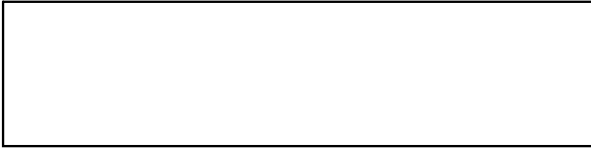


Geometry
11.1 Dilations

A DILATION is:



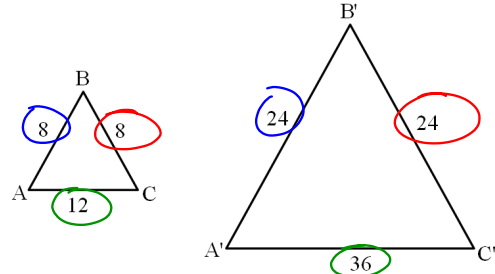
Coordinate Notation for a Dilation

You can describe a dilation with respect to the origin with the notation $(x, y) \rightarrow (kx, ky)$, where k is the scale factor.

If $0 < k < 1$, the dilation is a **reduction**. If $k > 1$, the dilation is an **enlargement**.

***** Remember that the scale factor for a dilation is always from **image to preimage**. So the primes go on top and the originals go on bottom.

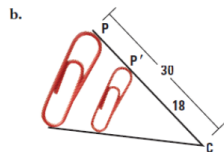
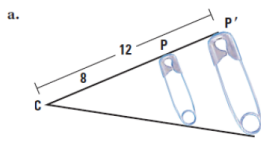
Find the scale factor from triangle ABC to triangle A'B'C'.



Scale Factor: $\frac{24}{8} = \boxed{3}$
 $\frac{24}{8} = 3$ $\frac{36}{12} = 3$

EXAMPLE 1 Identify dilations

Find the scale factor of the dilation. Then tell whether the dilation is a reduction or an enlargement.



SF: $\frac{12}{8} = \boxed{\frac{3}{2}}$

enlargement

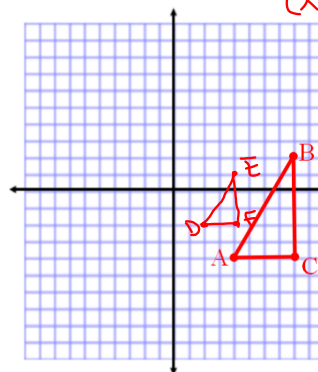
SF: $\frac{18}{30} = \boxed{\frac{3}{5}}$

reduction

A triangle has the vertices $A(4, -4)$, $B(8, 2)$, and $C(8, -4)$. The image of $\triangle ABC$ after a dilation with a scale factor of $\frac{1}{2}$ is $\triangle DEF$.

a. Sketch $\triangle ABC$ and $\triangle DEF$.

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



$A(4, -4) \rightarrow D(2, -2)$

$B(8, 2) \rightarrow E(4, 1)$

$C(8, -4) \rightarrow F(4, -2)$

Find the coordinates of L , M , and N so that $\triangle LMN$ is a dilation of $\triangle PQR$ with a scale factor of k .

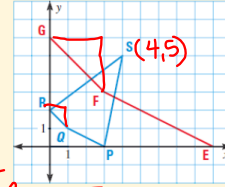
1. $P(-2, -1)$, $Q(-1, 0)$, $R(0, -1)$; $k = 4$

$$\begin{aligned} P(-2, -1) &\rightarrow L(-8, -4) \\ Q(-1, 0) &\rightarrow M(-4, 0) \\ R(0, -1) &\rightarrow N(0, -4) \end{aligned}$$

EXAMPLE 4 Standardized Test Practice

You want to create a quadrilateral $EFGH$ that is similar to quadrilateral $PQRS$. What are the coordinates of H ?

- (A) $(12, -15)$
- (B) $(7, 8)$
- (C) $(12, 15)$
- (D) $(15, 18)$



$$\sqrt{1^2 + 1^2}$$

$$\sqrt{2} \quad \sqrt{3^2 + 3^2} = \sqrt{18} \text{ or } 3\sqrt{2}$$

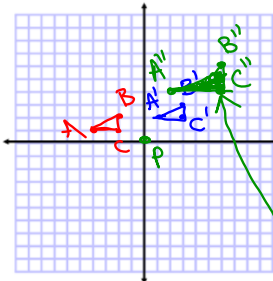
$$S(4, 5) \rightarrow H(12, 15)$$

$$\frac{3\sqrt{2}}{\sqrt{2}} = 3$$

EXAMPLE 5 Find the image of a composition

The vertices of $\triangle ABC$ are $A(-4, 1)$, $B(-2, 2)$, and $C(-2, 1)$. Find the image of $\triangle ABC$ after the given composition.

Translation: $(x, y) \rightarrow (x + 5, y + 1)$ $\rightarrow 5 \uparrow 1$
 Dilation: centered at the origin with a scale factor of 2

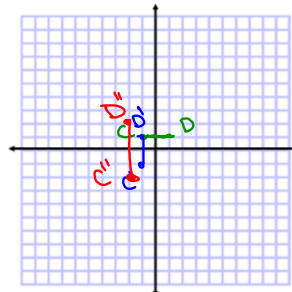


$$\begin{aligned} C'(3, 2) &\rightarrow C''(6, 4) \\ B'(3, 3) &\rightarrow B''(6, 6) \\ A'(1, 2) &\rightarrow A''(2, 4) \end{aligned}$$

Final Answer

Try this:

A segment has the endpoints $C(-1, 1)$ and $D(1, 1)$. Find the image of \overline{CD} after a 90° rotation about the origin followed by a dilation with its center at the origin and a scale factor of 2.



$$\begin{aligned} C'(-1, 1) &\rightarrow C''(-2, -2) \\ D'(-1, 1) &\rightarrow D''(-2, 2) \end{aligned}$$

What are 3 types of transformations that preserve congruency?

Rotations

Reflections

Translations

Homework

pg 494: 4, 5, 8, 11, 12, 13, 16, 17