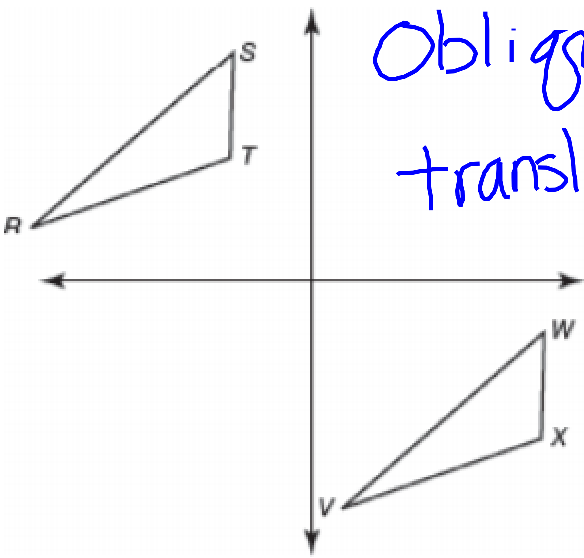
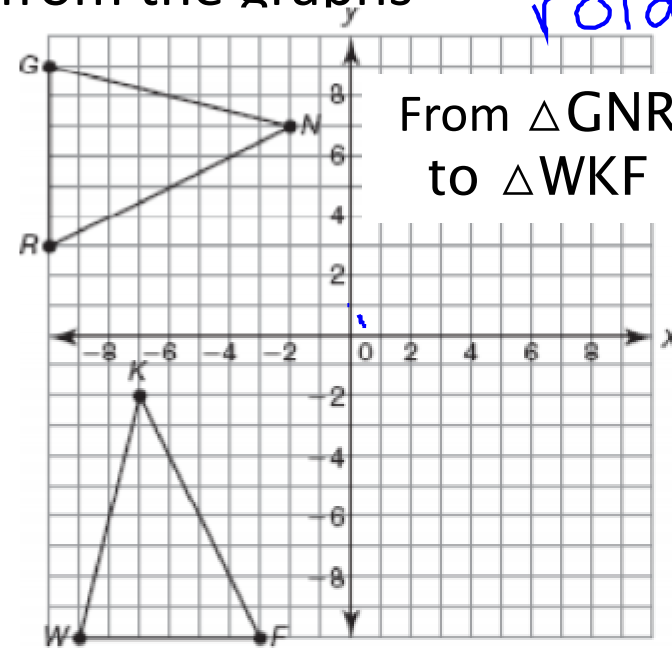
Friday, February 22, 2019

- Warm-up

Describe the transformations from the graphs



Oblique translation



90° CC rotation

270° clockwise rotation

- Dilation
- Composite

Objectives:

Content: I will use <u>rules</u> to produce rigid transformations.

Social: I will participate in the class activities and support my group.

Language: I will explain how to *dilate* rigid shapes using rules and how the dilation effects lengths and areas.

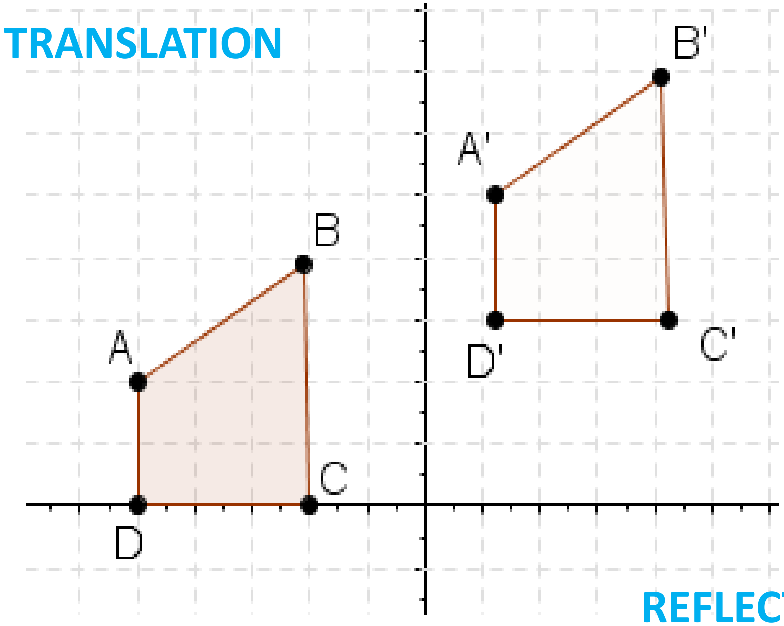
Congruent → exactly the same lengths, shape & angles

