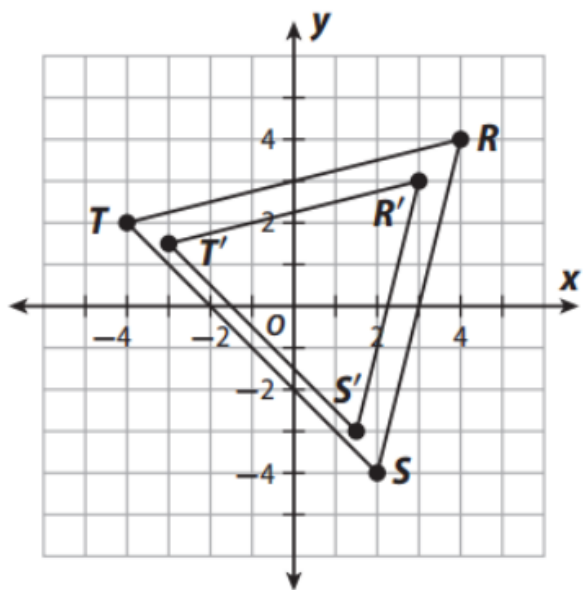


Use triangles RST and $R'S'T'$ to answer the questions.



1. For each pair of corresponding vertices, find the ratio of the x-coordinates.
2. For each pair of corresponding vertices, find the ratio of the y-coordinates.
3. What is the ratio of the lengths of the corresponding sides of triangle RST and $R'S'T'$? Explain how you know.
4. What is the scale factor of the dilation? Is it an enlargement or a reduction?

10.2 Algebraic Representations of Dilations

Common Core Standard

8.G.3

Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.

Vocabulary

- enlargement - dilation producing a larger figure
↳ Scale factor is greater than 1
- reduction - dilation producing a smaller figure
↳ Scale factor less than 1
- Scale factor - describes how much the figure is enlarged or reduced

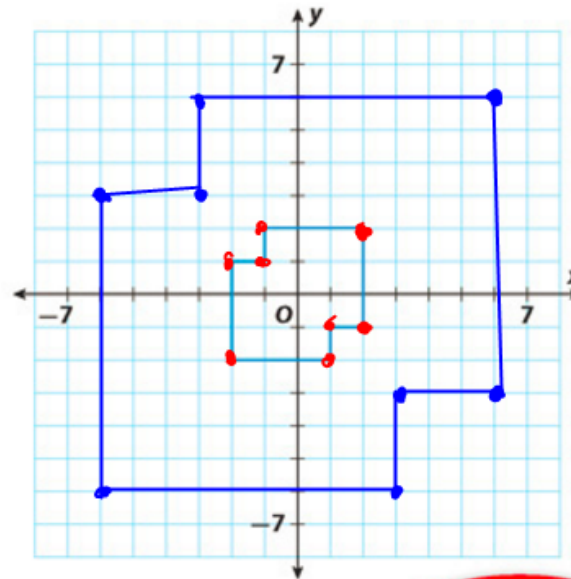
EXPLORE ACTIVITY 1



The figure shown on the grid is the preimage. The center of dilation is the origin.

- A** List the coordinates of the vertices of the preimage in the first column of the table.

Preimage (x, y)	Image (3x, 3y)
(2, 2)	(6, 6)
(2, -1)	(6, -3)
(1, -1)	(3, -3)
(1, -2)	(3, -6)
(-2, -2)	(-6, -6)
(-2, 1)	(-6, 3)
(-1, 1)	(-3, 3)
(-1, 2)	(-3, 6)



Dilation Calculation

$$(X, y) \rightarrow (kx, ky)$$

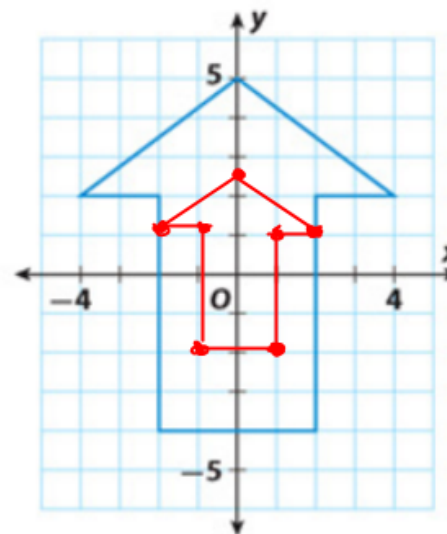
where k is the
Scale factor

EXPLORE ACTIVITY 2

The arrow shown is the preimage. The center of dilation is the origin.

