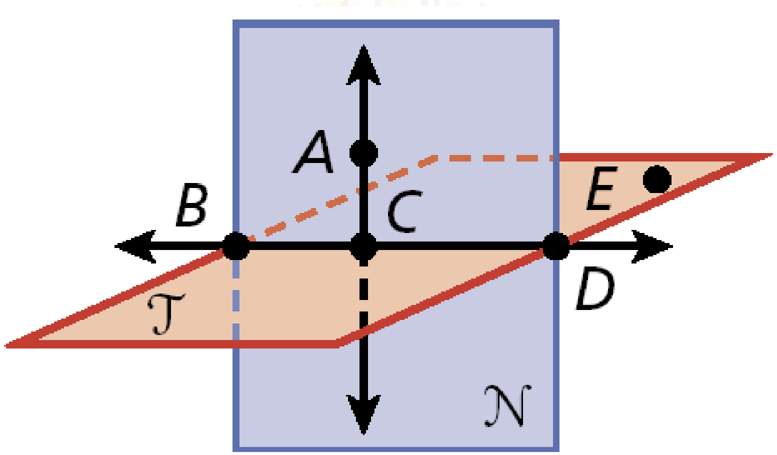
Need Your Textbook (Volume 2)!

- What is the intersection of two planes?

- What about two lines?



TRANSFORMATIONS!!!

Transformations

- A **<u>transformation</u>** is a function that changes the position, size, or shape of a figure.

Preimage and Image

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- The original figure is called the **preimage**.
- The resulting figure is called the **image**.
- A transformation *maps* the preimage to the image.

Transformations are Functions

- A function is a rule that pairs each input (x-value) with exactly one output (y-value).

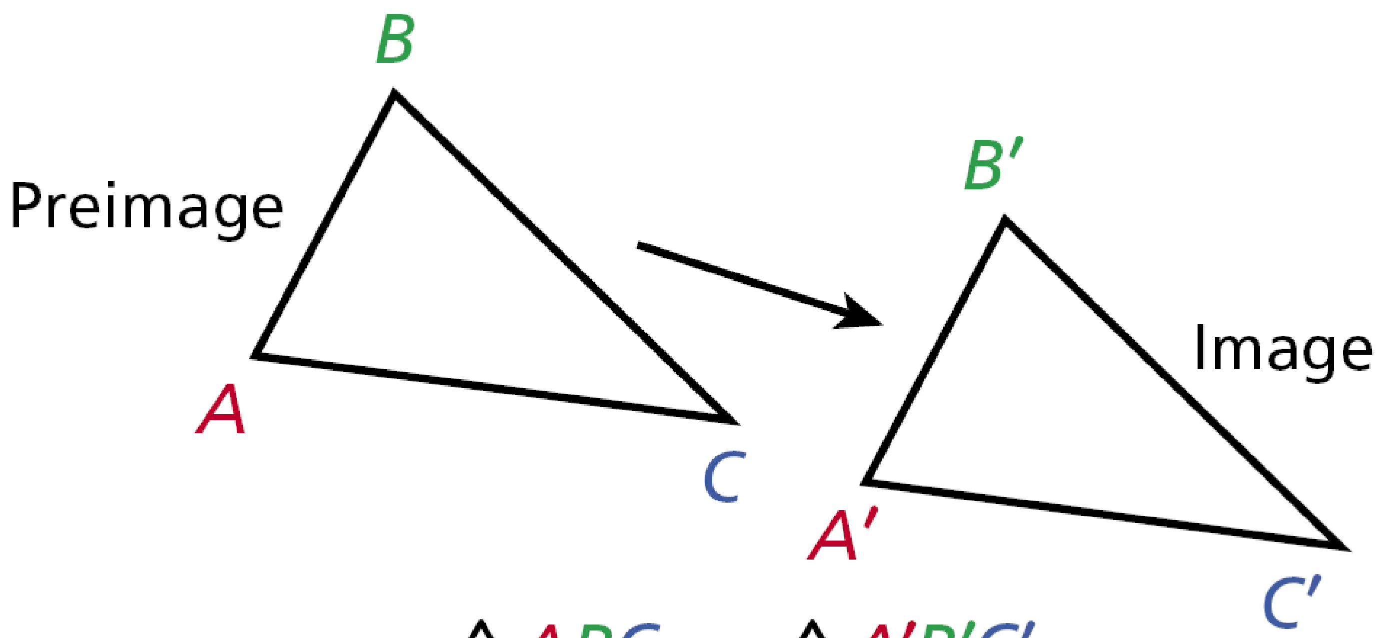
Notation

- There are two types of notation that we use in transformations.
  - Prime Notation
  - Coordinate Notation

Prime Notation

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

You can use prime notation to name the image of a point. Note that a transformation is sometimes called a mapping.