Vocabulary

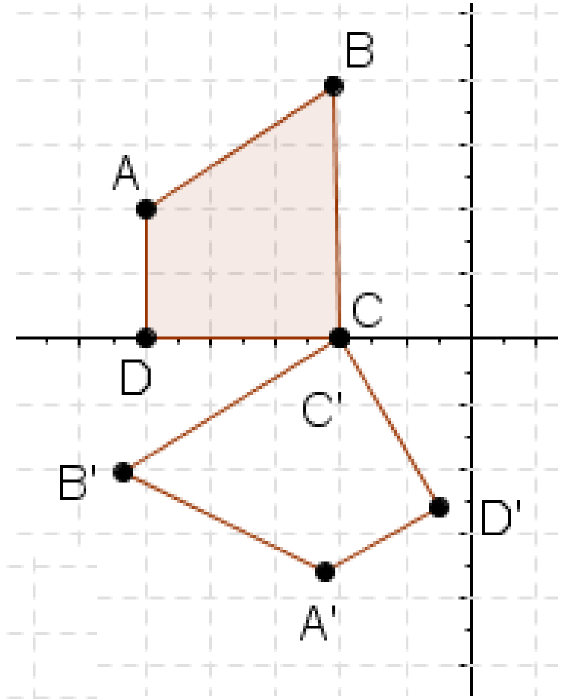
Word	Real world example	What does it mean in this context?
Dilate	Your doctor dilates your eyes during your annual physical.	eyes get bigger = pupil
Similar	You and your friend have similar tastes in music.	close, but not the same
Scale	A map is a scale drawing of a city.	bigger or smaller same shape

Word	Geometry example	What does it mean in this context?
Dilate	A geometric figure is a dilation of another geometric figure.	bigger or smaller
Similar	Dilation produces a polygon is similar to original polygon.	use a consistent scale factor AND the angles ~~[illegible]~~ are same
Scale	Scale drawing in the coordinate plane. "to scale"	precise - proportional

