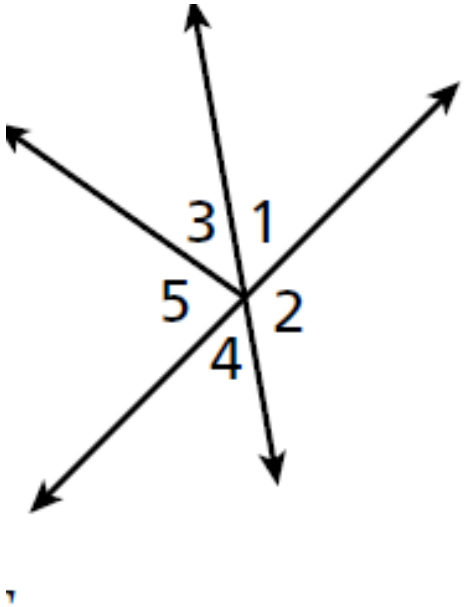
Bellwork

Tell whether the angles are only adjacent, Adjacent and form a linear pair, or not adjacent.



1. Angle 1 and Angle 2
2. Angle 4 and Angle 5
3. Angle 3 and Angle 4

If the measure of angle T is (5x – 10), find the measure of:

4. Supplement of angle T

5. Complement of angle T

Objectives

Identify and graph reflections, rotations, and translations.

1-7 Transformations in the Coordinate Plane

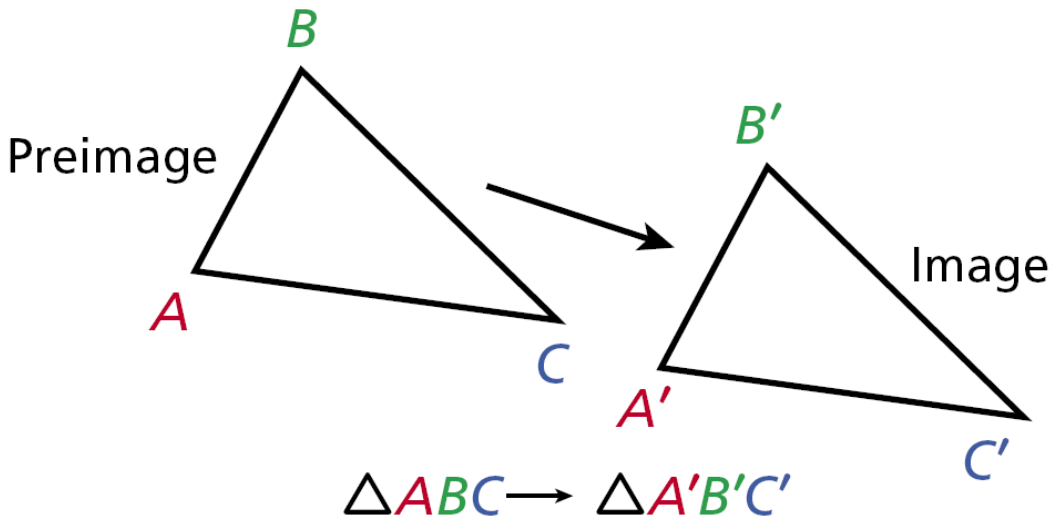
A **transformation** is a change in the position, size, or shape of a figure.

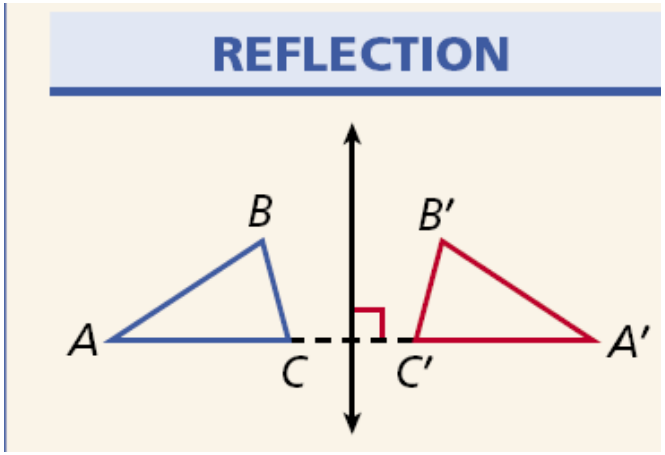
The original figure is called the **preimage**.

