

Section 9.7: Identify and Perform Dilations

EQ: How do you draw a dilation?

VOCABULARY:

Dilation

-A transformation that stretches or shrinks a figure

Similar shape

↳ not same size  
∴  $\neq$

Contraction

-A shrinking dilation  
-Scale factor 0 to 1

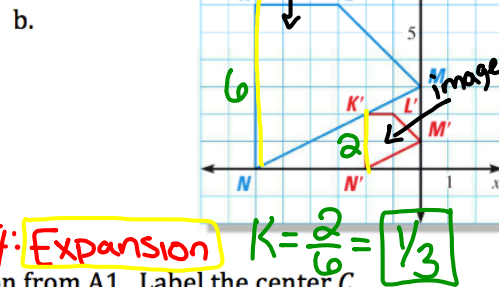
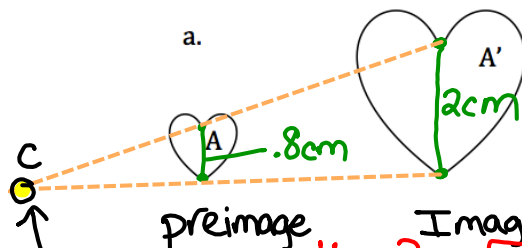
Expansion

-A stretching dilation  
-Scale factor  $> 1$

↗  
greater than

A1. Find the scale factor of the dilation. Tell whether the dilation is a contraction or expansion.

$K = \frac{\text{image}}{\text{preimage}}$



$K = \frac{2}{0.8} = 2.5$  Expansion

$K = \frac{2}{6} = \frac{1}{3}$

A2. Find the center of each dilation from A1. Label the center C.

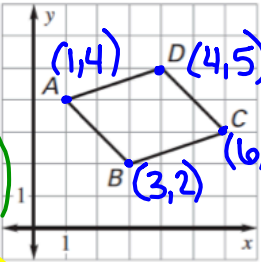
**Coordinate Rule for a Dilation Centered at the Origin**

If preimage  $(a, b)$  is dilated at the origin  $(0,0)$  with a scale factor of  $k$ , then its image is  $(K \cdot a, K \cdot b)$ .  
 \* multiply both  $x$  and  $y$  by the  $k$ -value

A3. Use the origin as the center of the dilation and the given scale factor to list the coordinates of the vertices of the image of the polygon.

a.  $k = \frac{2}{3}$

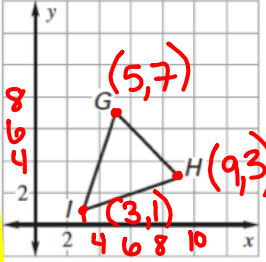
$(\frac{2}{3} \cdot x, \frac{2}{3} \cdot y)$   
 $A'(\frac{2}{3}(1), \frac{2}{3}(4))$



$A'(2/3, 8/3)$       $C'(4, 2)$   
 $B'(2, 4/3)$       $D'(8/3, 10/3)$

b.  $k = 4$

$(4x, 4y)$



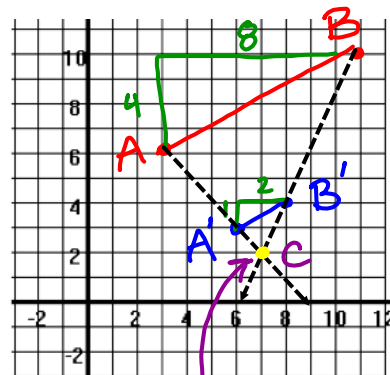
$G'(20, 28)$   
 $H'(36, 12)$   
 $I'(12, 4)$

A4. A dilation maps  $A$  to  $A'$  and  $B$  to  $B'$ . Find the scale factor and the center of the dilation.

$A(3, 6), A'(6, 3), B(11, 10), B'(8, 4)$

$\overline{AB}$  shrinks to  $\overline{A'B'}$   
 $\therefore$  contraction  
 so expect  $K < 1$