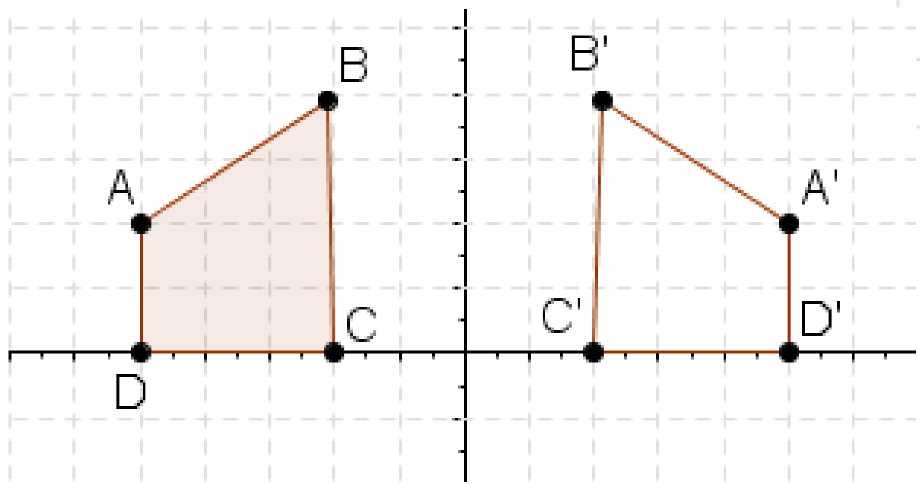
TRANSLATION



ROTATION



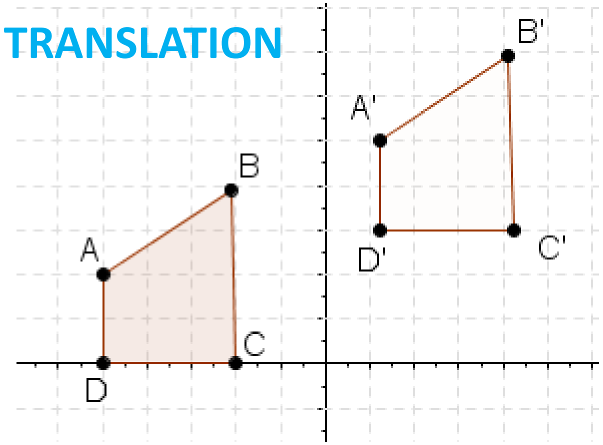
REFLECTION



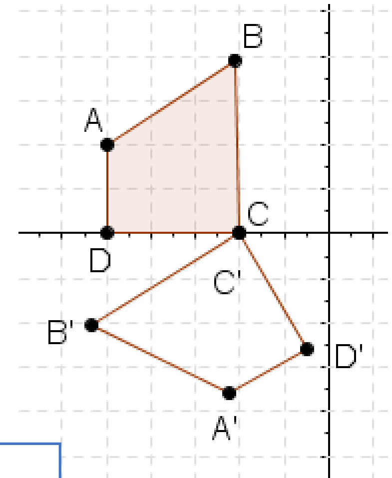
TRANSFORMATIONAL GEOMETRY

	Translations	Reflections	Rotations
Description	Slide Slide	Flip Flip	Turn Turn
Similar?	Yes	Yes	Yes
Congruent?	Yes	Yes	Yes