The resulting figure is called the **image**.

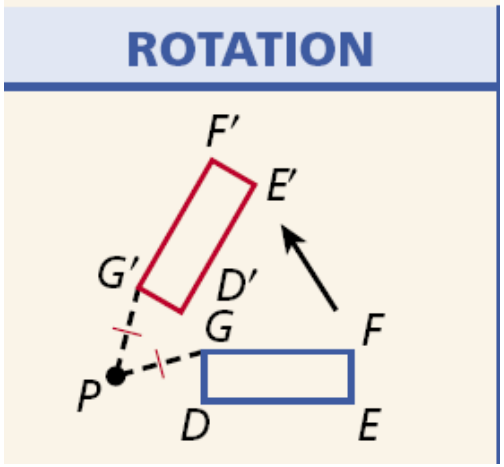
A transformation *maps* the preimage to the image.

Arrow notation ($\rightarrow$) is used to describe a transformation, and primes (′) are used to label the image.

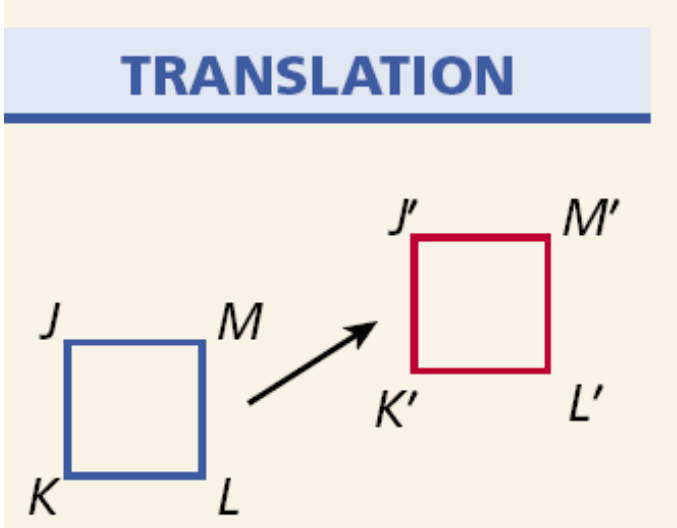




Reflection : A flip across a line. Each point and its image are the same distance from the line of reflection.



Rotation: A turn about a point.

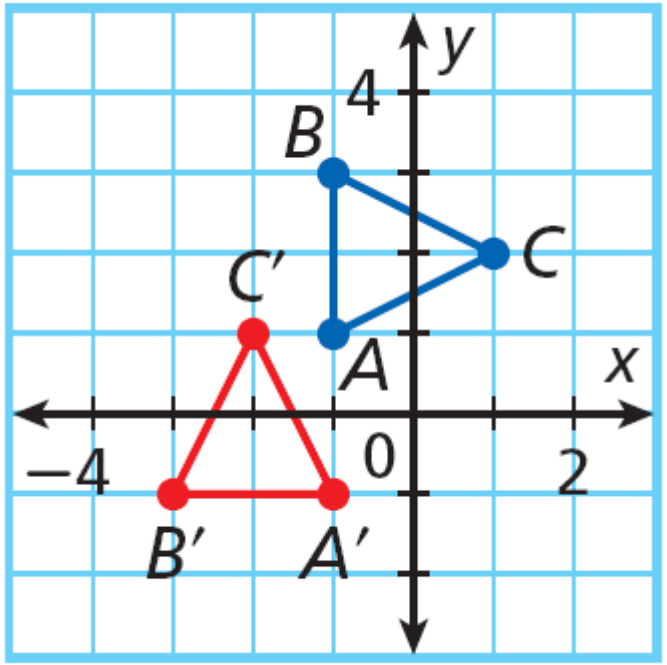


Transformation: is a slide where all the points move the same distance in the same direction.

