



Math Virtual Learning

Grade 8

Geometric Transformations: Dilations

April 23, 2020



Math 8

Lesson: April 23, 2020

Objective/Learning Target:

I can describe the effect of dilations of two-dimensional figures using coordinates.

Warm Up - Bigger or Smaller:



Directions: For each dilation below decide whether the scale factor would produce a bigger image, smaller image, or the image would stay the same.

- | | | | |
|--|--------|---------|---------------|
| 1. Dilation by a scale factor of 2 | Bigger | Smaller | Stay the Same |
| 2. Dilation by a scale factor of 0.5 | Bigger | Smaller | Stay the Same |
| 3. Dilation by a scale factor of 1 | Bigger | Smaller | Stay the Same |
| 4. Dilation by a scale factor of $\frac{1}{4}$ | Bigger | Smaller | Stay the Same |

Answer: 1: Bigger 2: Smaller 3: Stay the Same 4: Smaller

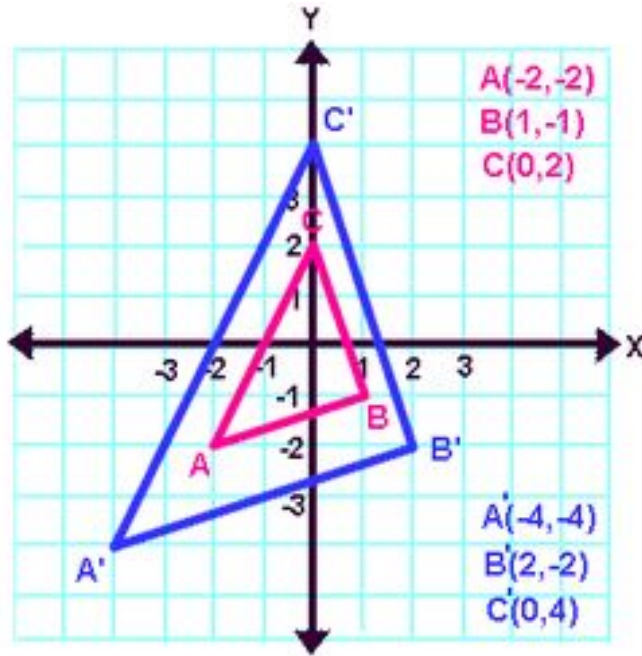
Understanding Dilations

Take notes on a piece of paper as you watch this video.



How To: Dilation

A dilation can be done around any point. The most commonly used point is the origin at (0,0). A dilation results in a figure that is the same shape, but not the same size. The **pre-image** and **image** are no longer congruent, but they are **similar**.



1) A figure (**pre-image**) is given to you and a rule
For example, ABC is our pre-image and the rule might say “dilate by a scale factor of 2”.

2) Choose a point of the **pre-image** and plug the coordinates into the rule. Plot the new point of the **image**.

Point A is at (-2,-2). The rule is $(x,y) \rightarrow (x \cdot 2, y \cdot 2)$, which turns it into $(-2 \cdot 2, -2 \cdot 2)$, or simply A' is (-4, -4).

3) Repeat for all remaining points.

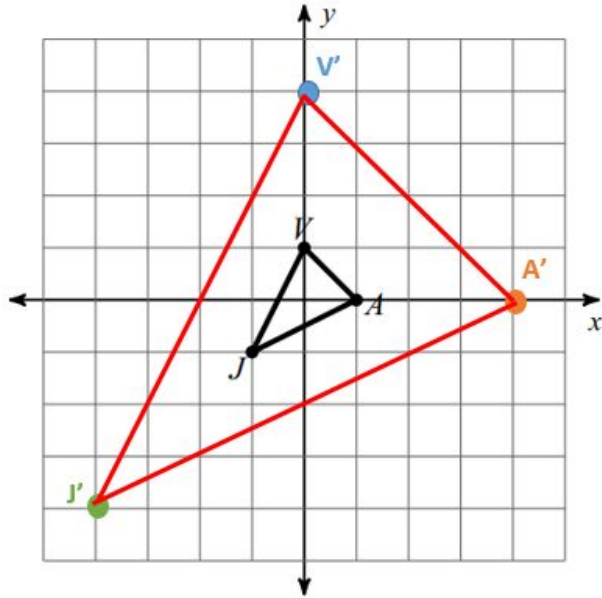
Points B and B', and points C and C' have been done.

Note: ABC is the **pre-image** and A'B'C' is the **image**.

