Objectives

Identify reflections, rotations, and translations.

Graph transformations in the coordinate plane.

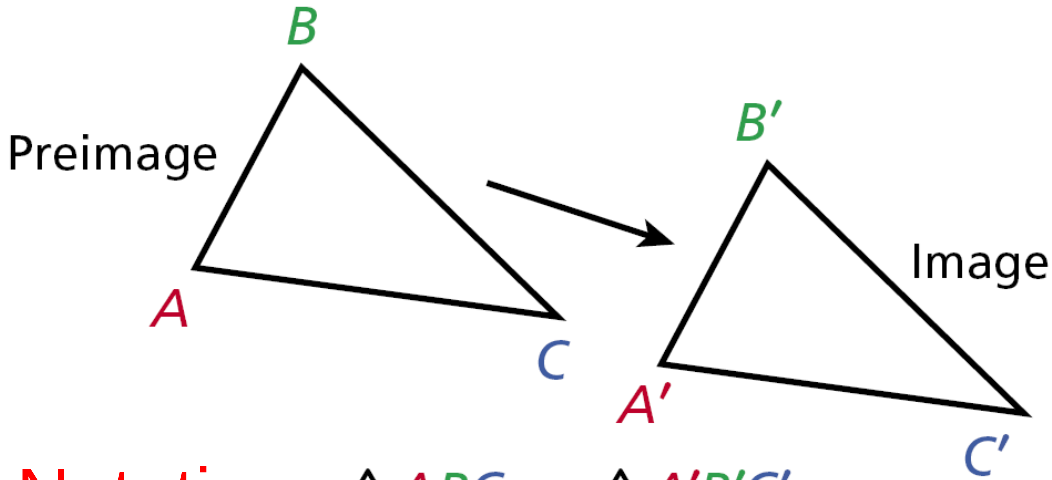
A Transformation is a change in the position, size, or shape of a figure.

The original figure is called the preimage.

The resulting figure is called the image.

A transformation maps the preimage to the image.

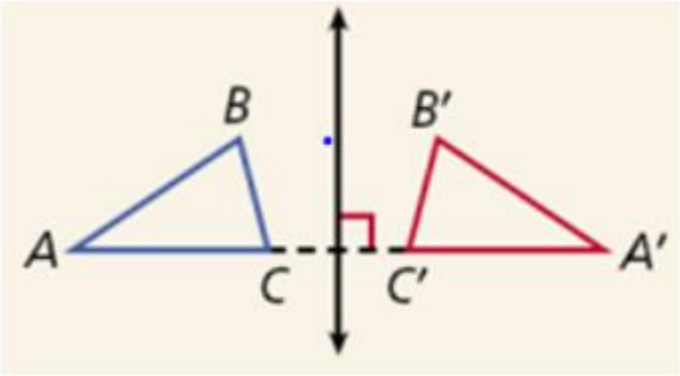
Arrow Notation ($\rightarrow$) is used to describe a transformation, and primes (′) are used to label the image.



Arrow Notation $\triangle ABC \rightarrow \triangle A'B'C'$

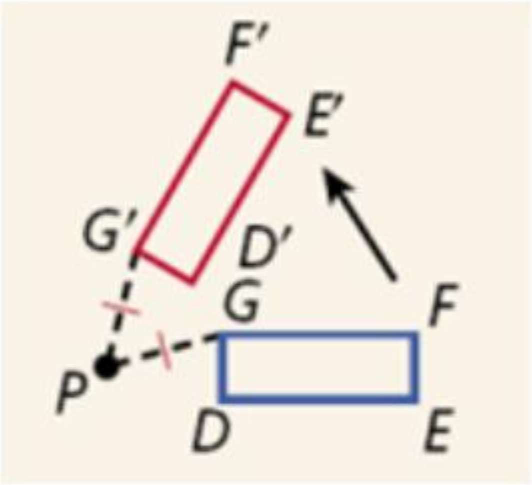
A **reflection** is a ____Flip____ across a line called the line of reflection.