Translations can also be described by a rule such as $(x, y) \rightarrow (x + a, y + b)$.

Example 1A: Identifying Transformation

Identify the transformation. Then use arrow notation to describe the transformation.

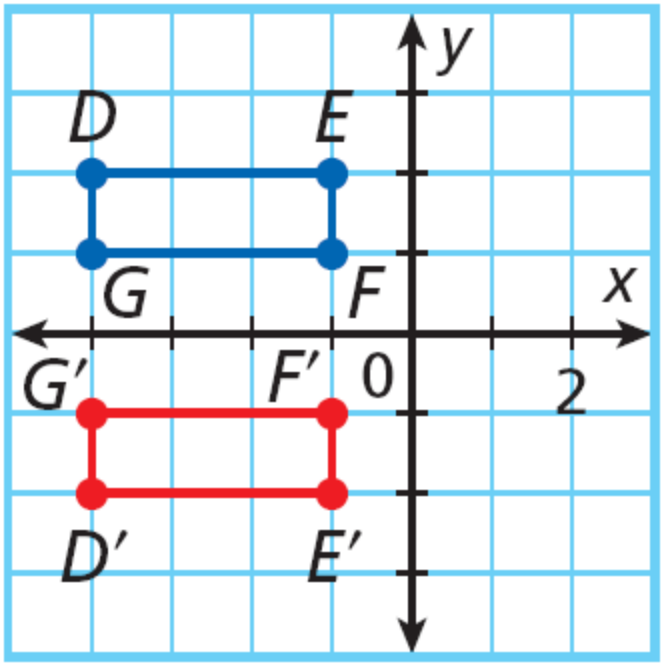


The transformation cannot be a reflection because each point and its image are not the same distance from a line of reflection.

90° rotation, $\Delta ABC \rightarrow \Delta A'B'C'$

Example 1B: Identifying Transformation

Identify the transformation. Then use arrow notation to describe the transformation.



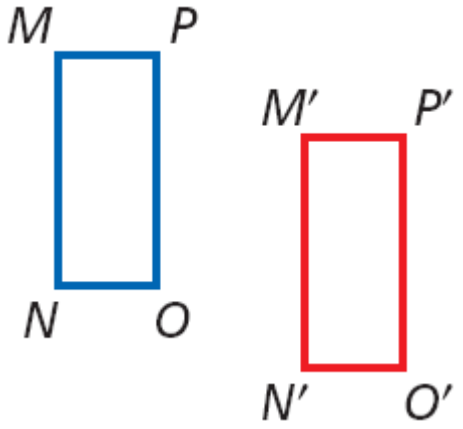
The transformation cannot be a translation because each point and its image are not in the same relative position.

reflection, $DEFG \rightarrow D'E'F'G'$

Check It Out! Example 1

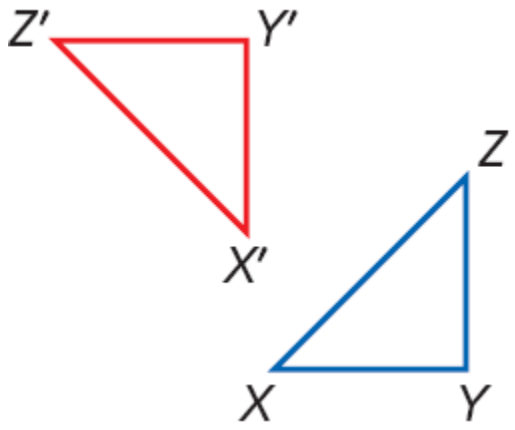
Identify each transformation. Then use arrow notation to describe the transformation.

a.



