

Similarity and Transformations

Lesson Objective | WBAT ~~the~~ perform and describe similarity transformations

A dilation is a transformation that preserves shape but NOT size.
 → So, a dilation is a nonrigid motion.

A similarity transformation is a dilation OR a composition of rigid motions and dilations.

Similar Figures Two geometric figures are similar figures if and only if there is a similarity transformation that maps one of the figures onto the other.

→ Similar figures ALWAYS have the same shape, but *not necessarily the same size*.

Congruence transformations preserve length and angle measure.

Think About It... If a dilation has a scale factor, k , what are the value(s) for k so that the dilation is ALSO a congruence transformation?

$$k = 1 \quad \text{or} \quad k = -1 \quad \leftarrow \text{rotates } 180^\circ$$

→ So, when the scale factor of the dilation(s) is NOT equal to 1 or -1, similarity transformations preserve angle measure ONLY.

Examples

- Graph $\triangle ABC$ with vertices $A(-4, 1)$, $B(-2, 2)$ and $C(-2, 1)$ and its image after the similarity transformation:

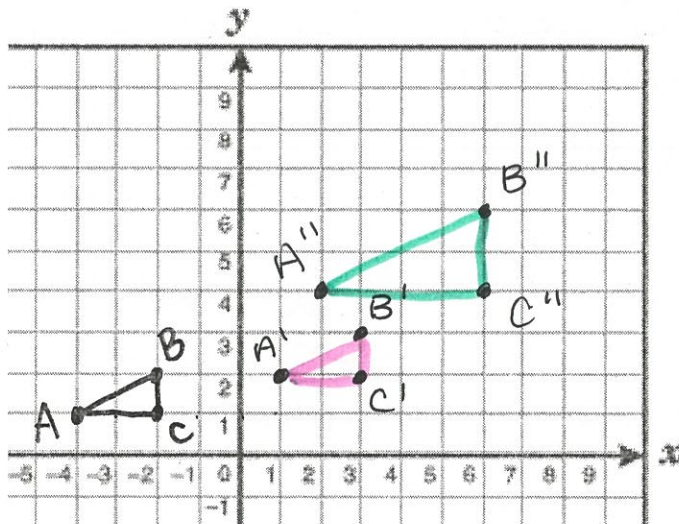
Translation: $(x, y) \rightarrow (x + 5, y + 1)$

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

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

$$B(-2, 2) \rightarrow B'(3, 3) \rightarrow B''(6, 6)$$

$$C(-2, 1) \rightarrow C'(3, 2) \rightarrow C''(6, 4)$$



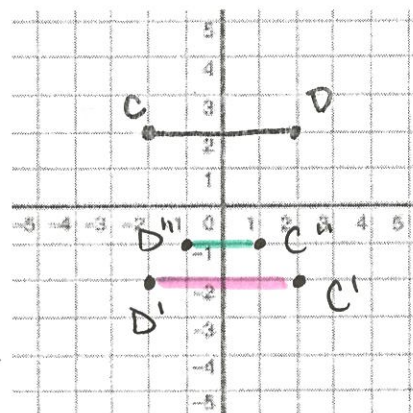
2. Graph $\overline{CD}$ with vertices $C(-2, 2)$ and $D(2, 2)$ and its image after the similarity transformation:

Rotation: 180° about the origin $(x, y) \rightarrow (-x, -y)$

Dilation: $(x, y) \rightarrow (\frac{1}{2}x, \frac{1}{2}y)$

$$C(-2, 2) \rightarrow C'(2, -2) \rightarrow C''(1, -1)$$

$$D(2, 2) \rightarrow D'(-2, -2) \rightarrow D''(-1, -1)$$



3. Describe a similarity transformation that maps trapezoid PQRS to trapezoid WXYZ.

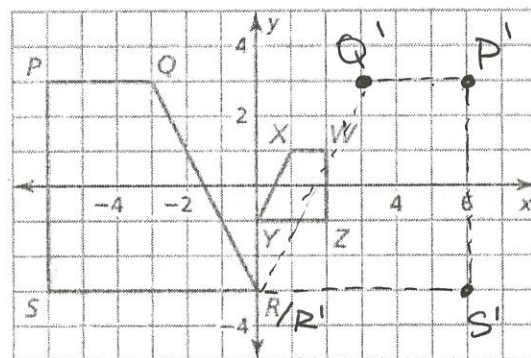
① reflect in y-axis
② dilate w/ $k = \frac{1}{3}$

$$Q'(3, 3) \rightarrow X(1, 1)$$

$$P'(6, 3) \rightarrow W(2, 1)$$

$$S'(6, -3) \rightarrow Z(2, -1)$$

$$R'(0, -3) \rightarrow Y(0, -1)$$



4. Describe a similarity transformation that maps quadrilateral DEFG to quadrilateral STUV.

① rotate 180° about origin
② dilate w/ $k = \frac{1}{2}$

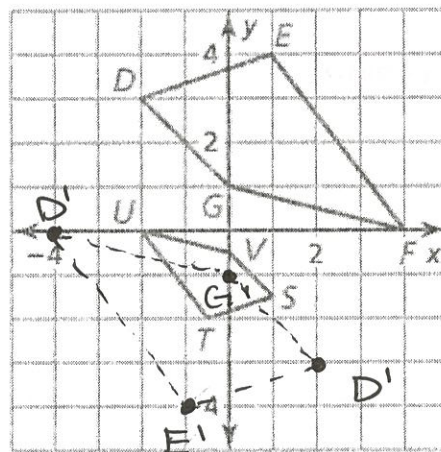
$$F'(-4, 0) \rightarrow U(-2, 0)$$

$$E'(-1, -4) \rightarrow T(-\frac{1}{2}, -2)$$

$$D'(2, -3) \rightarrow S(1, -1.5)$$

$$G'(0, -1) \rightarrow V(0, -0.5)$$

dilate w/ $k = -\frac{1}{2}$



5. Determine whether the polygons are similar. Use transformations to explain your reasoning.

translate $(x, y) \rightarrow (x+5, y-4)$

but then only 3 of 4 points match ($F \neq N$)

So, the polygons are not similar.