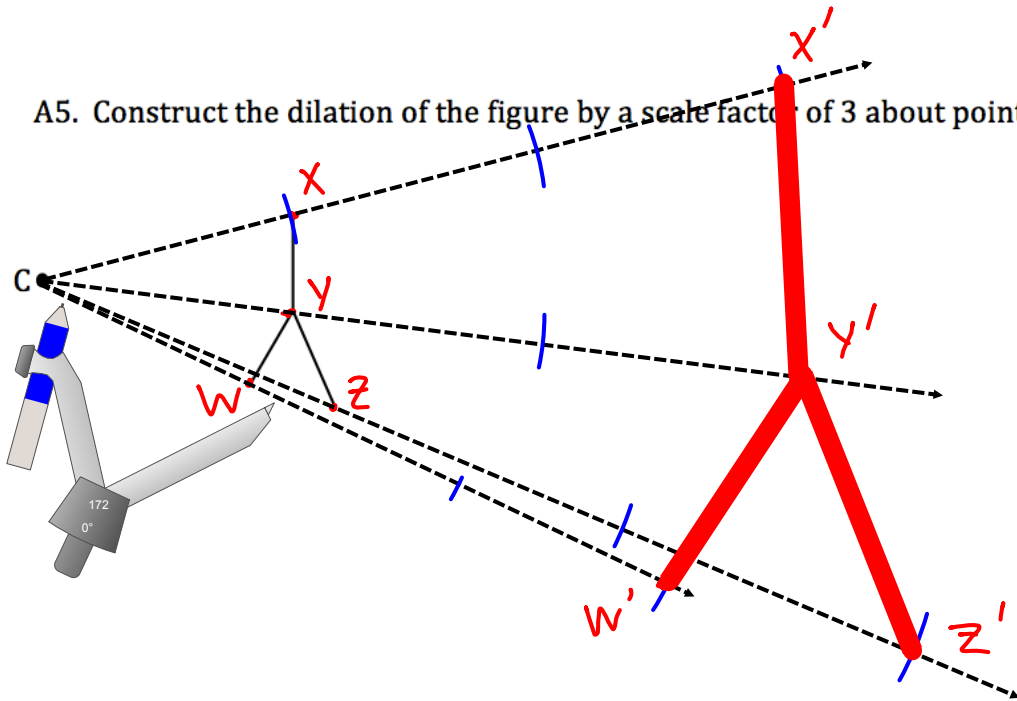
$K = \frac{\text{image}}{\text{preimage}} = \frac{A'B'}{AB} = \frac{\sqrt{1^2 + 2^2} = \sqrt{1+4}}{\sqrt{4^2 + 8^2} = \sqrt{16+64}}$



$C(7, 2)$

$K = \frac{\sqrt{5}}{\sqrt{80}} = .25 \text{ or } \frac{1}{4}$

A5. Construct the dilation of the figure by a scale factor of 3 about point C.



A6. Which transformation is a dilation?  
Why?

**B**, because both

x and y-value are being  
multiplied by the same constant

- A.  $(x, y) \rightarrow (x + 3, y)$
- B.**  $(x, y) \rightarrow (0.5x, 0.5y)$
- C.  $(x, y) \rightarrow (-x, 2y)$
- D.  $(x, y) \rightarrow (4 + x, 4 + y)$

A7. The vertices of  $\triangle ABC$  are  $A(-2, 1)$ ,  $B(0, 6)$ , and  $C(2, 2)$ . Graph only the final image of the triangle after a composition of the transformations listed in order.

1<sup>st</sup>: Rotation of  $180^\circ$   $(-x, -y)$

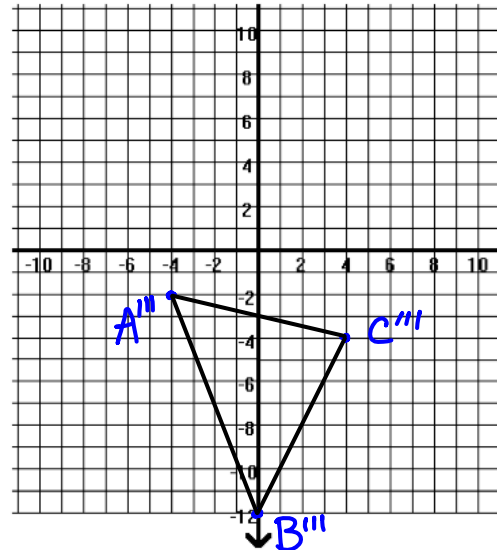
$A'(2, -1)$   
 $B'(0, -6)$      $C'(-2, -2)$

2<sup>nd</sup>: Dilation centered at the origin with a scale factor of  $k = 2$

$A''(4, -2)$      $(2x, 2y)$   
 $B''(0, -12)$      $C''(-4, -4)$

3<sup>rd</sup>: Reflection over  $y$ -axis

$A'''(-4, -2)$      $\hookrightarrow (-x, y)$   
 $B'''(0, -12)$      $C'''(4, -4)$



\* The "rule" is highlighted

## 9.7 Summary:

Draw a line from the fixed center of dilation (pt. C) through specific points on the pre-image. Measure the distance from pt. C to the pre-image and multiply that distance by your  $k$ -value. Using a ruler or compass create the image with your new distance from pt. C.