translation; $MNOP \rightarrow M'N'O'P'$

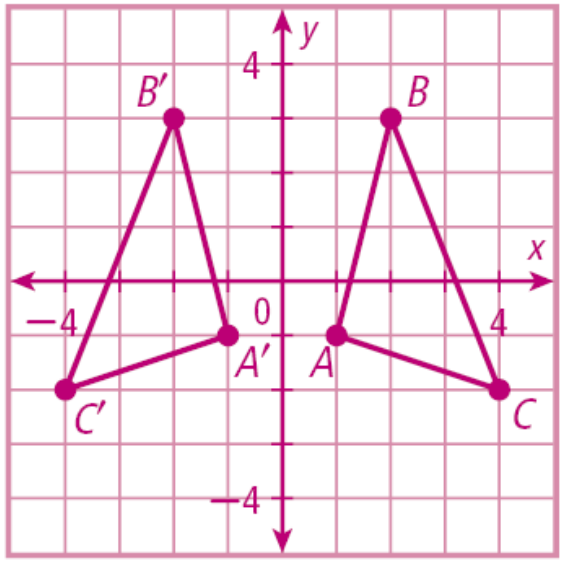
b.



rotation; $\Delta XYZ \rightarrow \Delta X'Y'Z'$

Example 2: Drawing and Identifying Transformations

A figure has vertices at $A(1, -1)$, $B(2, 3)$, and $C(4, -2)$. After a transformation, the image of the figure has vertices at $A'(-1, -1)$, $B'(-2, 3)$, and $C'(-4, -2)$. Draw the preimage and image. Then identify the transformation.

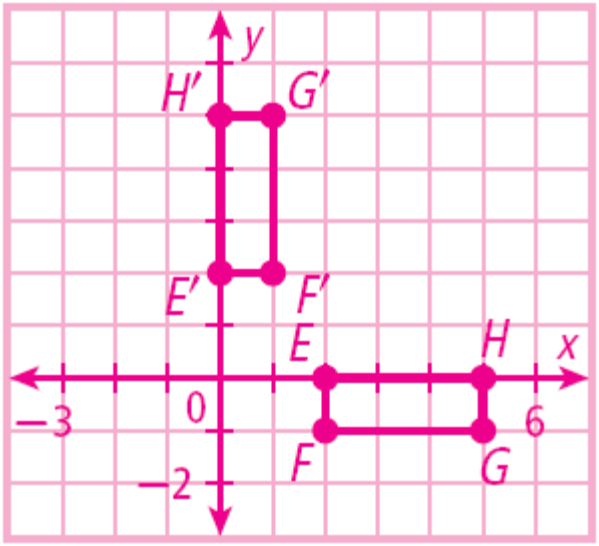


Plot the points. Then use a straightedge to connect the vertices.

The transformation is a reflection across the y-axis because each point and its image are the same distance from the y-axis.

Check It Out! Example 2

A figure has vertices at $E(2, 0)$, $F(2, -1)$, $G(5, -1)$, and $H(5, 0)$. After a transformation, the image of the figure has vertices at $E'(0, 2)$, $F'(1, 2)$, $G'(1, 5)$, and $H'(0, 5)$. Draw the preimage and image. Then identify the transformation.



Plot the points. Then use a straightedge to connect the vertices.

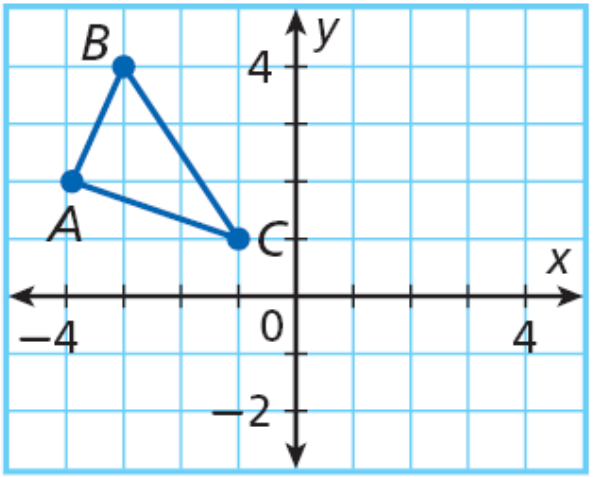
The transformation is a 90° counterclockwise rotation.

