

Geometry
9-5 Notes – Dilations

Date: _____

What is a dilation?

A transformation determined by a center point and a scale factor, K .

Is a dilation an isometry? Explain. (Hint: will original be \cong to the image?)

Sometimes \Rightarrow only when scale factor is 1

What is a congruence transformation?

anytime an image and pre-image are \cong ($K=1$)

What do I need to know in order to dilate something?

- center of dilation
- scale factor, K

$$\text{Scale Factor} = \frac{\text{image length}}{\text{pre-image length}} = \frac{\text{new}}{\text{old}}$$

How do I dilate something?

- 1* Draw a line from the center through a point/vertex
- 2* Measure the distance from the center to the point/vertex.
- 3* Multiply this distance by the scale factor
- 4* Use this distance to locate the new point by measuring from the center on the line drawn in step 1. Plot the new point.
- 5* Repeat for all points on the original figure.

DILATIONS NOT ON A COORDINATE PLANE or WHEN CENTER IS NOT AT THE ORIGIN

EX: Draw a dilation with a scale factor of 2 and center at point A.

$$XA = 2 \text{ cm}$$

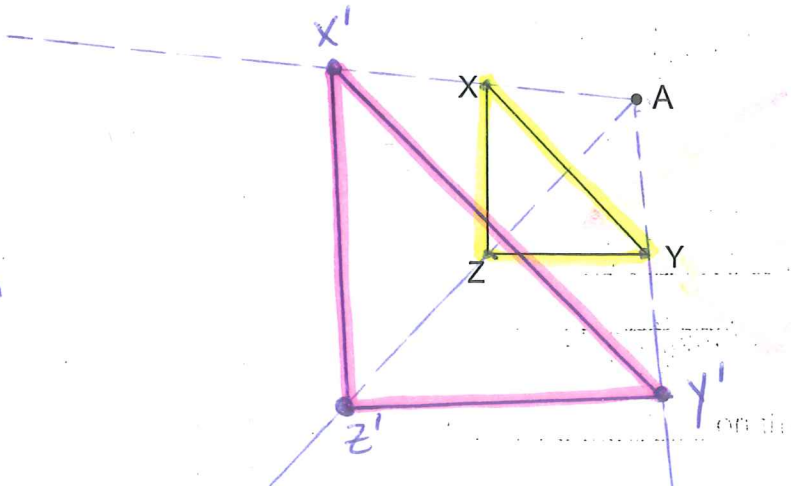
$$X'A = 2 \cdot 2 = 4 \text{ cm}$$

$$AZ = 2.8 \text{ cm}$$

$$AZ' = (2.8)(2) = 5.6 \text{ cm}$$

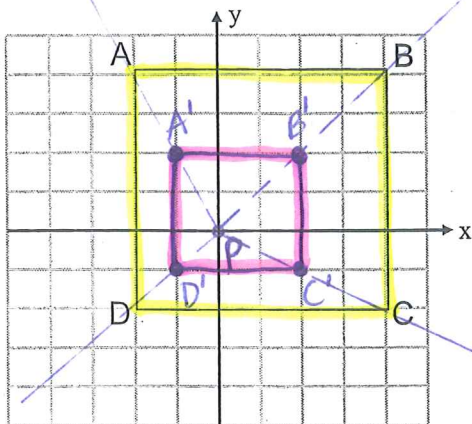
$$AY = 2 \text{ cm}$$

$$AY' = 2(2) = 4 \text{ cm}$$



DILATIONS ON A COORDINATE PLANE WHEN CENTER IS AT THE ORIGIN

EX:



point P is the center

Dilate square ABCD with a scale factor of $\frac{1}{2}$ and center at the origin. Label your points & write a rule for the dilation.

$$A(-2, 4) \rightarrow A'(-1, 2)$$

$$B(2, 4) \rightarrow B'(1, 2)$$

$$C(2, -2) \rightarrow C'(1, -1)$$

$$D(-2, -2) \rightarrow D'(-1, -1)$$

pre-image \rightarrow image

Rule: $(x, y) \rightarrow (\frac{1}{2}x, \frac{1}{2}y)$
 * center must be (0, 0) *

- When the scale factor is **greater than 1** then the dilation is an enlargement.

$$|k| > 1$$

- When the scale factor is **less than 1** the dilation is a reduction.

$$|k| < 1$$

- When the scale factor is **1**, the dilation is a congruence transformation.

- General Rule for Dilations on a Coordinate Plane:** with center at origin

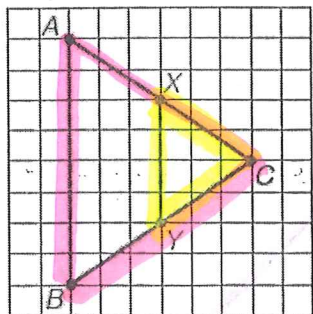
$$(x, y) \rightarrow (k \cdot x, k \cdot y)$$

FINDING THE SCALE FACTOR FROM A GIVEN DILATION

- Scale Factor = $\frac{\text{image length}}{\text{pre-image length}}$

Example: Determine the scale factor for the dilation of $\triangle XYC$ to $\triangle ABC$. Determine whether the dilation is an enlargement, reduction, or a congruence transformation. Write a rule for the dilation.

$$AB = 8 \quad XY = 4$$



$$\textcircled{1} k = \frac{\text{image}}{\text{pre-image}} = \frac{8}{4} = \boxed{2} \text{ factor}$$

$$|k| > 1$$

- $\textcircled{2} |2| > 1$ enlargement

$$\textcircled{3} (x, y) \rightarrow (2x, 2y)$$

with center @ origin