Transformations on the Coordinate Plane: Dilations

A **dilation** is a type of transformation that changes the size of a figure without changing its shape. This results in an image that is similar to the preimage. Figures are dilated from a fixed point, called the *center of dilation*. When dilating a figure centered at the origin, here is a rule to help you find the coordinates of the image:

Rule: $(x, y) \mapsto (kx, ky)$

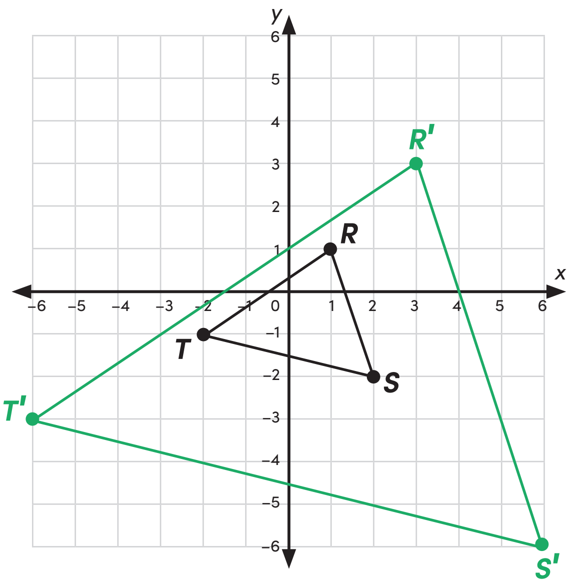
- When $k > 1$, the dilation is an *enlargement*, and the image is larger than the preimage.
- When $0 < k < 1$, the dilation is a *reduction*, and the image is smaller than the preimage.

Note: k is the *scale factor*, which is the ratio of a side length in the image to the corresponding side length in the preimage.

Dilating a Figure: Dilate $\triangle RST$ with a scale factor of **3**, centered at the origin. What are the coordinates of the image?

$R(1, 1)$	$\mapsto$	$R'(3 \cdot 1, 3 \cdot 1)$	=	$R'(3, 3)$
$S(2, -2)$	$\mapsto$	$S'(3 \cdot 2, 3 \cdot (-2))$	=	$S'(6, -6)$
$T(-2, -1)$	$\mapsto$	$T'(3 \cdot (-2), 3 \cdot (-1))$	=	$T'(-6, -3)$

The coordinates of the image are $R'(3, 3)$, $S'(6, -6)$, and $T'(-6, -3)$.



Describing a Dilation: The rectangle *E'F'G'H'* is a dilation of the rectangle *EFGH*, centered at the origin. Identify the type of dilation and the scale factor.

The **image** is smaller than the **preimage**, so the dilaton is a reduction.

$\overline{E'H'}$ is 3 units long, and $\overline{EH}$ is 6 units long. The ratio of $\overline{E'H'}$ to the corresponding side length, $\overline{EH}$, is $\frac{3}{6}$ or $\frac{1}{2}$.

The scale factor is $\frac{1}{2}$ or 0.5.