Example 3: Translations in the Coordinate Plane

Find the coordinates for the image of ΔABC after the translation $(x, y) \rightarrow (x + 2, y - 1)$. Draw the image.

Step 1 Find the coordinates of ΔABC.

The vertices of ΔABC are $A(-4, 2)$, $B(-3, 4)$, $C(-1, 1)$.



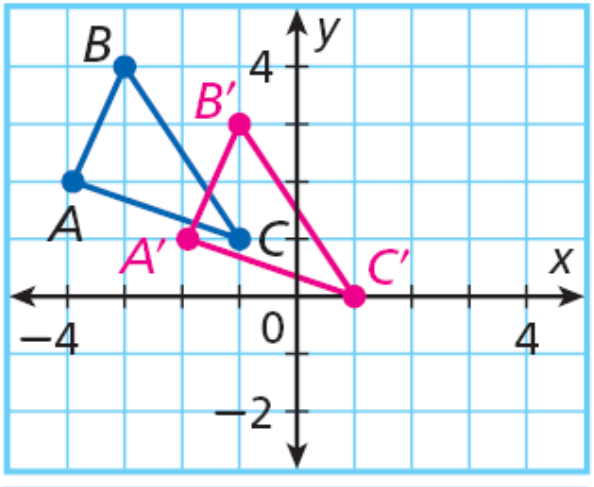
Example 3 Continued

Step 2 Apply the rule to find the vertices of the image.

$A'(-4 + 2, 2 - 1) = A'(-2, 1)$

$B'(-3 + 2, 4 - 1) = B'(-1, 3)$

$C'(-1 + 2, 1 - 1) = C'(1, 0)$



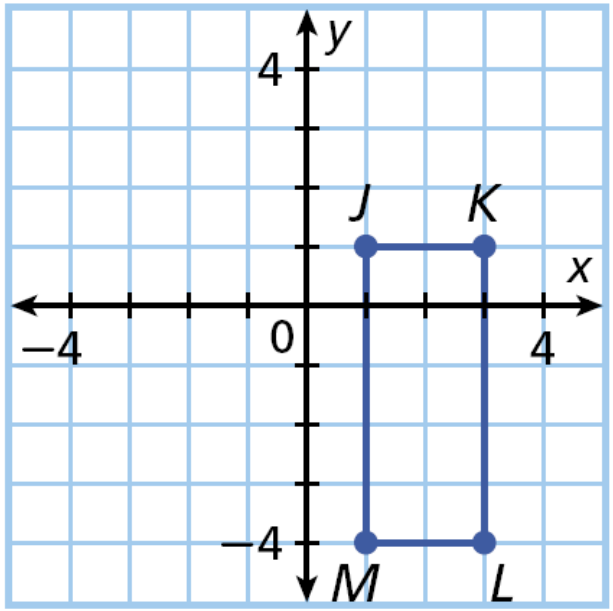
Step 3 Plot the points. Then finish drawing the image by using a straightedge to connect the vertices.

Check It Out! Example 3

Find the coordinates for the image of *JKLM* after the translation $(x, y) \rightarrow (x - 2, y + 4)$. Draw the image.

Step 1 Find the coordinates of *JKLM*.

The vertices of *JKLM* are *J*(1, 1), *K*(3, 1), *L*(3, –4), *M*(1, –4), .

