

Name: Key

Class: _____

M8-U3: Notes# 3 – Dilations

Date: _____

Dilation - transformation that produces an image that is the same shape as the original but not the same size.

- A dilation is similar to the original figure.
- Dilations are centered around the origin (0, 0), unless otherwise stated.

Scale factor - is $\frac{\text{image length}}{\text{pre-image length}}$, which is a ratio.

- If the scale factor is greater than 1, the figure becomes larger.
- If the scale factor is between 0 and 1, the figure becomes smaller.

Rule: $(x, y) \rightarrow (fx, fy)$ where f represents the scale factor.

Example 1: If the scale factor is 3, how would you write the rule?

$$(x, y) \rightarrow (3x, 3y)$$

Example 2:

Triangle ABC has vertices $A(0, 2)$, $B(4, 4)$, and $C(-1, 4)$.

What are the vertices of its *image* with a scale factor of 4?

$$A(0, 2) \rightarrow A'(0, 8)$$

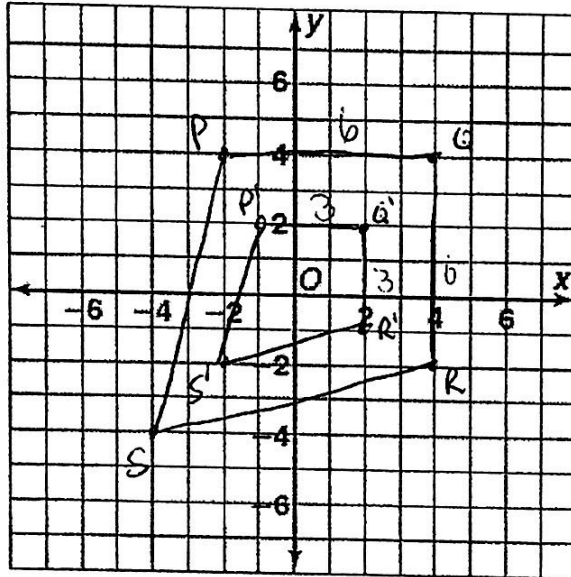
$$B(4, 4) \rightarrow B'(16, 16)$$

$$C(-1, 4) \rightarrow C'(-4, 16)$$

Example 3:

Quadrilateral $PQRS$ has vertices $P(-2, 4)$, $Q(4, 4)$, $R(4, -2)$, and $S(-4, -4)$. It is dilated by a scale factor of $\frac{1}{2}$.

- a) What are the coordinates of the image? Graph them.



$$(x, y) \rightarrow \left(\frac{x}{2}, \frac{y}{2}\right)$$

$$P(-2, 4) \rightarrow P'(-1, 2)$$

$$Q(4, 4) \rightarrow Q'(2, 2)$$

$$R(4, -2) \rightarrow R'(2, -1)$$

$$S(-4, -4) \rightarrow S'(-2, -2)$$

- b) Demonstrate these quadrilaterals are similar by comparing the ratios of the lengths.

$$\frac{6}{3} = 2 \quad \text{or} \quad \frac{3}{6} = \frac{1}{2}$$

From small
to large (>1)

$\frac{\text{large}}{\text{small}}$

From large to
small (<1)

$\frac{\text{small}}{\text{large}}$

- c) What do you notice about the angle measurements of the two figures?

They are the same size

... so just because you make it bigger or smaller
the angles don't change.

Example 4:

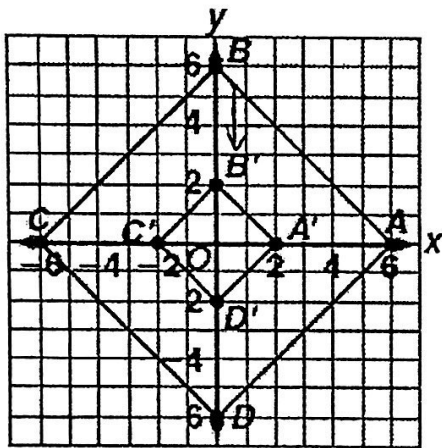
If the scale factor is $\frac{5}{2}$, how would you write the general rule?

Is this an enlargement or a reduction?

$$(x, y) \rightarrow \left(\frac{5}{2}x, \frac{5}{2}y\right)$$

Example 5:

Quadrilateral $A'B'C'D'$ is a dilation of quadrilateral $ABCD$. Find the scale factor. Classify the dilation as an enlargement or a reduction.



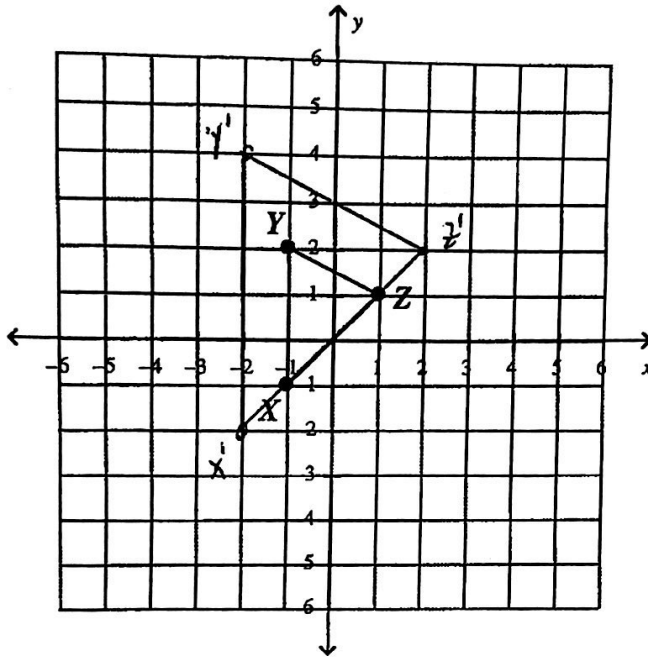
it got smaller

$$A(6,0) \rightarrow A'(2,0)$$

the scale factor
must be $\frac{1}{3}$.

Example 6:

Triangle XYZ is graphed below. Draw and label Triangle X'Y'Z' after a dilation using a scale factor of two.



$$\begin{aligned} & \times (x, y) \rightarrow (2x, 2y) \\ \circledR & X(-1, 1) \rightarrow X'(-2, 2) \\ \circledR & Y(-1, 2) \rightarrow Y'(-2, 4) \\ \circledR & Z(1, 1) \rightarrow Z'(2, 2) \end{aligned}$$

What will be the coordinates of point Y'' after a reflection of polygon X'Y'Z' over the x-axis?

\circledR Answer $Y''(-2, -4)$