- A** List the coordinates of the vertices of the preimage in the first column of the table.
- B** What is the scale factor for the dilation? $\frac{1}{2}$
- C** Apply the dilation to the preimage and write the coordinates of the vertices of the image in the second column of the table.
- D** Sketch the image after the dilation on the coordinate grid.

Preimage (x, y)	Image $(\frac{1}{2}x, \frac{1}{2}y)$
(4, 2)	(2, 1)
(2, 2)	(1, 1)
(0, 5)	(0, 2.5)
(-2, 2)	(-1, 1)
(-4, 2)	(-2, 1)
(-2, -4)	(-1, -2)
(2, -4)	(1, -2)



EXAMPLE 1

Graph the image of $\triangle ABC$ after a dilation with the origin as its center and a scale factor of 3. What are the vertices of the image?

STEP 1

Find the coordinates for your
Preimage $\triangle ABC$

$$A(1,1)$$

$$B(3,1)$$

$$C(1,3)$$

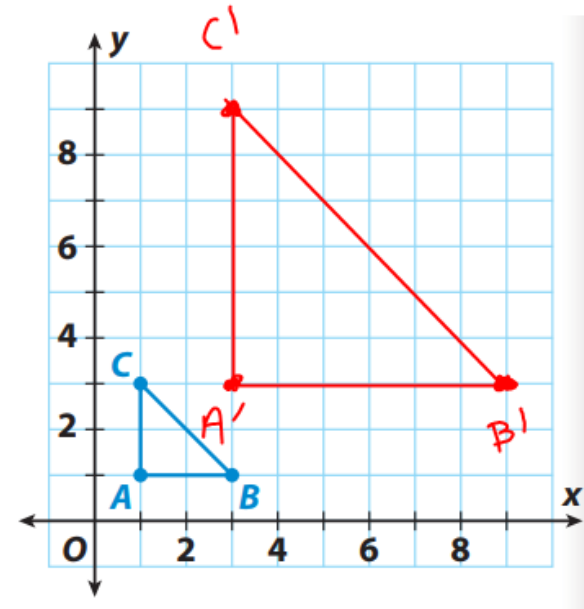
STEP 2

Multiply preimage coordinates by
Scale factor, then graph

$$A(1,1) \rightarrow A'(3 \times 1, 3 \times 1) \rightarrow A'(3,3)$$

$$B(3,1) \rightarrow B'(3 \times 3, 3 \times 1) \rightarrow B'(9,3)$$

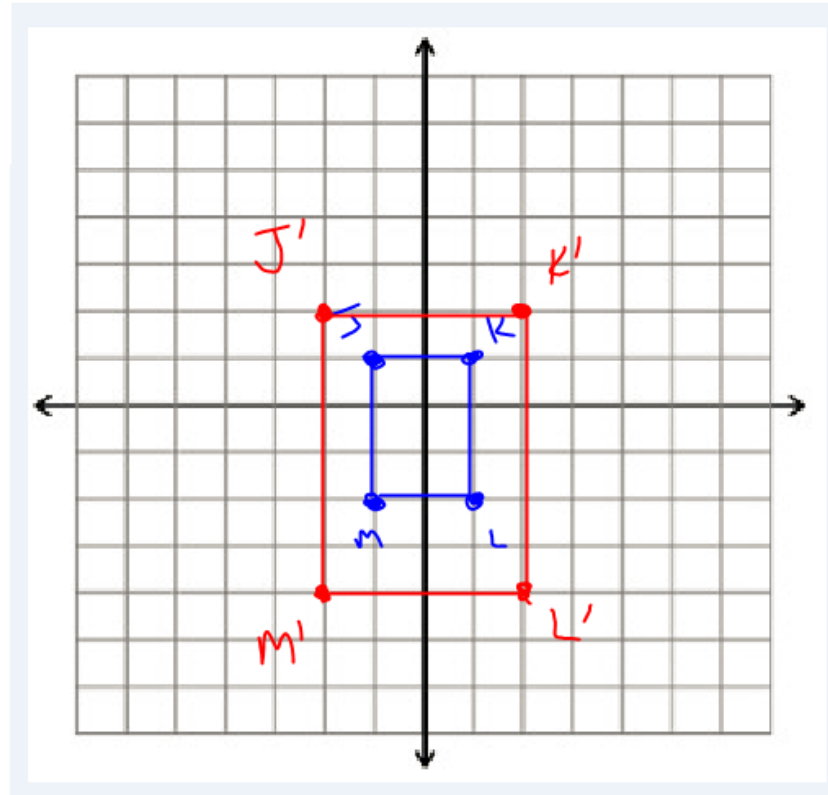
$$C(1,3) \rightarrow C'(3 \times 1, 3 \times 3) \rightarrow C'(3,9)$$



ADDITIONAL EXAMPLE 1

Graph the image of rectangle $JKLM$ after a dilation with the origin as its center and a scale factor of 2. What are the vertices of the image?