TRANSLATION

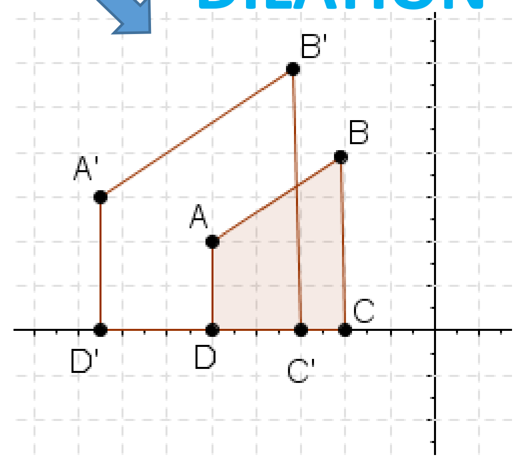


ROTATION

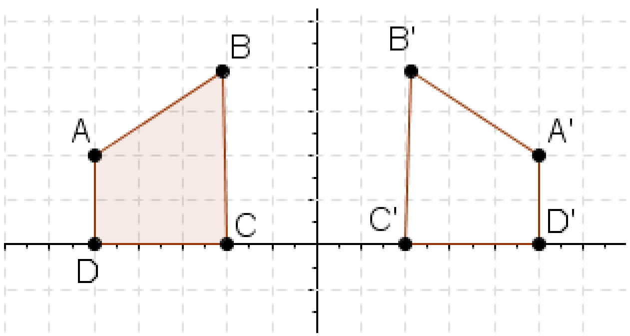


same shape
DIFFERENT size

DILATION



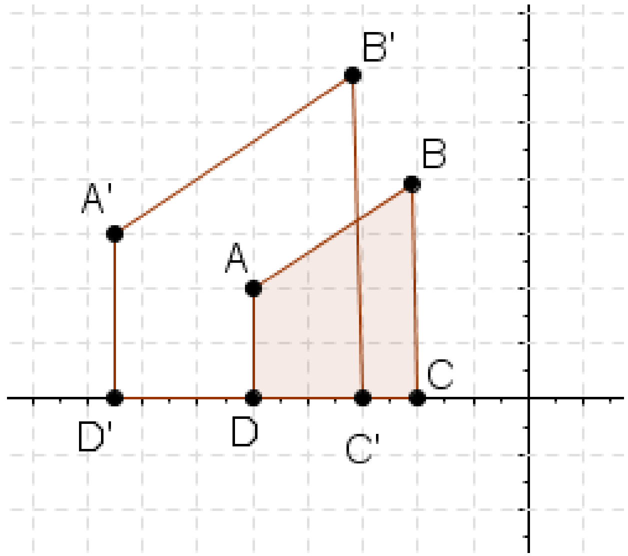
REFLECTION



TRANSFORMATIONAL GEOMETRY

	Translations	Reflections	Rotations	Dilations
Description	Slide Slide	Flip Flip	Turn Turn	Enlarge or Reduce
Similar? $\triangle ABC \sim \triangle A'B'C'$	YES	YES	YES	Yes
Congruent? $\triangle ABC \cong \triangle A'B'C'$	YES	YES	YES	No

Dilation is used to map an image that is similar to the original image (pre-image).



Dilated polygons are **SIMILAR ONLY**.

ABCD ~ A'B'C'D'

- Translations, reflections, and rotations are **congruence transformations**.
  - Congruence transformations are **rigid motions**.
  - In rigid motions, the original image (pre-image) and the image are **congruent**.

Scale factor → 7

$(x, y) \to (7x, 7y)$

- A **dilation** is a **similarity transformation**.
  - A **dilation** is a transformation which produces an image that is
    - the **same shape** as the pre-image
    - a **different size** of the pre-image
  - A similarity transformation is a **rigid motion** followed by a dilation.

center (0,0)

- **Dilations** include the following components:
  - **scale factor** , or ratio of dilation and
  - the **center of the dilation**, a fixed point in the plane about which all points are contracted or expanded.
- **Notation**

$$\boldsymbol{D_k(x, y) = (kx, ky)}$$

where D is the center of dilation and k is the scale factor.

- The image created by a dilation is either an **enlargement** or a **reduction**.

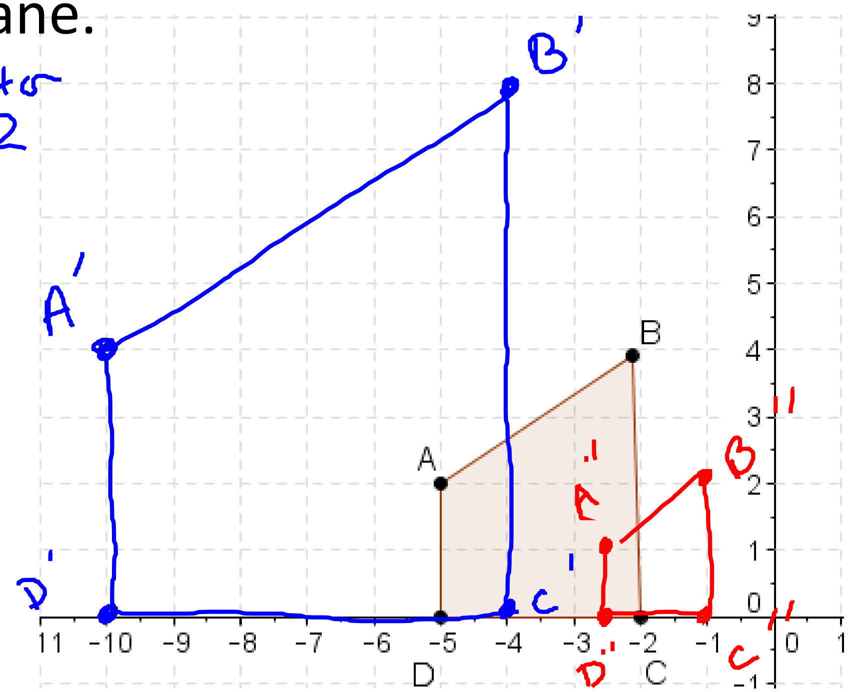
Drawing a dilation in the coordinate plane.

