Multiple Choice:

1. Which of the following describes the image of a figure after a dilation that has a scale factor between zero and one?

a) It has a different shape from the original figure and is smaller than the original figure.

b) It has the same shape as the original and is larger than the original figure.

c) It has the same shape as the original and is smaller than the original figure.

d) It has the same shape and same size as the original figure.

2. Which of the following describes the image of a square after a dilation that has a scale factor of 6?

a) Its sides are 6 units longer than those of the original square.

b) Its sides are $\frac{1}{6}$ as long as those of the original square.

c) Its sides are 6 times as long as those of the original square.

d) Its sides are 6 units shorter than those of the original square.

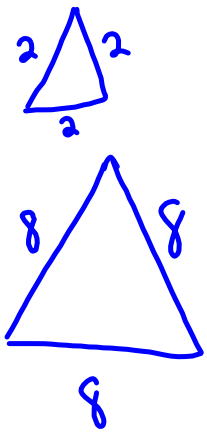
3. Which of the following describes the image of a triangle after a dilation that has a scale factor of $\frac{5}{6}$?

a) Each angle has $\frac{5}{6}$ of the measure of its corresponding angle in the original triangle.

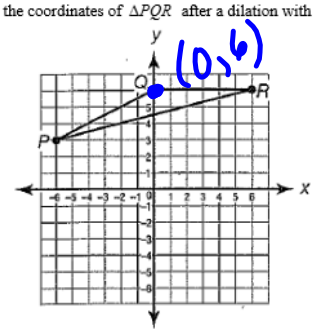
b) Each angle has $\frac{6}{5}$ of the measure of its corresponding angle in the original triangle.

c) Each angle has the same measure as its corresponding angle in the original triangle.

d) Each angle is $\frac{1}{6}$ larger than the measure of its corresponding angle in the original triangle.



4. What are the coordinates of ΔPQR after a dilation with a scale factor of $\frac{2}{3}$?



a) $P'(-2,1), Q'(0,2), R'(2,2)$

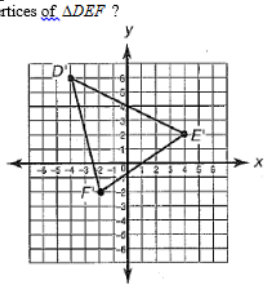
b) $P'(-4,2), Q'(0,4), R'(4,4)$

c) $P'(-4,2), Q'(4,0), R'(4,2)$

d) $P'(-12,6), Q'(0,12), R'(12,12)$

5. $\Delta D'E'F'$ is the image of ΔDEF after a dilation with a scale factor of 2. What are the coordinates of the vertices of ΔDEF?

(-4, 6)



a) $D(-8,-12), E(8,4), F(-4,-4)$

b) $D(-6,4), E(-2,0), F(-4,-4)$

c) $D(-2,8), E(6,4), F(0,0)$

d) $D(-2,3), E(2,1), F(-1,-1)$

Day 2 – Dilations and Scale Factors

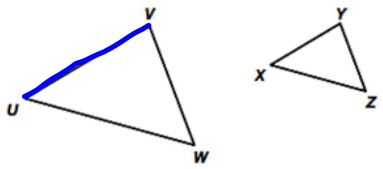
A **dilation** is a proportional enlargement or reduction of a figure through a point called the **center of dilation**. The size of the enlargement or reduction is called the **scale factor** of the dilation.

- If the dilated image is larger than the original figure, then the scale factor is greater than 1. This is called an **enlargement**.
- If the dilated image is the same as the original, then the scale factor is 1. The figures are **congruent**.
- If the dilated image is smaller than the original figure, then the scale factor is less than 1. This is called a **reduction**.

A figure and its dilated image are always **similar**. Similar figures will always have the same angle measures, but their side lengths will be different (will remain proportional to each other). **This means dilations do not preserve congruency.** If two figures are congruent, they are also similar.

Congruence $\cong$

Similar Figures:
When you say two figures are similar to each other, you use the symbol ' ~ '. In the figure below, $\Delta UVW \sim \Delta XYZ$. The order in which you write the vertices in a similarity statement indicates the corresponding angles and sides (just like congruence statements). Name the corresponding sides and angles.