Example 1: Dilation

Click here (and scroll down): [Shape Dilation Animation](#)

dilation of 4



1. Will the pre-image with a scale factor of 4 be an enlargement or reduction?

Enlargement

2. List the ordered pairs of the pre-image.

$A(1, 0)$ $J(-1, -1)$ $V(0, 1)$

3. Multiply each pre-image ordered pair by the scale factor.

$$A(1, 0) \rightarrow (1 \times 4, 0 \times 4) \rightarrow A'(4, 0)$$

$$J(-1, -1) \rightarrow (-1 \times 4, -1 \times 4) \rightarrow J'(-4, -4)$$

$$V(0, 1) \rightarrow (0 \times 4, 1 \times 4) \rightarrow V'(0, 4)$$

4. Graph the new ordered pairs to create the image.

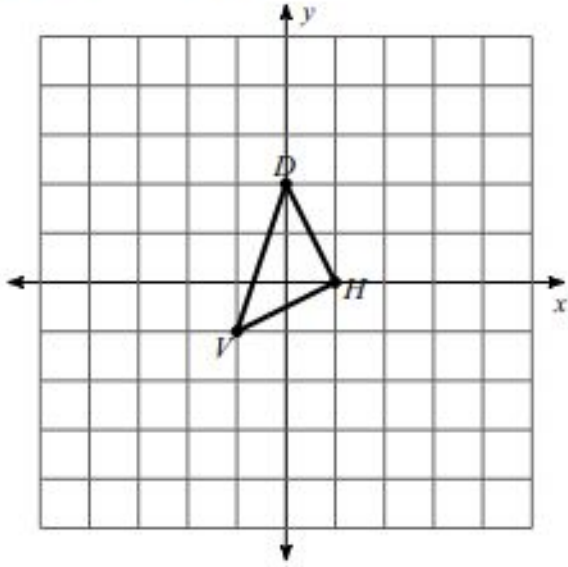
$A'(4, 0)$ $J'(-4, -4)$ $V'(0, 4)$

Practice 1

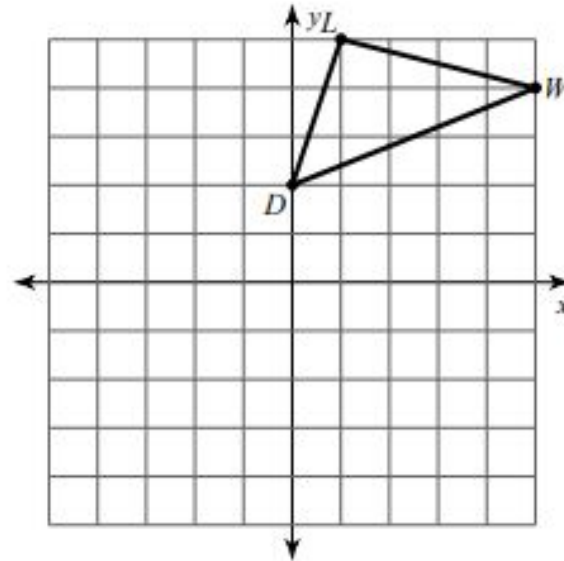
[Link: Printable Graph Paper](#)

Use the transformation rule to complete each problem.