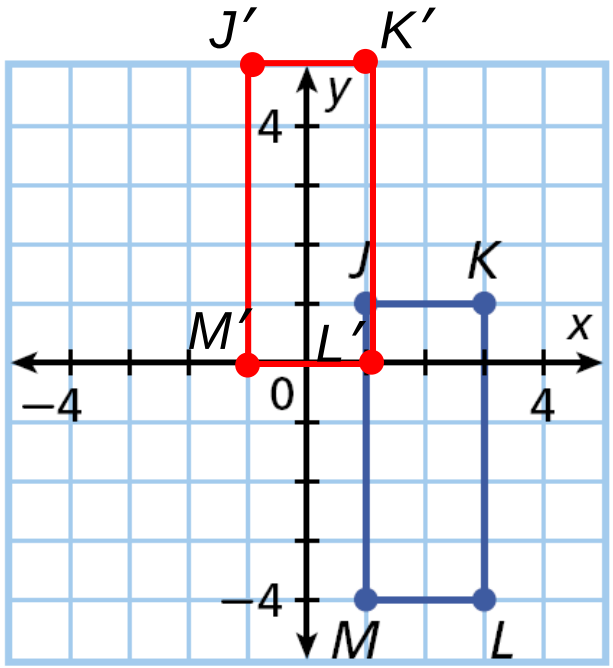


Check It Out! Example 3 Continued

Step 2 Apply the rule to find the vertices of the image.

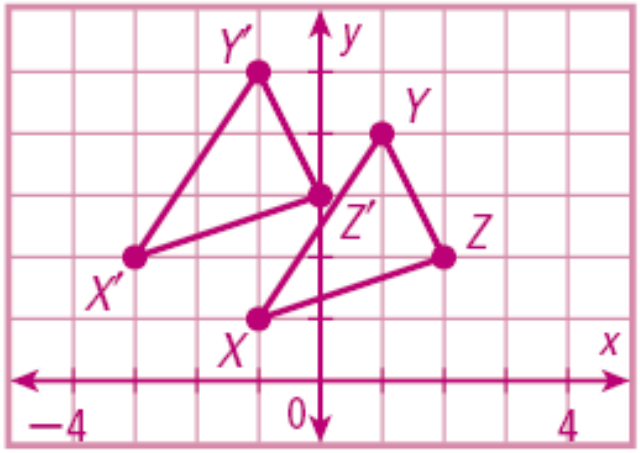
$J'(1 - 2, 1 + 4) = J'(-1, 5)$
$K'(3 - 2, 1 + 4) = K'(1, 5)$
$L'(3 - 2, -4 + 4) = L'(1, 0)$
$M'(1 - 2, -4 + 4) = M'(-1, 0)$

Step 3 Plot the points. Then finish drawing the image by using a straightedge to connect the vertices.



Lesson Quiz: Part I

1. A figure has vertices at $X(-1, 1)$, $Y(1, 4)$, and $Z(2, 2)$. After a transformation, the image of the figure has vertices at $X'(-3, 2)$, $Y'(-1, 5)$, and $Z'(0, 3)$. Draw the preimage and the image. Identify the transformation.

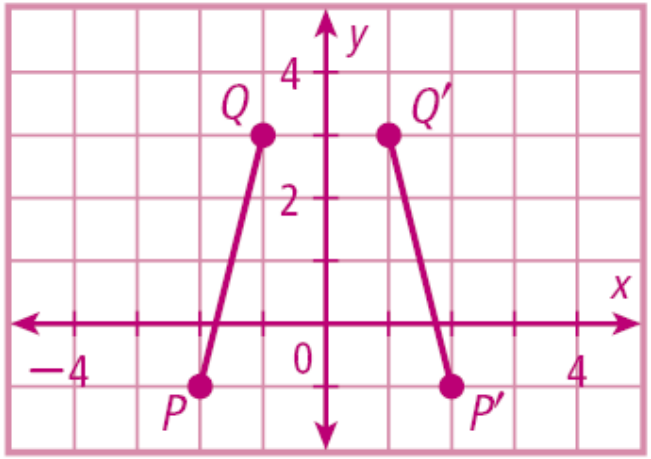


translation

2. What transformation is suggested by the wings of an airplane? **reflection**

Lesson Quiz: Part II

3. Given points $P(-2, -1)$ and $Q(-1, 3)$, draw $\overline{PQ}$ and its reflection across the y-axis.



4. Find the coordinates of the image of $F(2, 7)$ after the translation $(x, y) \rightarrow (x + 5, y - 6)$.

(7, 1)