Reflections Practice 2](#)

[Printable Graph Paper](#)

[Virtual Graph Paper](#)

* May need to click twice for the links *

Triangle A is reflected in a horizontal mirror line. Which way round would it be after this reflection, would it be like triangle B or triangle C?

Reflection - horizontal or vertical mirror line

Press Play