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

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Coordinate Notation:

One way to write a rule for a transformation on a coordinate plane.

The notation uses an arrow to show how the transformation changes the coordinates of a general point. i.e. $(x, y) \rightarrow (x + a, y + b)$.

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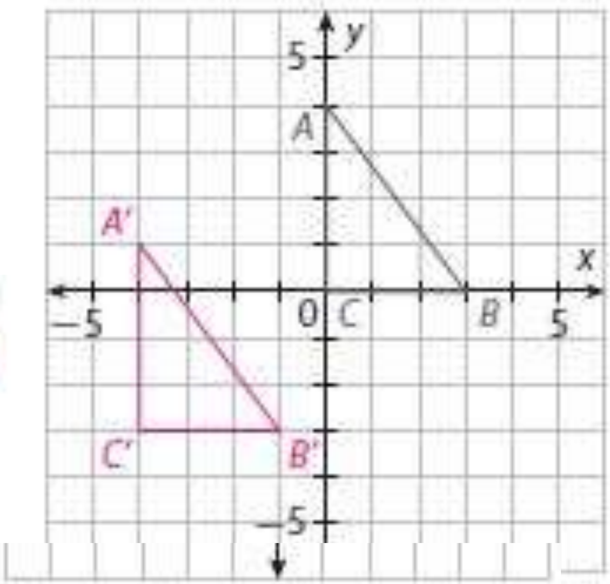
Find the unknown coordinates for each transformation and draw the image. Then complete the description of the transformation and compare the image to its preimage.

A $(x, y) \rightarrow (x - 4, y - 3)$

Preimage (x, y)		Rule $(x, y) \rightarrow (x - 4, y - 3)$		Image $(x - 4, y - 3)$
$A(0, 4)$	$\rightarrow$	$A'(0 - 4, 4 - 3)$	$=$	$A'(-4, 1)$
$B(3, 0)$	$\rightarrow$	$B'(3 - 4, 0 - 3)$	$=$	$B'(-1, -3)$
$C(0, 0)$	$\rightarrow$	$C'(0 - 4, 0 - 3)$	$=$	$C'(-4, -3)$



The transformation is a translation 4 units (left/right)

and 3 units (up/down).

A comparison of the image to its preimage shows that

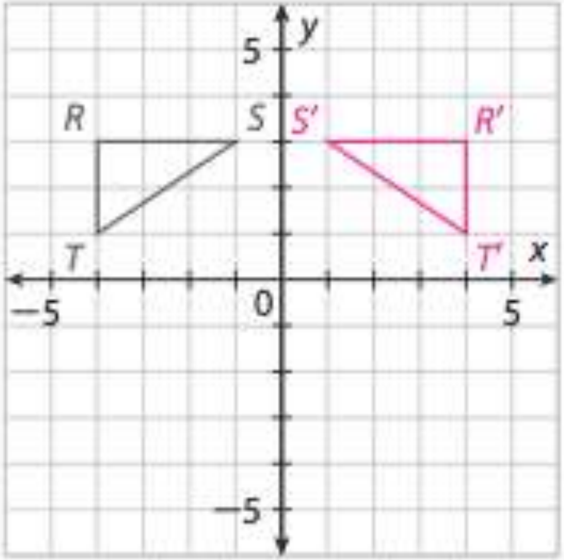
Possible answer: the image is the same size and shape as the preimage

You try!!!

pg. 802 (B, C, 1 and 2)

Ⓑ $(x, y) \rightarrow (-x, y)$

Preimage (x, y)		Rule $(x, y) \rightarrow (-x, y)$		Image $(-x, y)$
$R(-4, 3)$	$\rightarrow$	$R'(-(-4), 3)$	$=$	$R'(4, 3)$
$S(-1, 3)$	$\rightarrow$	$S'(-(-1), 3)$	$=$	$S'(1, 3)$
$T(-4, 1)$	$\rightarrow$	$T'(-(-4), 1)$	$=$	$T'(4, 1)$



