# 2.6 Intro to Similarity

Dilations & Scale Factors

**Old** Isometric Transformations

1. Translation
"Slide"
$(x,y) \rightarrow (x \pm h, y \pm k)$
left or right; up or down

2. Reflection
"flip"
$(x,y) \rightarrow (x,-y)$ across x-axis
$(x,y) \rightarrow (-x,y)$ across y-axis

3. Rotation
"turn"
$(x,y) \rightarrow (-y,x)$ $90°$ Rotation  $(x,y) \rightarrow (-x,-y)$ $180°$ Rotation  $(x,y) \rightarrow (y,-x)$ $270°$ Rotation

- Preimage to the image is the same shape & same size.

Isometric transformations (rigid motion) is where the distances between the points are preserved. Basically, the image is congruent to its preimage.

**new** Dilations

- Dilation is a non-isometric transformation that produces an image that is the same shape as the preimage but different in size.
- A dilation stretches or shrinks the preimage by the scale factor.

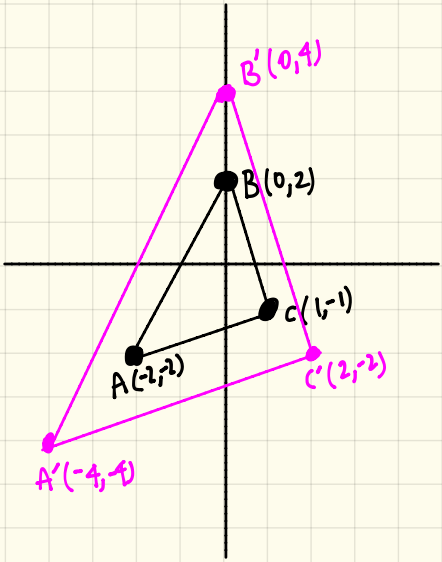
**Notation**

preimage $(x,y)$ ⇝ image $(kx, ky)$

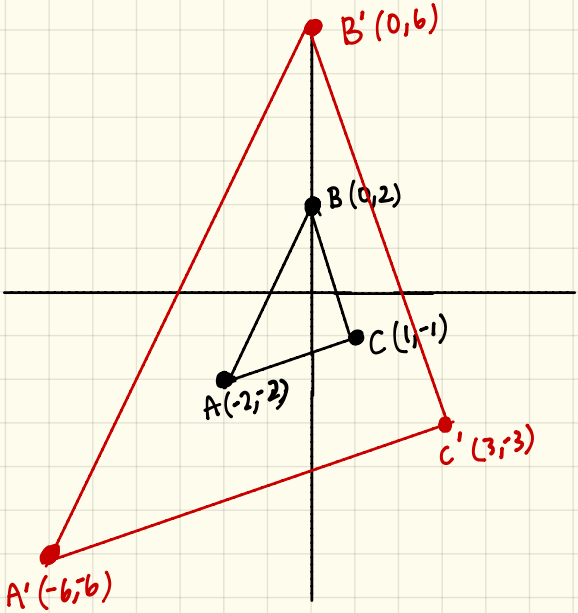
note The "k's" are the scale factors (numbers multiplying x & y)

[Examples]

① $(x,y) \rightarrow (2x, 2y)$



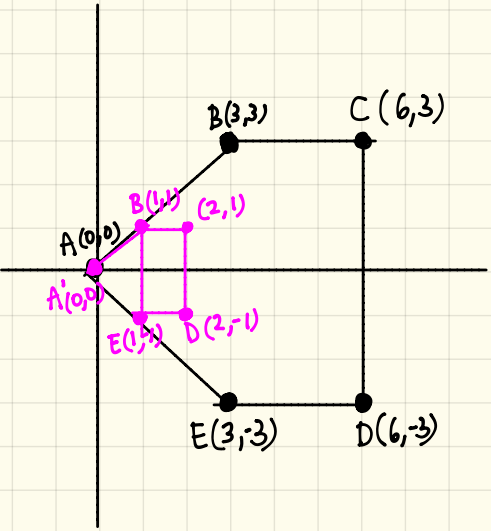

② $(x,y) \rightarrow (3x, 3y)$



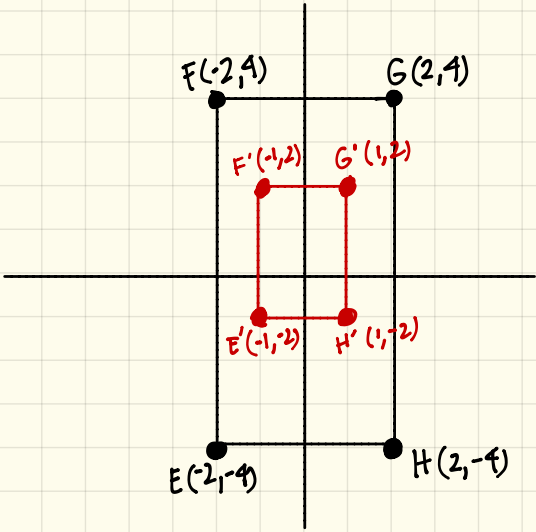

Conclusion: When "k" is greater than 1, then the image will stretch (expand) or get bigger.

[Examples]

① $(x,y) \rightarrow \left(\frac{1}{3}x, \frac{1}{3}y\right)$

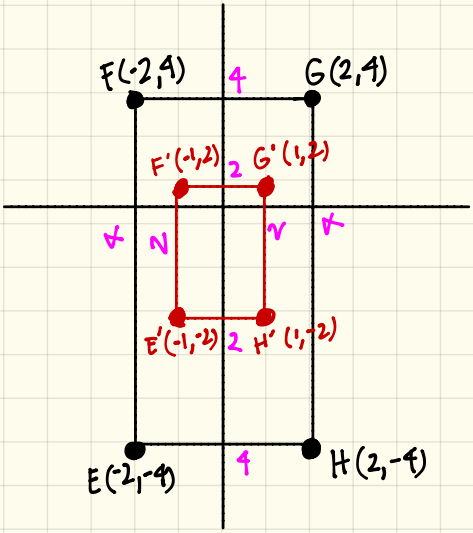



② $(x,y) \rightarrow \left(\frac{1}{2}x, \frac{1}{2}y\right)$




Conclusion when "k" is between 0 and 1, the image will shrink or get smaller.

Let's consider the previous example. Is there a relationship between each preimage & image?




$$\frac{\text{Sides of Preimage}}{\text{Sides of Image}} = \frac{FE}{F'E'} = \frac{FG}{F'G'} = \frac{GH}{G'H'} = \frac{EH}{E'H'}$$

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

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

**Conclusion:**

There is a proportional (or ratio) relationship with similar figures.