$(x, y) \rightarrow (2x, 2y)$ Scale factor 2

$$\begin{bmatrix} -5 & -2 & -2 & -5 \\ 2 & 4 & 0 & 0 \end{bmatrix} \rightarrow \begin{bmatrix} -10 & -4 & -4 & -10 \\ 4 & 8 & 0 & 0 \end{bmatrix}$$

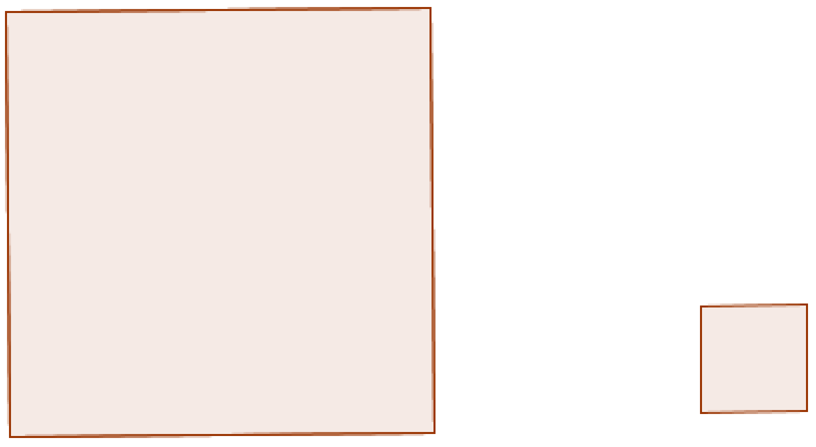
$(x, y) \rightarrow (\frac{1}{2}x, \frac{1}{2}y)$ Scale factor $\frac{1}{2}$

$$\begin{bmatrix} -5 & -2 & -2 & -5 \\ 2 & 4 & 0 & 0 \end{bmatrix} \rightarrow \begin{bmatrix} -2.5 & -1 & -1 & -2.5 \\ 1 & 2 & 0 & 0 \end{bmatrix}$$



In this example we will dilate a figure by the scale factors of $k = \frac{1}{2}$ and $k = 2$

Do the figures appear to be dilations?