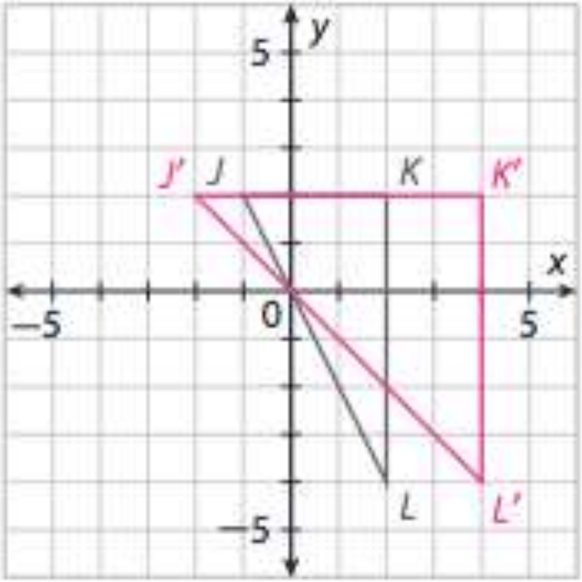
The transformation is a reflection across the (x-axis/y-axis).

A comparison of the image to its preimage shows that

Possible answer: the image is the same size and shape as the preimage, but it is flipped over the *y*-axis

C $(x, y) \to (2x, y)$

Preimage (x, y)		Rule $(x, y) \to (2x, y)$		Image $(2x, y)$
$J(-1, 2)$	$\to$	$J'(2 \cdot -1, 2)$	$=$	$J'(-2, 2)$
$K(2, 2)$	$\to$	$K'(2 \cdot 2, 2)$	$=$	$K'(4, 2)$
$L(2, -4)$	$\to$	$L'(2 \cdot 2, -4)$	$=$	$L'(4, -4)$



The transformation is a (horizontal/vertical) stretch by a factor of 2.

A comparison of the image to its preimage shows that

Possible answer: the image and the preimage are both right triangles, but they do not have the same size or shape.

Reflect

1. **Discussion** How are the transformations in Steps A and B different from the transformation in Step C?
The transformations in Steps A and B preserve the size and shape of the right triangle. The transformation in Step C changes the shape of the right triangle.

2. For each transformation, what rule could you use to map the image back to the preimage?
A. $(x, y) \rightarrow (x + 4, y + 3)$; **B.** $(x, y) \rightarrow (-x, y)$; **C.** $(x, y) \rightarrow (0.5x, y)$