$\overline{UV} \sim \overline{XY}$
$\overline{VW} \sim \overline{YZ}$
$\overline{UW} \sim \overline{XZ}$

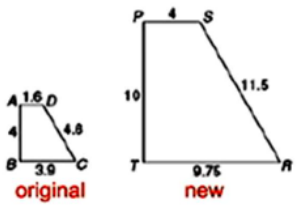
Angles
$\angle U \cong \angle X$
$\angle V \cong \angle Y$
$\angle W \cong \angle Z$

Finding Scale Factors

To find the scale factor of your new figure (image), you want to compare the ratio of the sides from the new figure to the original figure (pre-image).

$$\frac{\text{image}}{\text{pre-image}} = \frac{\text{new}}{\text{original}}$$

Example 1: Trapezoid PTRS is a dilation of Trapezoid ABCD. What is the scale factor of the dilation?

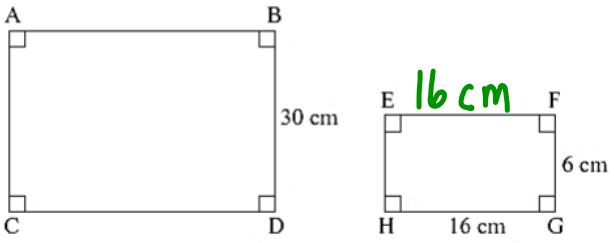


$\frac{4}{1.6} = 2.5$ $\frac{10}{4} = 2.5$

$\frac{11.5}{4.6} = 2.5$ $\frac{9.75}{3.9} = 2.5$

The scale factor of the dilation is 2.5.

Example 2: Rectangle EFGH is a dilation of Rectangle ABCD. What is the scale factor of the dilation?



$\frac{6}{30} = \frac{1}{5}$

$\frac{EF}{AB} = \frac{FG}{DB}$

$\frac{16}{AB} = \frac{6}{30}$

$6AB = 480$

$AB = 80$

Can you find the length of AB?

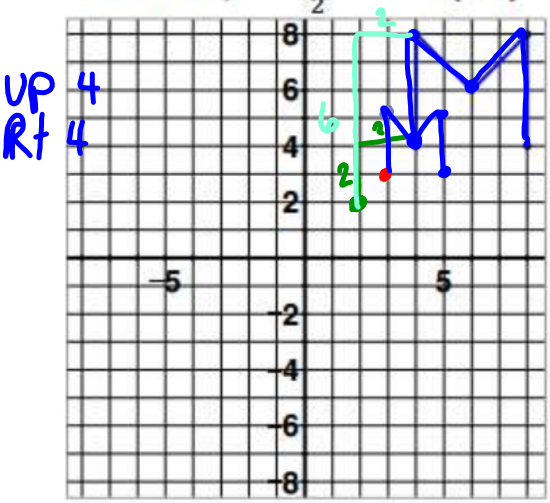
AB = 80 cm

Finding the Scale Factor with a Center of Dilation NOT at the Origin

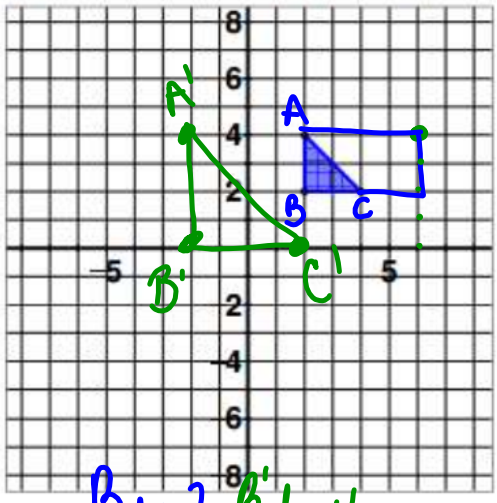
Graphing Dilations when Center of Dilation is NOT at the Origin
Multiply the horizontal and vertical distance between each point on the pre-image and the center of dilation by the scale factor and plot the new image points.

Example 7: Perform the given dilation on each given pre-image with the given center of dilation.

