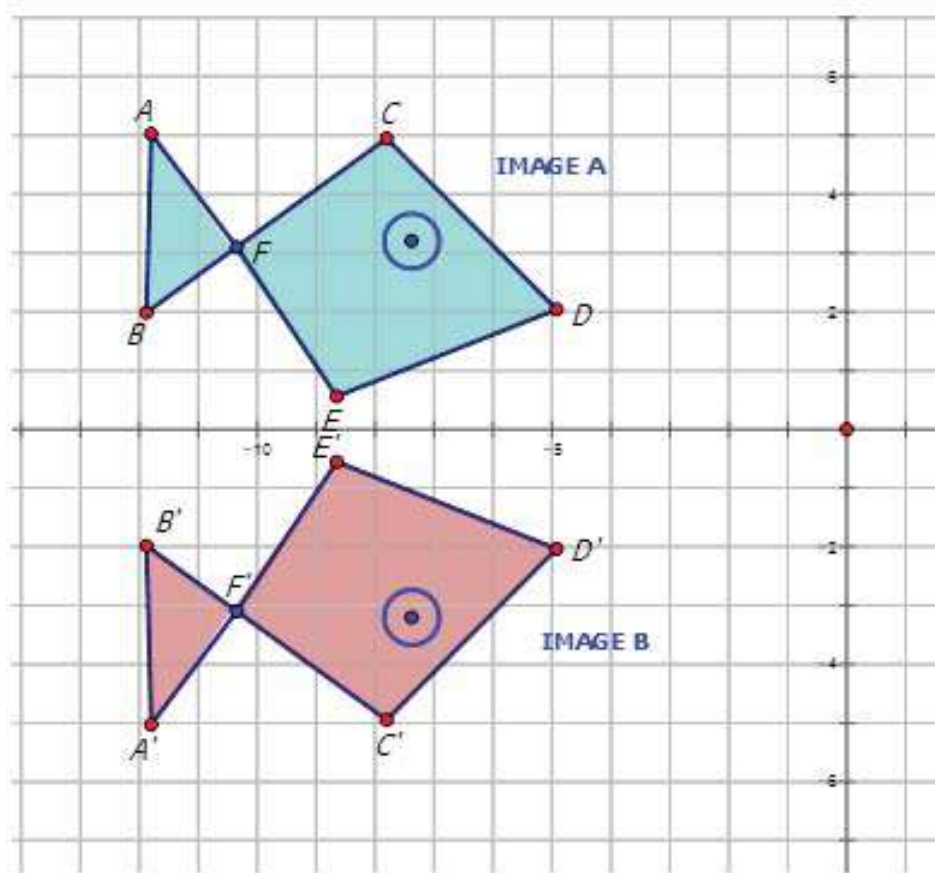


1.4 Rules for Reflections

Here you will learn notation for describing a reflection with a rule.

The figure below shows a pattern of two fish. Write the mapping rule for the reflection of Image A to Image B.



Watch This

First watch this video to learn about writing rules for reflections.



MEDIA

Click image to the left for more content.

[CK-12 FoundationChapter10RulesforReflectionsA](#)

Then watch this video to see some examples.



