Geometry H
Notes 6.7: Perform Dilations

Name: Key
Date: _____ Period: _____

- I can draw the dilation image of a figure using both positive and negative scale factors.
- I can identify the scale factor of a dilation.
- I can find points on a dilation.

Vocabulary

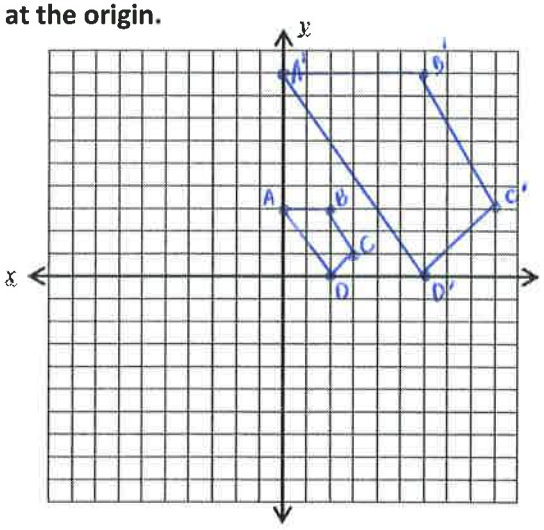
A **dilation** is a transformation that stretches or shrinks a figure to create a similar figure. In a dilation, the figure is enlarged or reduced with respect to a fixed point called the **center of dilation**. The **scale factor** describes how much the figure is enlarged or reduced.

On the coordinate plane, you can describe a dilation with respect to the origin with the notation $(x,y)\rightarrow(kx,ky)$, where k is the scale factor. multiply x and y value by the scale factor k.

- ✓ If $0<k<1$, the dilation is a **reduction.**
- ✓ If $k>1$, the dilation is an **enlargement.**

Example 1: Draw a dilation on the coordinate plane centered at the origin.

a) Draw a dilation of quadrilateral *ABCD* with vertices *A*(0, 3), *B*(2, 3), *C*(3, 1), and *D*(2, 0) about the origin with a scale factor of 3.



A(0,3) × 3 ⇒ A'(0,9)

B(2,3) × 3 ⇒ B'(6,9)

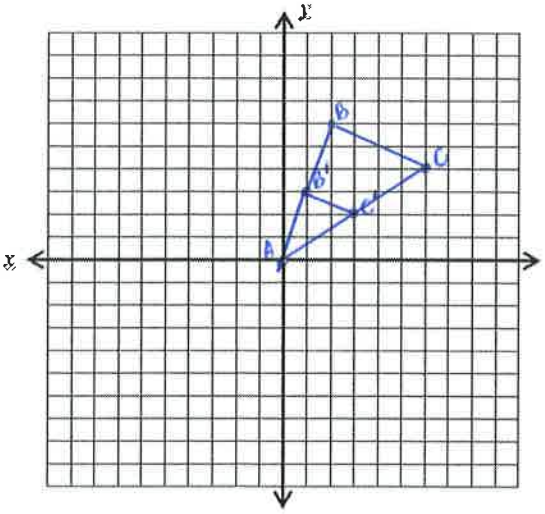
C(3,1) × 3 ⇒ C'(9,3)

D(2,0) × 3 ⇒ D'(6,0)

➔ Was this dilation a reduction or an enlargement?

Enlargement (k>1)

b) Triangle *ABC* has vertices *A*(0,0), *B*(2, 6), and *C*(6, 4). Find the coordinates of the vertices of the image after a dilation about the origin with a scale factor of ½.



A(0,0) × ½ ⇒ A'(0,0)

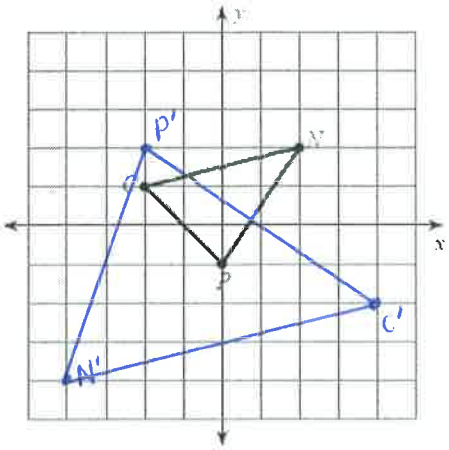
B(2,6) × ½ ⇒ B'(1,3)

C(6,4) × ½ ⇒ C'(3,2)

➔ Was this dilation a reduction or an enlargement?