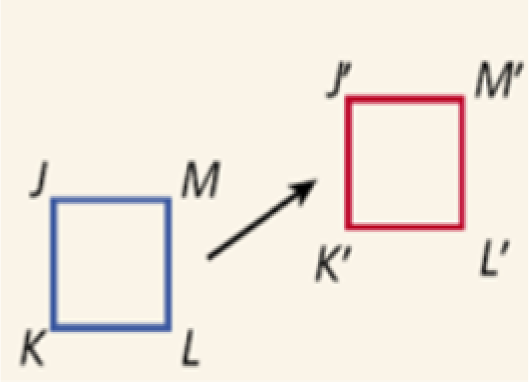
The reflected image is congruent to the original figure. Each point of the pre-image and the image are the __same__ __distance__ from **line of reflection**.



A **Rotation** is a ___turn___ about a fixed point called the point of rotation.

All ___points___ in the image and pre-image are the same distance from the point of rotation.





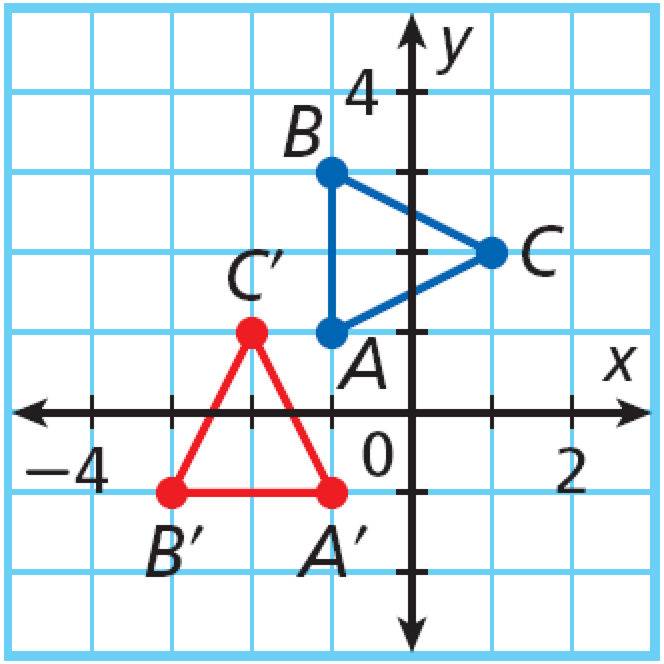
A **translation** is a ____slide____ which all the points move on the same direction the same distance.

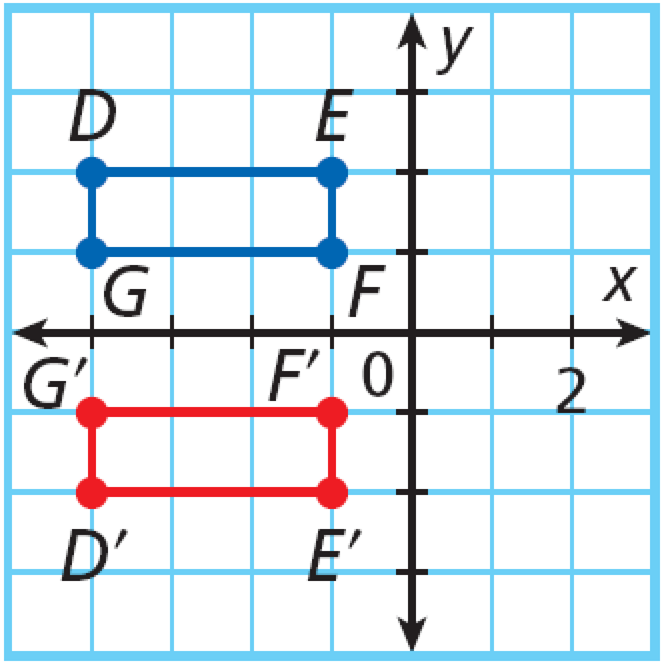
Translations are described by a rule such as
$(x, y) \longrightarrow (x + a, y + b)$.

__add a to the x value__ for the change in position left or right and
__add b to the y value__ for the change in position up and down.