Multimedia

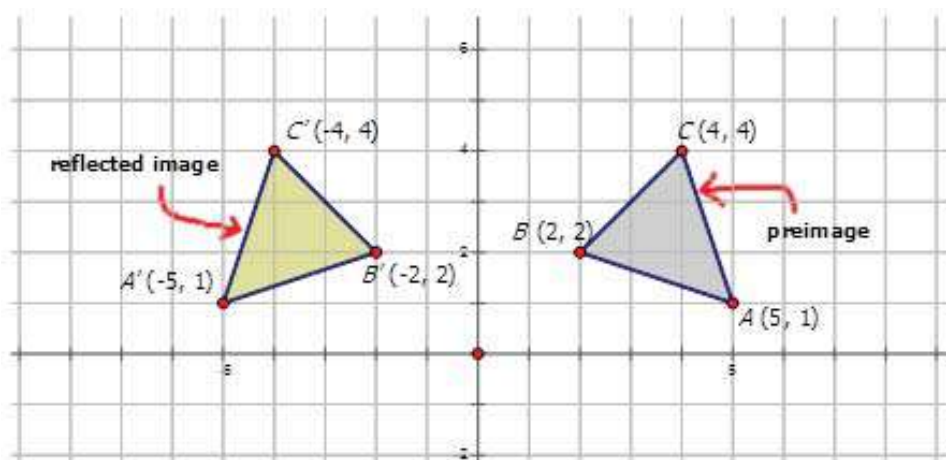
MEDIA

Click image to the left for more content.

CK-12 FoundationChapter10RulesforReflectionsB

Guidance

In geometry, a transformation is an operation that moves, flips, or changes a shape to create a new shape. A reflection is an example of a transformation that takes a shape (called the preimage) and flips it across a line (called the line of reflection) to create a new shape (called the image). By examining the coordinates of the reflected image, you can determine the line of reflection. The most common lines of reflection are the x -axis, the y -axis, or the lines $y = x$ or $y = -x$.



The preimage has been reflected across the y -axis. This means, all of the x -coordinates have been multiplied by -1 . You can describe the reflection in words, or with the following notation:

$$r_{y\text{-axis}}(x, y) \rightarrow (-x, y)$$

Notice that the notation tells you exactly how each (x, y) point changes as a result of the transformation.

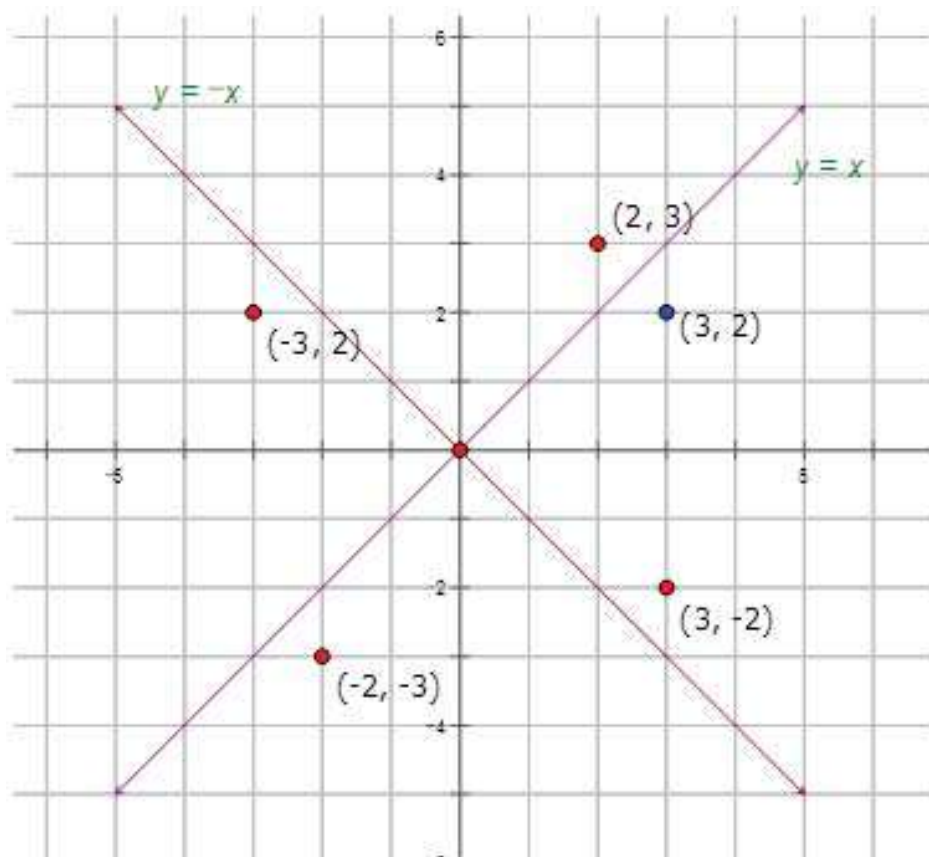
Example A

Find the image of the point $(3, 2)$ that has undergone a reflection across

- the x -axis,
- the y -axis,
- the line $y = x$, and
- the line $y = -x$.