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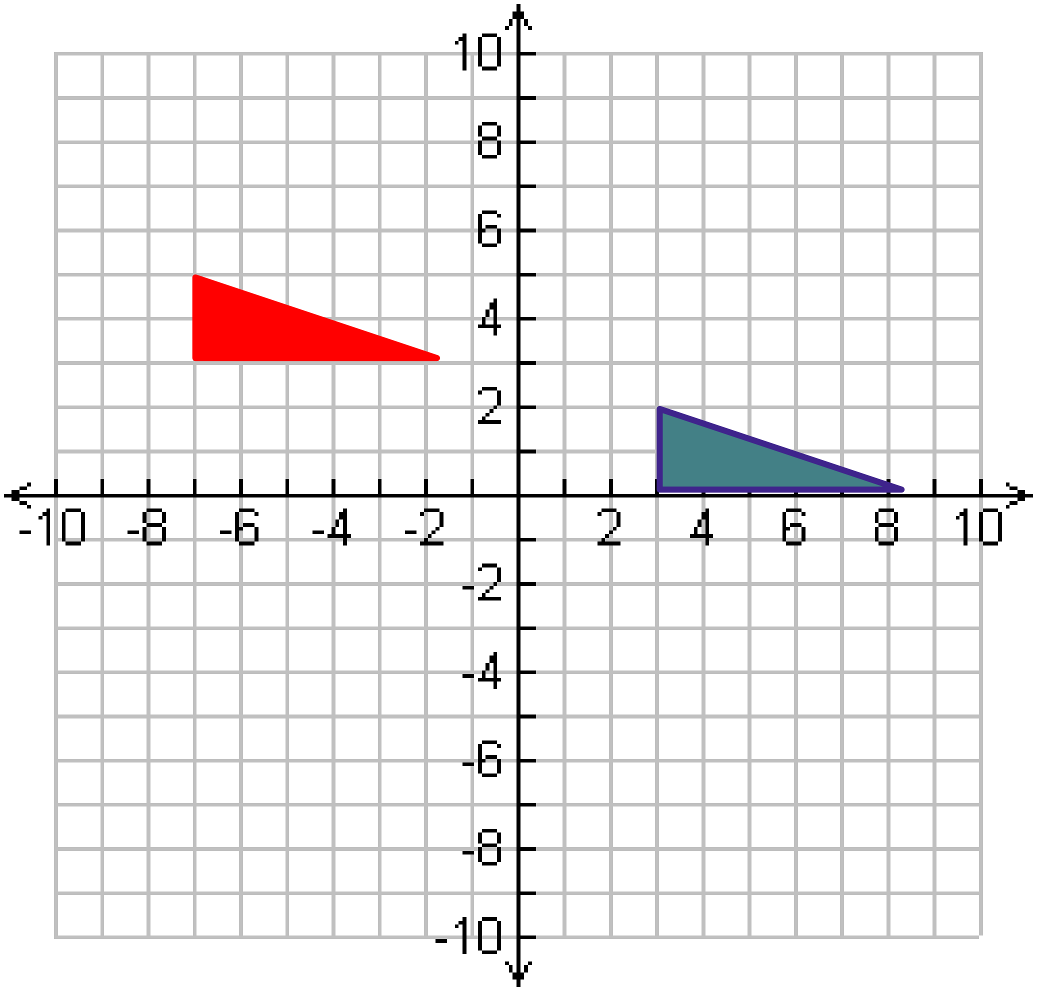
Rigid Motion:
A transformation that changes the position of a figure without changing the size or shape of the figure.
Two figures that have the same size and the same shape are called congruent!

Translations, reflections, and rotations are rigid motions.

Try It Out!

- Graph these triangles on your graphing sheet.
- How can we prove they are congruent?
- Find the lengths of all of the sides.
- Find all of the angle measures