Example 1

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



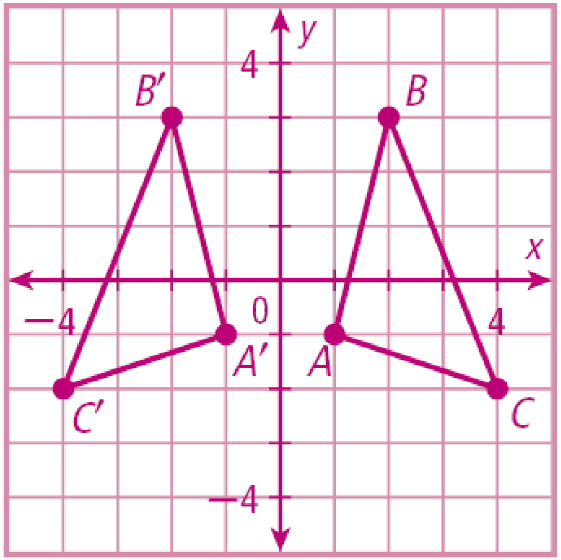


90° rotation,
$\Delta ABC \rightarrow \Delta A'B'C'$

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

Example 2:

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.

Example 3

Find the coordinates for the image of Δ*ABC* after the translation (*x*, *y*) → (*x* + 2, *y* - 1). Draw the image.

Step 1 Find the coordinates of Δ*ABC*.

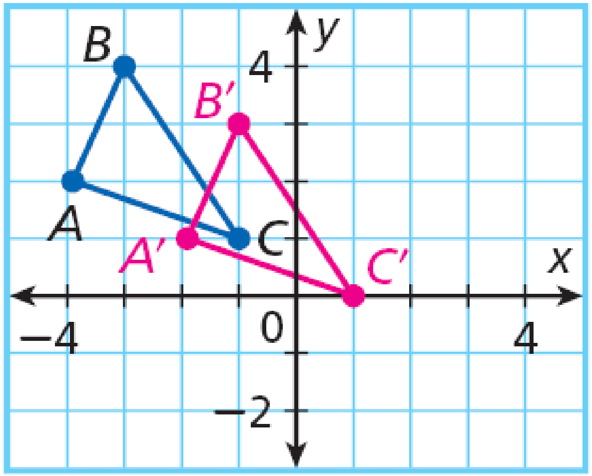
Step 2 Apply the rule

(*x*, *y*) → (x + 2, y - 1)

A(−4, 2) (-4 + 2, 2 - 1) = *A*′(−1, 5)

B(−3, 4) (-3 + 2, 4 - 1) = *B*′(1, 5)

C(−1, 1) (-1 + 2, 1 - 1) = *C*′(1, 0)



Step 3 Plot the points.

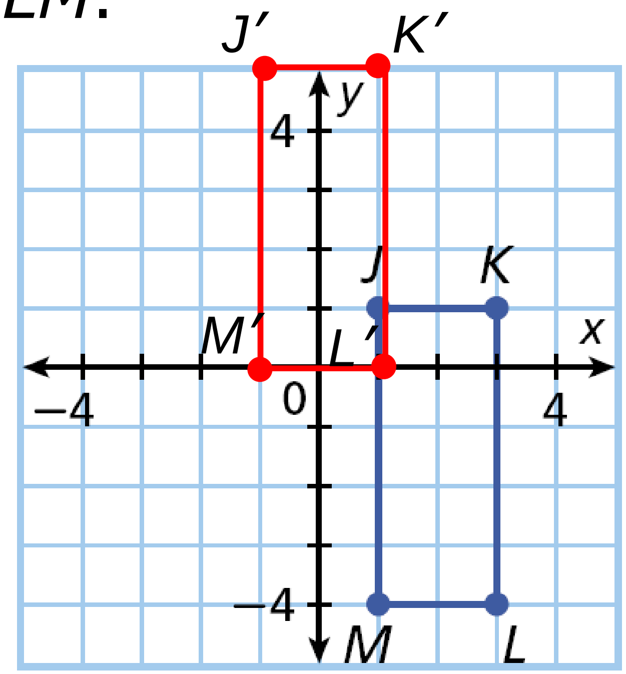
Check It Out! Example 3

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 $J(1, 1)$, $K(3, 1)$, $L(3, -4)$, $M(1, -4)$, .