Write the notation to describe the reflection.

Solution:

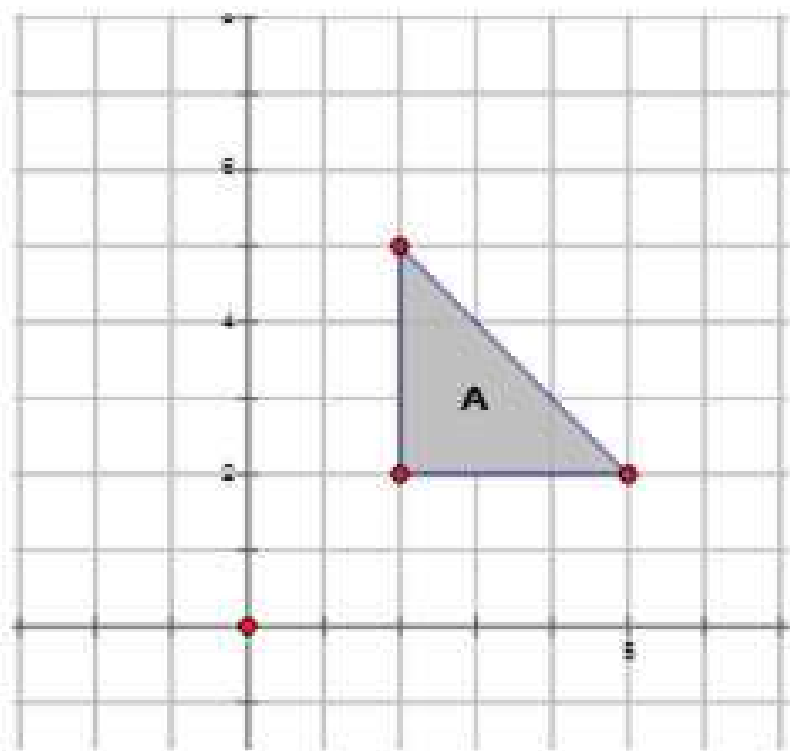


- a) Reflection across the x -axis: $r_{x\text{-axis}}(3, 2) \rightarrow (3, -2)$
- b) Reflection across the y -axis: $r_{y\text{-axis}}(3, 2) \rightarrow (-3, 2)$
- c) Reflection across the line $y = x$: $r_{y=x}(3, 2) \rightarrow (2, 3)$
- d) Reflection across the line $y = -x$: $r_{y=-x}(3, 2) \rightarrow (-2, -3)$

Example B

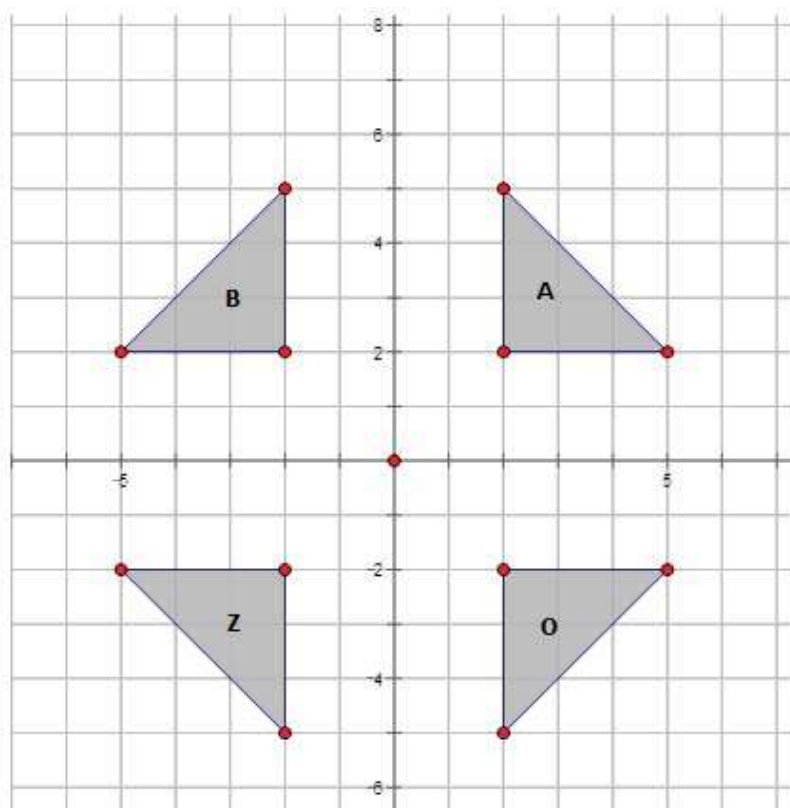
Reflect Image A in the diagram below:

- a) Across the y -axis and label it B .
- b) Across the x -axis and label it O .
- c) Across the line $y = -x$ and label it Z .



Write notation for each to indicate the type of reflection.

Solution:



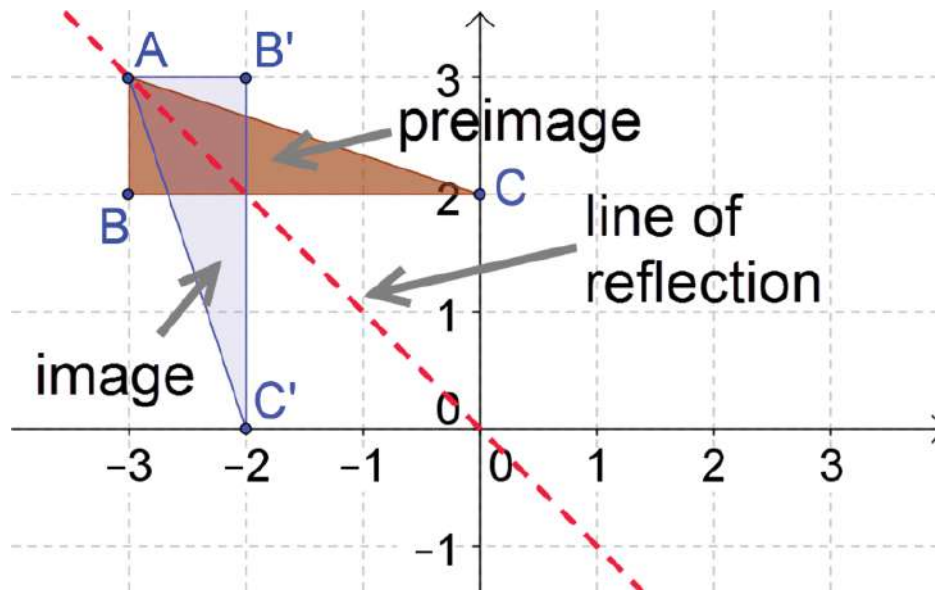
a) Reflection across the y -axis: $r_{y\text{-axis}}A \rightarrow B = r_{y\text{-axis}}(x, y) \rightarrow (-x, y)$

b) Reflection across the x -axis: $r_{x\text{-axis}}A \rightarrow O = r_{x\text{-axis}}(x, y) \rightarrow (x, -y)$

c) Reflection across the $y = -x$: $r_{y=-x}A \rightarrow Z = r_{y=-x}(x, y) \rightarrow (-y, -x)$

Example C

Write the notation that represents the reflection of the preimage to the image in the diagram below.