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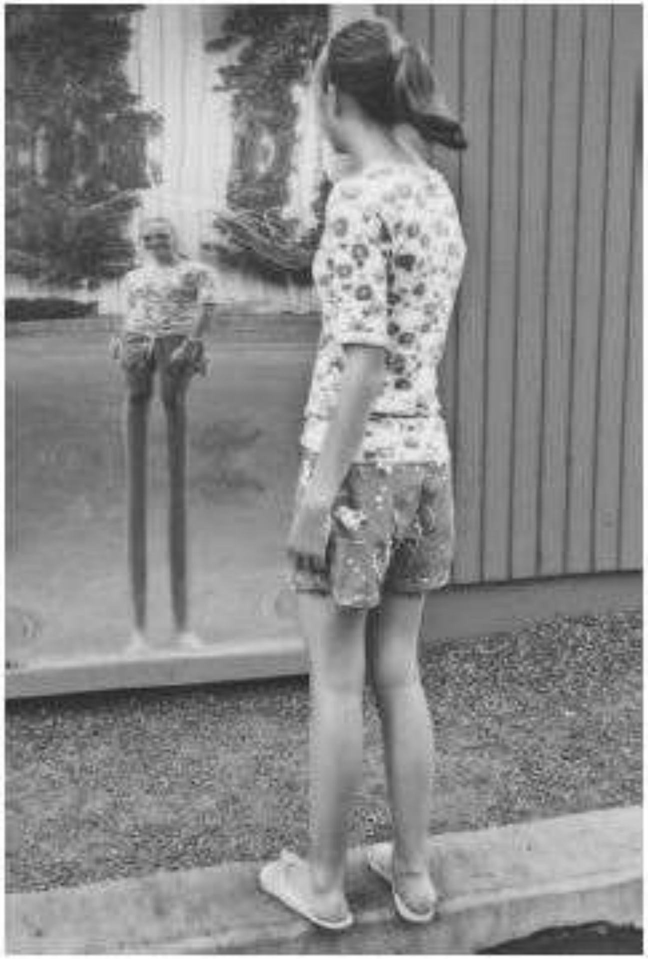
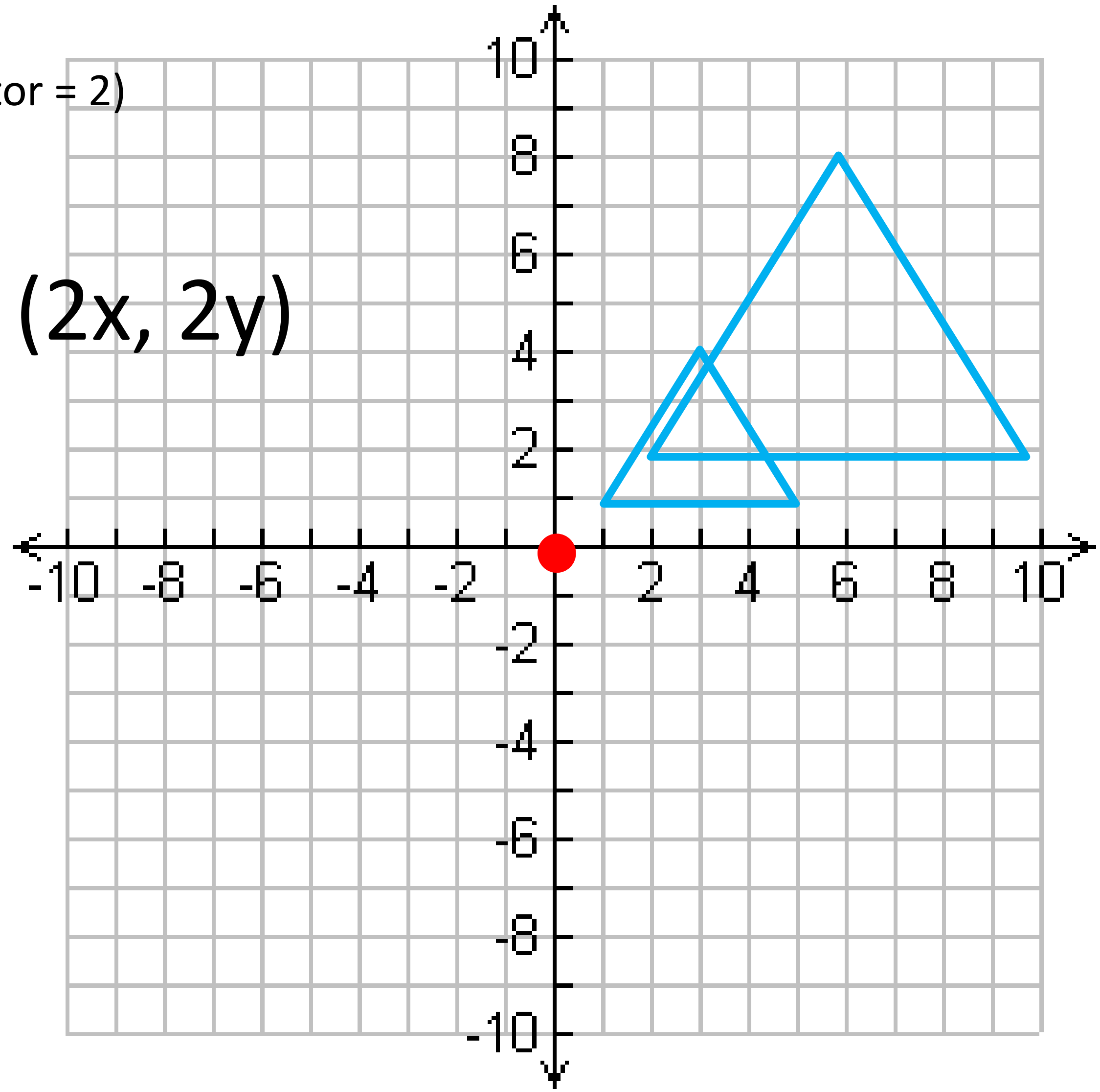
<u>Nonrigid Motions:</u>
Transformations that stretch or compress figures are not rigid motions because they do not preserve distance.



Dilations are Non-Rigid transformations

(Scale factor = 2)

$(x, y) \rightarrow (2x, 2y)$



Homework

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