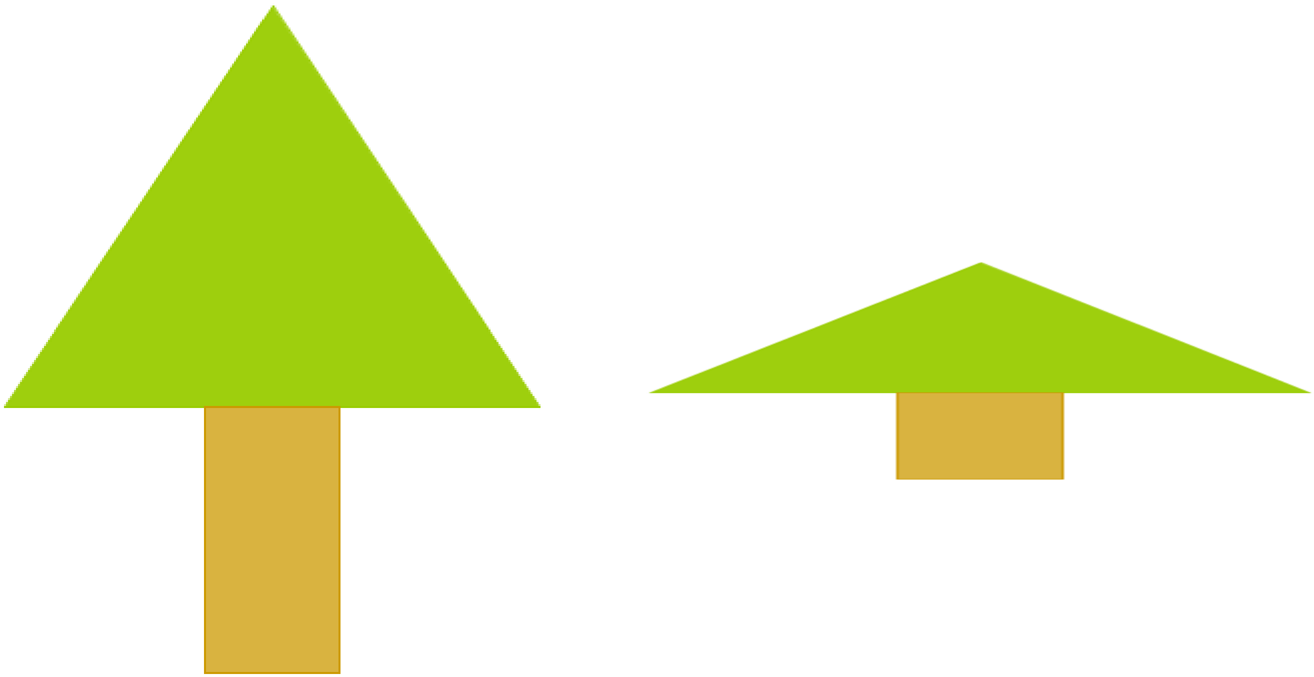


Do the figures appear to be dilations?

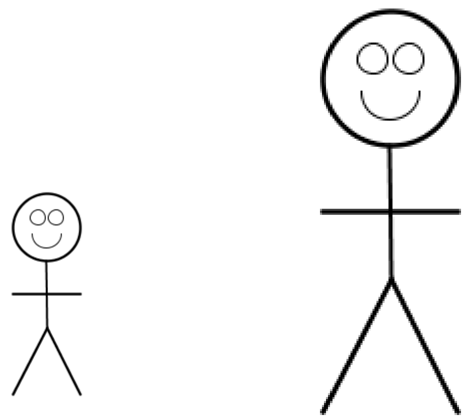
$y = x$

$180°$

Do the figures appear to be dilations?



Do the figures appear to be dilations?



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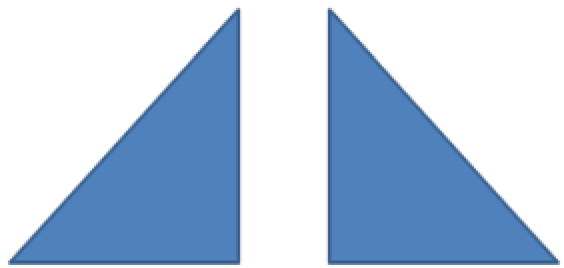
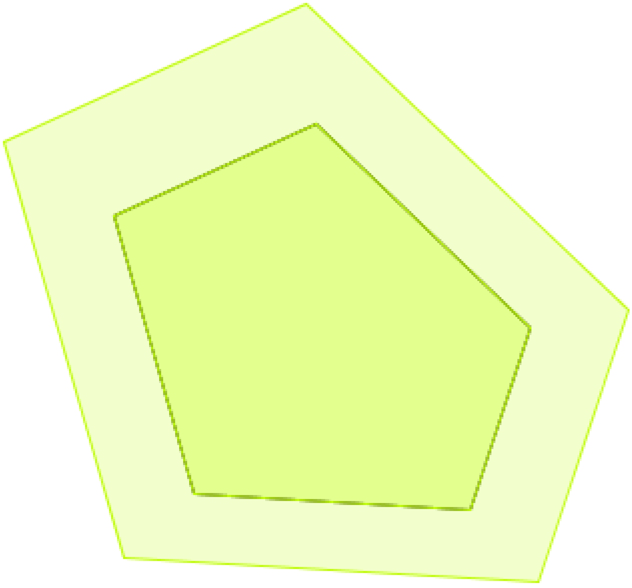


Do the figures appear to be dilations?