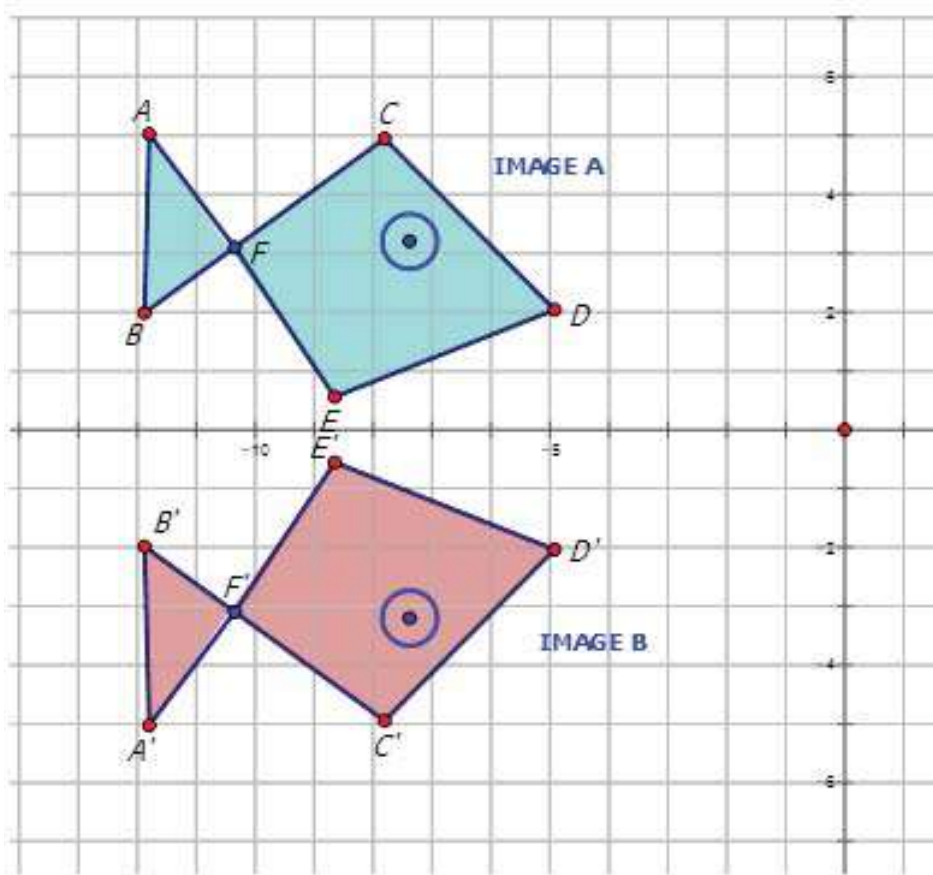


Solution:

This is a reflection across the line $y = -x$. The notation is $r_{y=-x}(x, y) \rightarrow (-y, -x)$.

Concept Problem Revisited

The figure below shows a pattern of two fish. Write the mapping rule for the reflection of Image A to Image B.



To answer this question, look at the coordinate points for Image A and Image B.

TABLE 1.1:

Image A	$A(-11.8, 5)$	$B(-11.8, 2)$	$C(-7.8, 5)$	$D(-4.9, 2)$	$E(-8.7, 0.5)$	$F(-10.4, 3.1)$
Image B	$A'(-11.8, -5)$	$B'(-11.8, -2)$	$C'(-7.8, -5)$	$D'(-4.9, -2)$	$E'(-8.7, -0.5)$	$F'(-10.4, -3.1)$

Notice that all of the y-coordinates have changed sign. Therefore Image A has reflected across the x-axis. To write a rule for this reflection you would write: $r_{x\text{-axis}}(x, y) \rightarrow (x, -y)$.

Vocabulary

Notation Rule

A **notation rule** has the following form $r_{y\text{-axis}}A \rightarrow B = r_{y\text{-axis}}(x, y) \rightarrow (-x, y)$ and tells you that the image A has been reflected across the y-axis and the x-coordinates have been multiplied by -1.

Reflection

A **reflection** is an example of a transformation that flips each point of a shape over the same line.

Image

In a transformation, the final figure is called the **image**.

Preimage

In a transformation, the original figure is called the **preimage**.