2. Dilate by $c = \frac{1}{2}$, center (2,2)



4. Dilate by $c = 2$, center (6,4)



A
Left 4

A'
Left 8

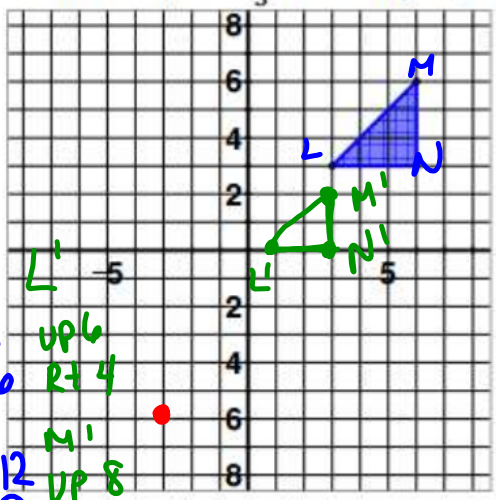
C
dn 2
lt 2

B dn 2
lt 4

B' dn 4
lt 8

C' dn 4
lt 4

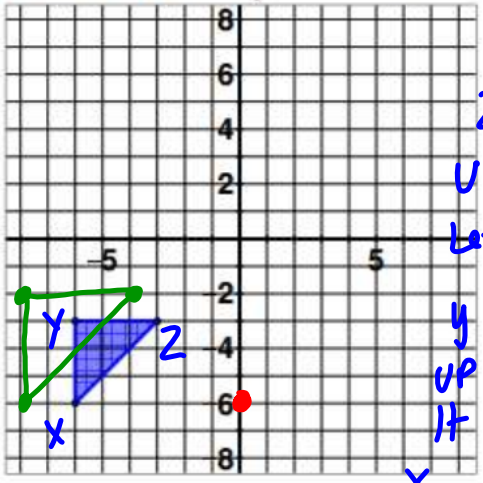
8. Dilate by $c = \frac{2}{3}$, center $(-3, -6)$



L
up 9
Rt 6
M
up 12
Rt 9

L'
up 6
Rt 4
M'
up 8
Rt 6

18. Dilate by $c = \frac{4}{3}$, center $(0, -6)$



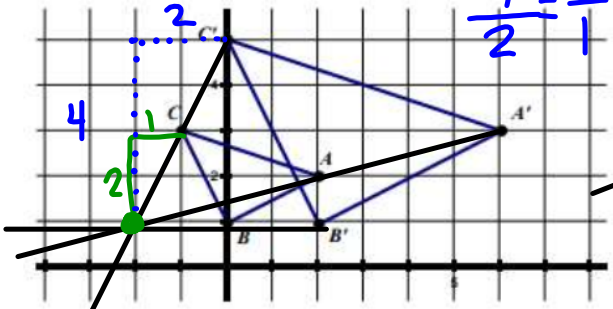
Z
up 3
Left 3
Y
up 3
lt 6
X
left 6

Z'
up 4
lt 4
Y'
up 4
lt 8
X'
lt 8

Example 8: Work backwards to find the center of dilation, and also determine the scale factor.

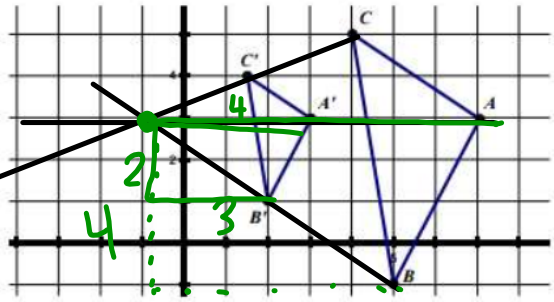
a. Center of Dilation: (-2, 1)
Scale Factor: 2

$\frac{4}{2} = \frac{2}{1}$

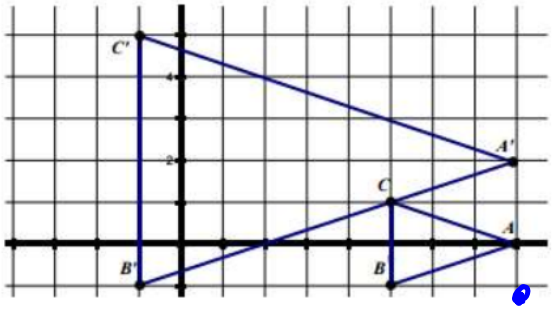


b. Center of Dilation: (-1, 3)
Scale Factor: 1/2

$\frac{4}{8}$

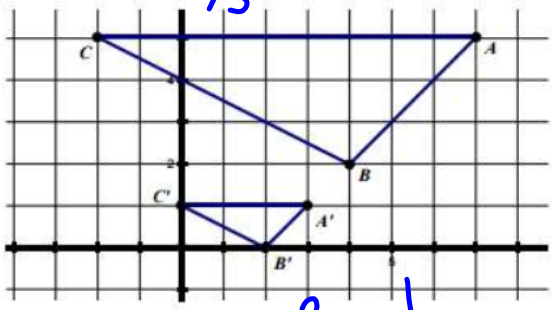


c. Center of Dilation: (8, -1)
Scale Factor: 3



$\frac{3}{1}$

d. Center of Dilation: (1, -1)
Scale Factor: 1/3



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