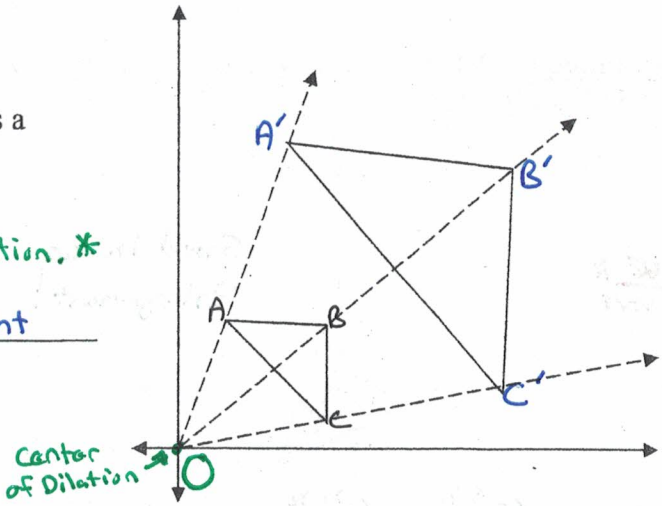
Math 2

Unit 4.3 Dilations

Dilation → or Scaling is a ***TRANSFORMATION*** that ENLARGES or reduces a figure proportionally.



A dilation produces a Similar figure and is a type of Similarity transformation.

* Dilation IS NOT a rigid transformation. *

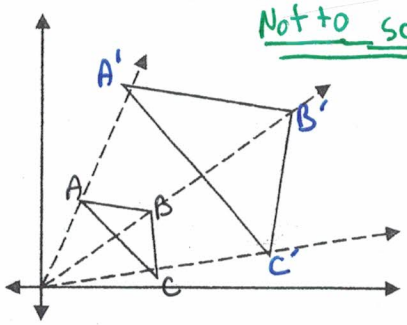
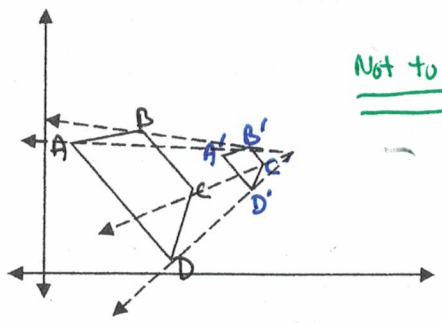
Dilations are performed with respect to a fixed point called the Center of Dilation.

The scale factor of dilation decribes the extent of the dilation. The scale factor is the RATIO of a length on the image to a corresponding length on the PREIMAGE. The letter K is usually used to represent the scale factor of a dilation. The value of "*k*" determines whether the dilation is an enlargement or a reduction.

$k = \frac{\text{Image}}{\text{Preimage}}$

Dilation Symbolism: $D_{O,2}$ (Center of dilation (letter)) means a dilation centered on O with a scale factor (K) of 2.

- There are 2 types of dilations:

1.) Enlargements	2.) Reduction
A dilation that has a scale factor greater than 1 that produces an image that is larger than the preimage. If k > 1, then the dilation is an enlargement.	A dilation that has a scale factor between 0 and 1 that produces an image that is smaller than the preimage. If $0 < k < 1$, then the dilation is a reduction.
Not to scale  	Not to scale 
△ABC is dilated by a scale factor of 3, to produce △A'B'C'. * K > 1	Quadrilateral ABCD is dilated by a scale factor of $\frac{1}{2}$ to produce Quadrilateral A'B'C'D'

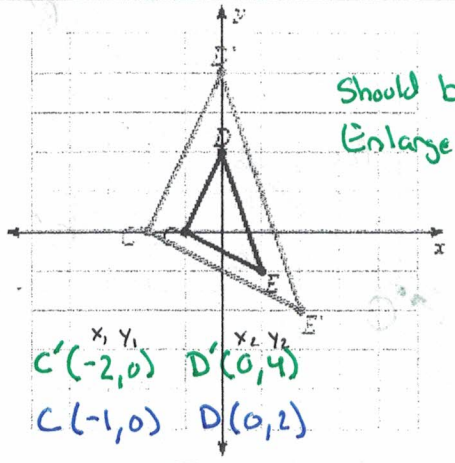
FYI: Distance Formula (used on the coordinate plane to find the distance between two points)

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

* Used to find the distance between two points. This is how we find "k".

Example 1: Determine whether the dilation from "A" to "B" is an ***enlargement*** or a ***reduction***. Then find the scale factor.

a)



* IMAGE * / PREIMAGE

Should be an Enlargement!

$k = \frac{C'D'}{CD}$

x_1, y_1 x_2, y_2

$C'(-2,0)$ $D'(0,4)$

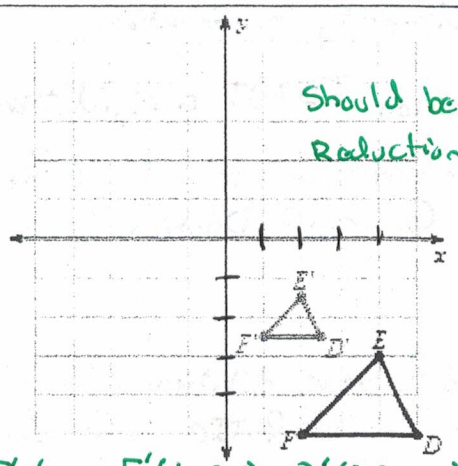
$C(-1,0)$ $D(0,2)$

$k = \frac{\sqrt{(0-(-2))^2 + (4-0)^2}}{\sqrt{(0-(-1))^2 + (2-0)^2}} \rightarrow \frac{\sqrt{20}}{\sqrt{5}} \rightarrow \sqrt{\frac{20}{5}}$

$\sqrt{4}$

$k = 2$

b)



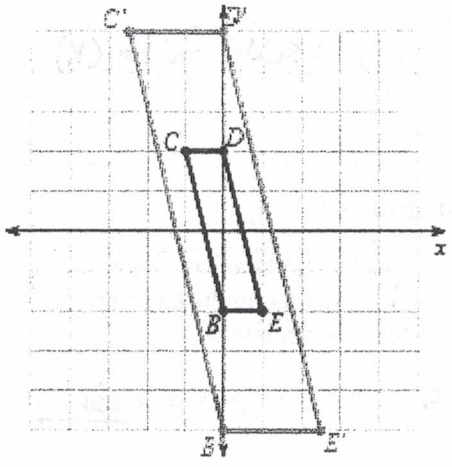
Should be a Reduction!

$k = \frac{F'D'}{FD}$ $F'(1,-2.5)$ $D'(2.5,-2.5)$

$F(2,-5)$ $D(5,-5)$

$k = \frac{\sqrt{(2.5-1)^2 + (-2.5-(-2.5))^2}}{\sqrt{(5-2)^2 + (-5-(-5))^2}} = \frac{\sqrt{2.25}}{\sqrt{9}} \rightarrow \frac{1.5}{3} = k = \frac{1}{2}$

c)



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