Reduction (k<1)

c) Dilate the following with respect to the origin.
$(x, y) \rightarrow (-2x, -2y)$



P(0, -1) → $(-2(0), -2(-1)) \Rightarrow (-2, 2)$ P'

C(-2, 1) → $(-2(-2), -2(1)) \Rightarrow (4, -2)$ C'

N(2, 2) → $(-2(2), -2(2)) \Rightarrow (-4, -4)$ N'

➔ Was this a reduction or an enlargement?

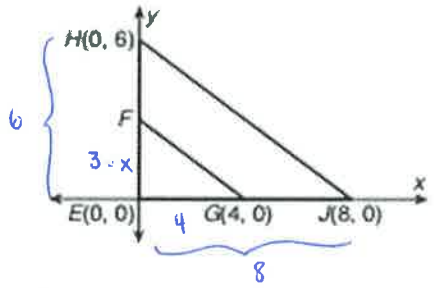
Enlargement

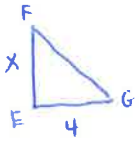
➔ What effect did the negative have on the dilation?

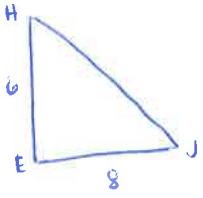
It flipped the figure over (reflected over the x-axis)

Example 2: Use similar figures to find coordinates of dilation.

a) $\Delta FEG \sim \Delta HEJ$. Find the coordinates of *F* and the scale factor.







$\frac{x}{6} = \frac{4}{8}$

$8x = 24$

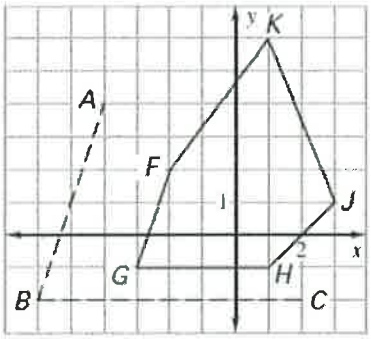
$x = 3$

F(0, 3)

Scale Factor: $\frac{\Delta FEG}{\Delta HEJ}$: $\frac{3}{6} = \boxed{\frac{1}{2}}$

b) You want to create a pentagon *ABCDE* that is similar to pentagon *FGHJK* in the diagram below.

➢ What is the scale factor?



New/Old: B: (-6, -2), G: (-3, -1) $\Rightarrow \frac{-6}{-3} = \boxed{\frac{2}{1}}$ OR $\frac{-2}{-1} = \boxed{\frac{2}{1}}$

➢ What are the coordinates of D and E?

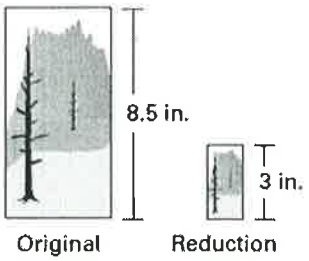
Old: J(3, 1) → D(6, 2)

Old: K(1, 6) → E(2, 12)

> multiply the old coordinates by the scale factor of 2 to get new coordinates D and E

Example 3: Find a scale factor

a) A digital photograph has the height shown in the diagram. You want to reduce the size of the photograph to the height shown. What is the scale factor of the reduction?



← divide and use MATH → FRAC

New/Old: $\frac{3 \text{ in}}{8.5 \text{ in}} = \boxed{\frac{6}{17}}$

b) You find a picture that you want to enlarge for a poster. The original picture is 2.5 cm wide, and you want to enlarge it proportionally so that the new width is 7.5 cm. What is the scale factor of the enlargement?

old

new

New/Old: $\frac{7.5 \text{ cm}}{2.5 \text{ cm}} = \boxed{\frac{3}{1}}$