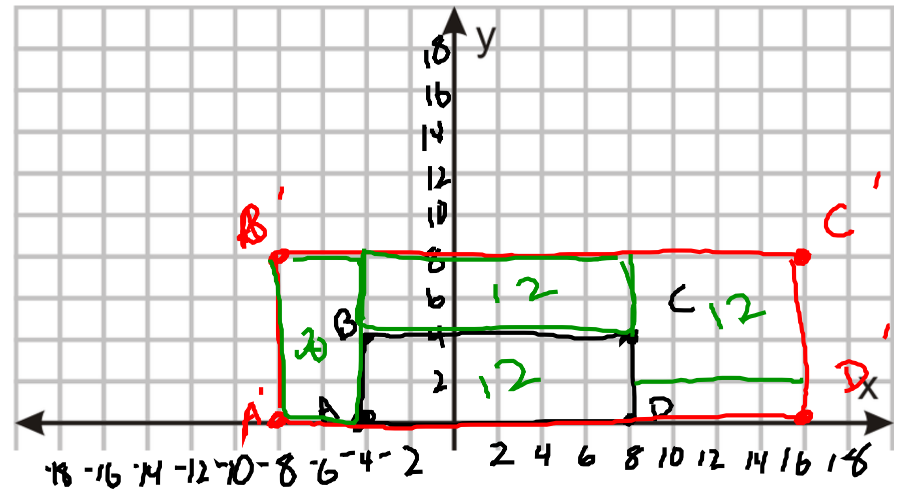


Practice

Scale factor = 2

$(x, y) \rightarrow (2x, 2y)$

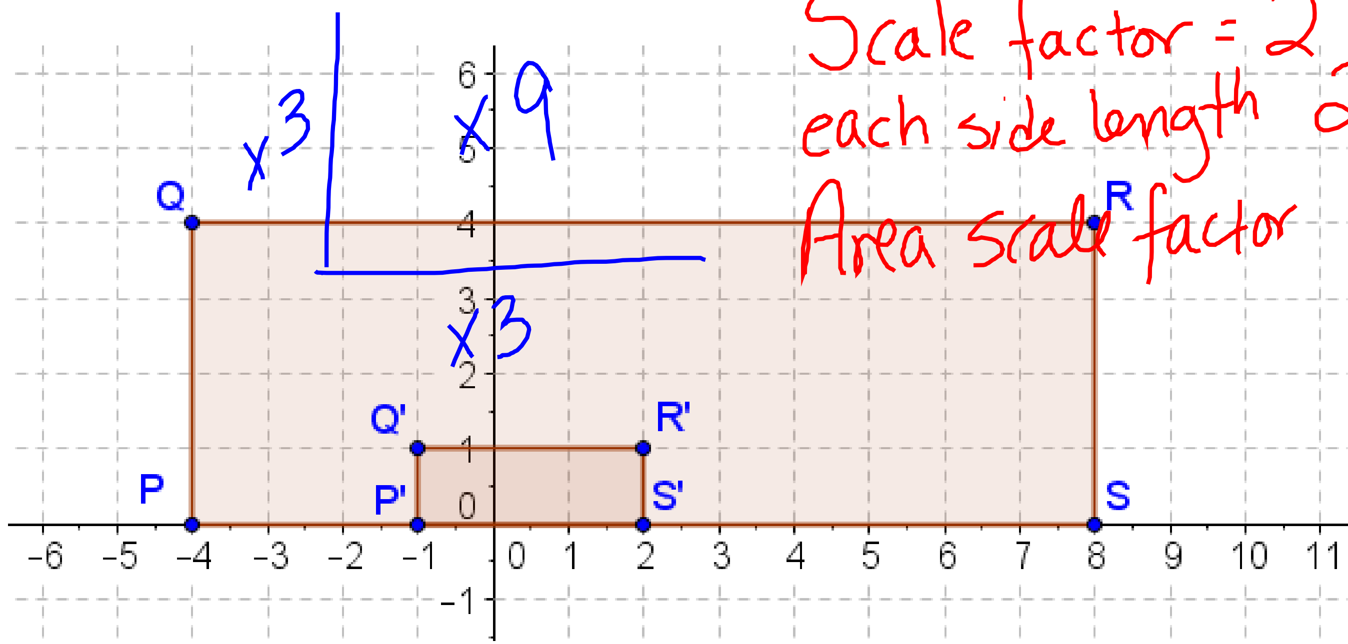
$$\boxed{\begin{bmatrix} -4 & -4 & 8 & 8 \\ 0 & 4 & 4 & 0 \end{bmatrix}} \rightarrow \begin{bmatrix} -8 & -8 & 16 & 16 \\ 0 & 8 & 8 & 0 \end{bmatrix}$$