$J(-1,1)$	$J'(-2,2)$
$K(1,1)$	$K'(2,2)$
$L(1,-2)$	$L'(2,-4)$
$M(-1,-2)$	$M'(-2,-4)$

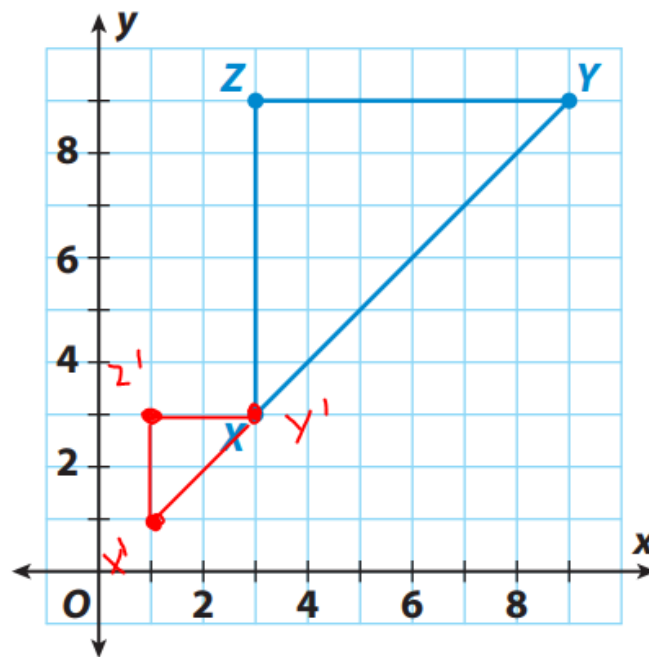


YOUR TURN

$$\frac{3}{1} \times \frac{1}{3} = \frac{3}{3} = 1$$

5. Graph the image of $\triangle XYZ$ after a dilation with a scale factor of $\frac{1}{3}$ and the origin as its center. Then write an algebraic rule to describe the dilation.

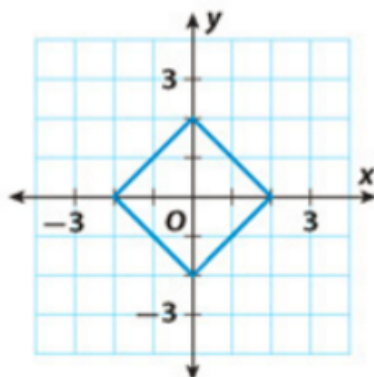
$$\begin{array}{ll} X(3,3) & X'(1,1) \\ Y(9,9) & Y'(3,3) \\ Z(3,9) & Z'(1,3) \end{array}$$



Guided Practice

1. The grid shows a diamond-shaped preimage. Write the coordinates of the vertices of the preimage in the first column of the table. Then apply the dilation $(x, y) \rightarrow \left(\frac{3}{2}x, \frac{3}{2}y\right)$ and write the coordinates of the vertices of the image in the second column. Sketch the image of the figure after the dilation. ([Explore Activities 1 and 2](#))

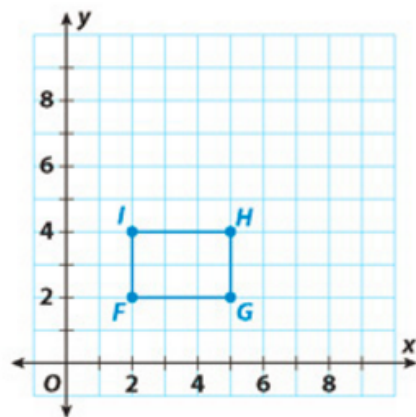
Preimage	Image
(2, 0)	(3, 0)



Graph the image of each figure after a dilation with the origin as its center and the given scale factor. Then write an algebraic rule to describe the dilation.

(Example 1)

2. scale factor of 1.5



3. scale factor of $\frac{1}{3}$