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

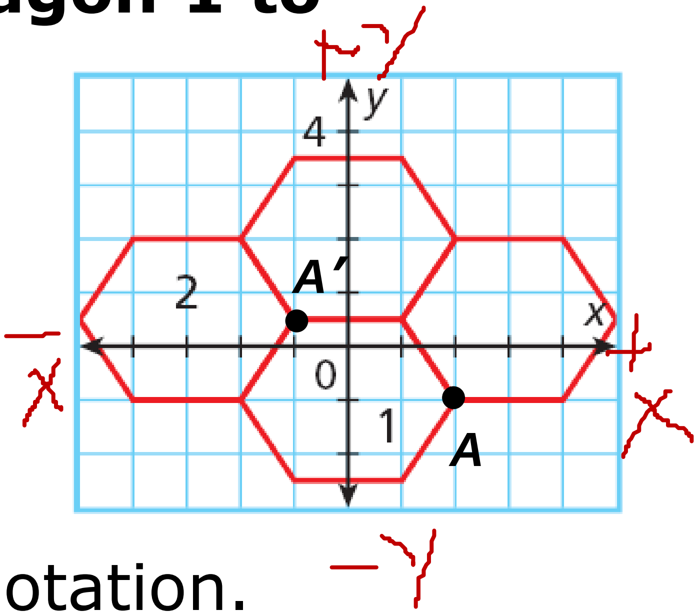
$J'(1 - 2, 1 + 4) = J'(-1, 5)$
$K'(3 - 2, 1 + 4) = K'(1, 5)$
$L'(3 - 2, -4 + 4) = L'(1, 0)$
$M'(1 - 2, -4 + 4) = M'(-1, 0)$



Step 3 Plot the points.

Example 4:

The figure shows part of a tile floor. Write a rule for the translation of hexagon 1 to hexagon 2.



Step 1 Choose two points.

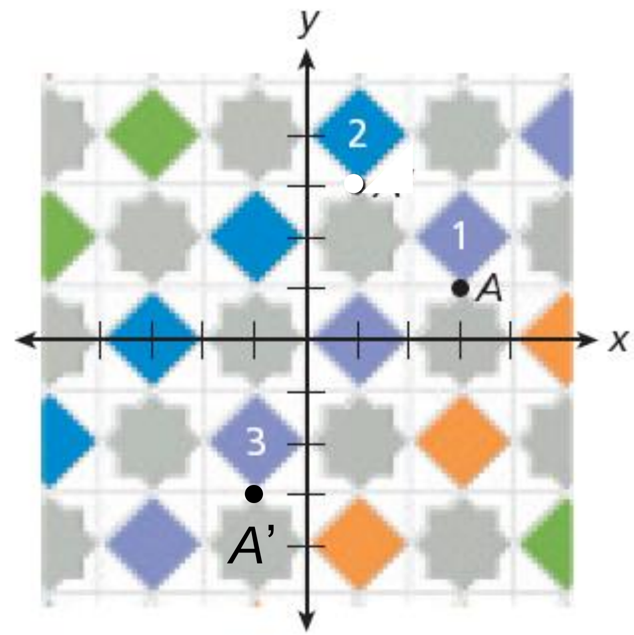
Step 2 Count how many spaces you moved from A to A′ in both the x and y directions.

Step 3 Convert it to coordinate notation.

$$(x, y) \rightarrow (x - 3, y + 1\tfrac{1}{2}).$$

Check It Out! Example 4

Use the diagram to write a rule for the translation of square 1 to squa



Step 1 Choose two points.

A(3, 1) and *A′*(–1, –3).

Step 2 Count spaces from A to A′.

Step 3 Convert it to coordinate notation.

$(x, y) \rightarrow (x - 4, y - 4).$