$(x, y) \rightarrow (\quad)$

Scale factor 3

$$\begin{bmatrix} -4 & -4 & 8 & 8 \\ 0 & 4 & 4 & 0 \end{bmatrix} \rightarrow \begin{bmatrix} \quad \end{bmatrix}$$

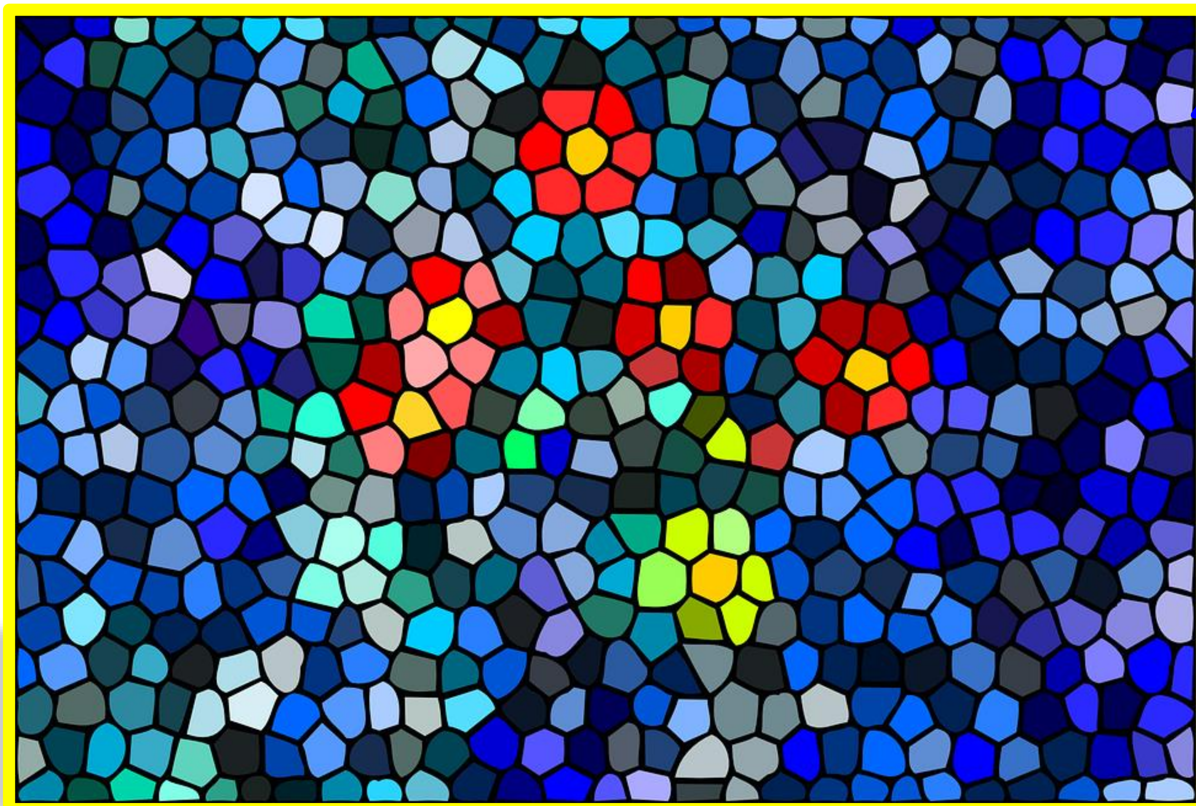


Scale factor = 2
each side length 2 x's bigger
Area scale factor 4x's bigger

90° CC then translate $+\underline{3\,h}$, $-2v$

Composite Transformations

$(x, y) \rightarrow (-y, x)$ $(x, y) \rightarrow (-y+3, x-2)$



start

$(-2, 4)$

end

$(4, 2)$

$(y, -x)$