# Geometry Lesson 84

Objective: TSW identify and use dilations.

A dilation is a transformation that changes the size of a figure but not its shape. The multiplier used on each dimension of a figure to change it into a similar figure is the scale factor.

Dilations - A dilation maps a figure to a similar figure.

A dilation that results in an image smaller than its preimage is called a _____ or a contraction.

A dilation that results in an image larger than its preimage is called an _____ or an expansion.
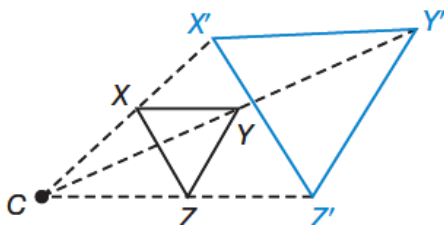
Dilations require a center and a scale factor. The center of dilation is the intersection of lines that connect each point of the image with the corresponding point of the preimage.

In the diagram, ΔXYZ a scale factor of 2, with the center of dilation C to create the image $\Delta X'Y'Z'$.

Example 1 Enlarging by Dilation

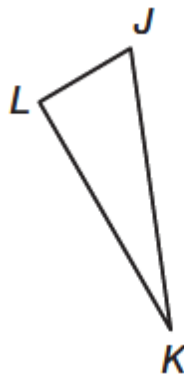Find the image of $\overline{AB}$ after a dilation with a scale factor of 2 and center C.

SOLUTION
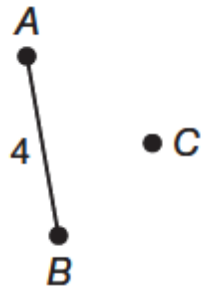
Example 2 Contracting by Dilation

Apply a dilation to ΔJKL using a scale factor of $\frac{1}{2}$ and center C.

SOLUTION

Hint

When a dilation is applied, it also affects the figure's distance from the center of dilation. For example, if a dilation of scale factor 2 is applied to a single point that is 3 units from the origin, the image will be 6 units from the origin.

The scale factor can be used to find the coordinates of an image after a dilation. The notation $D_{O,k}$ indicates a dilation that is centered at the origin O of the coordinate plane and that has a scale factor of k. In mapping notation, $D_{O,k}(x,y) \rightarrow (kx, ky)$.

Example 3 Dilating on the Coordinate Plane

Triangle DEF has vertices located at $D(4, 6)$, $E(6, 2)$, and $F(2, 4)$. Graph the image after a dilation centered at the origin and with a scale factor of $\frac{1}{2}$.

SOLUTION
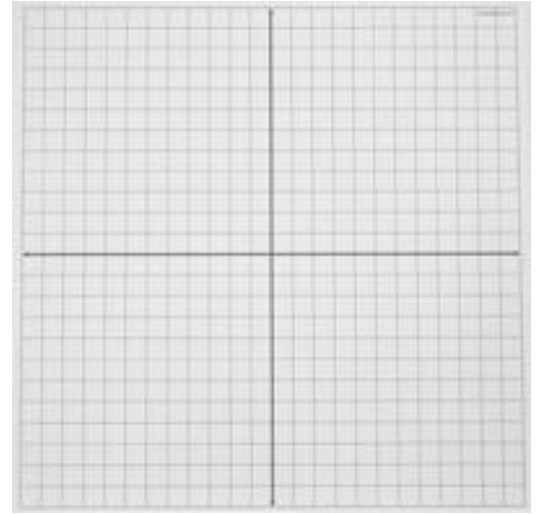
Example 4 Application: Photocopiers

A student wants to scan and enlarge a piece of art that is 6 inches by 8 inches. If the student selects the 150% enlargement function, what will the lengths of the sides of the copy be? How does the perimeter of the original art compare to the perimeter of the copy?
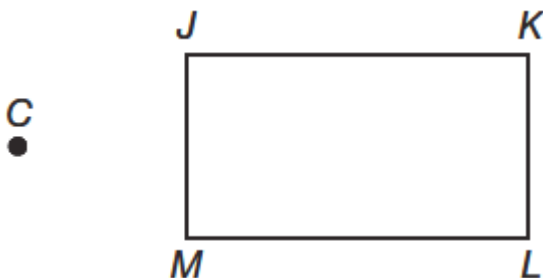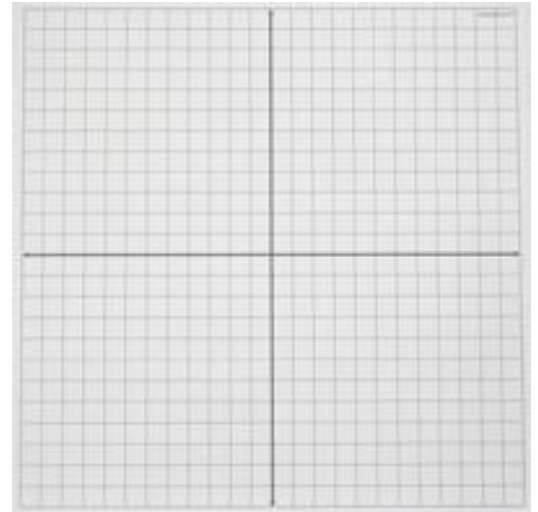
SOLUTION

You Try!!!!

a.Apply a dilation to ΔQRS using a scale factor of 3 and center C.
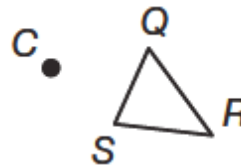
b.Apply a dilation to rectangle $JKLM$ using a scale factor of $\frac{1}{2}$ and center C.

c.Triangle *MNP* has vertices *M*(-2, 1), *N*(-1, -2), and *P*(-3, -2). Apply a dilation with the center at the origin of the coordinate plane and a scale factor of 3.

d.Architecture An architect is drawing plans for a building. The drawing for the front of the building is 4 feet long by 2.5 feet high. If the drawing is a reduction by a scale factor of $\frac{1}{20}$, what will the actual dimensions of the front of the building be? How do the areas of the drawing and the building compare?