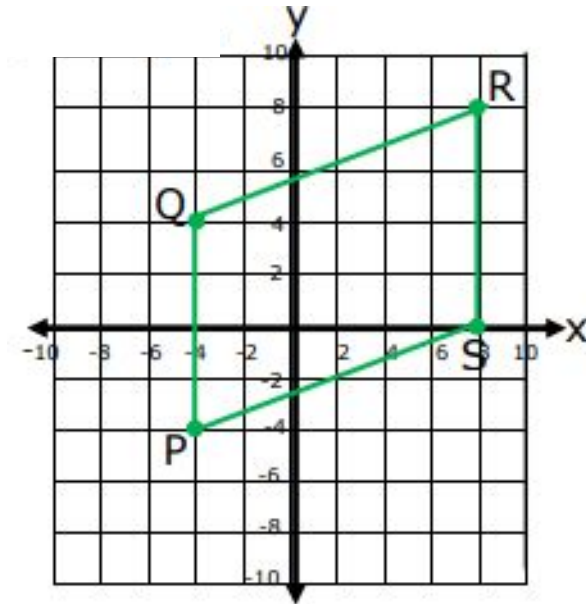
1) dilation of 2



2) dilation of $\frac{1}{2}$



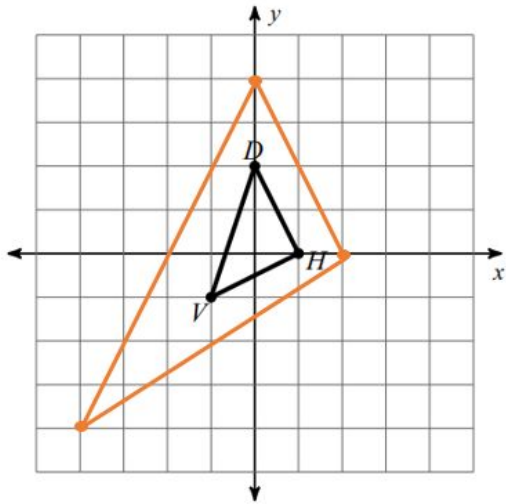
3) dilation of $\frac{1}{4}$



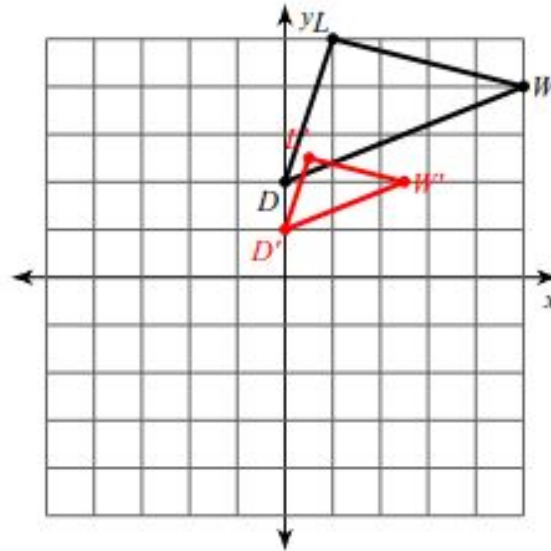
Answers on next page

Practice 1: *Answer Key*

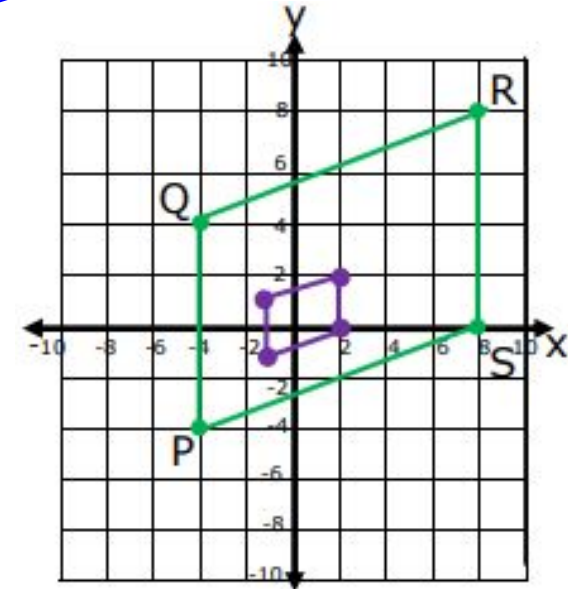
It is okay if the pre-image and image overlap!



$V'(-2,-2)$, $D'(0,4)$, $H'(2,0)$

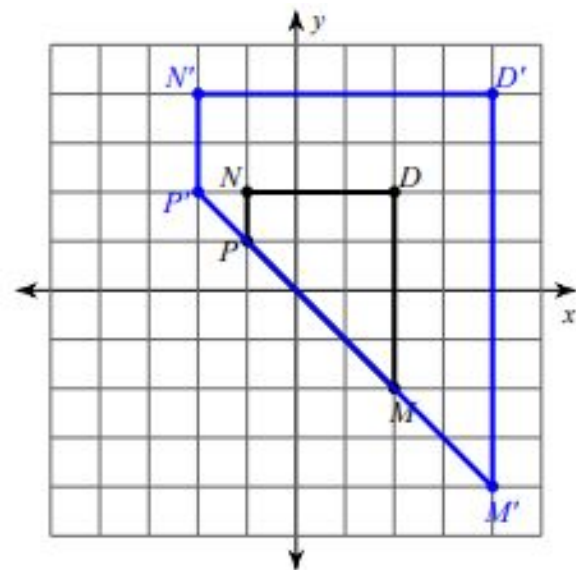


$D'(0, 1)$, $L'(0.5, 2.5)$, $W'(2.5, 2)$



$P'(-1,-1)$, $Q'(-1,1)$, $R'(2,2)$, $S'(2,0)$

How To: Identify a Dilation Rule



1) Determine which points are your **image** and **pre-image**.
PNDM is the pre-image. P'N'D'M' is the image.

2) Choose a point from your **image** and write the x and y values as the numerators of each ratio.

Pick point D'(4,4) and write it as: $\frac{4}{2}$ and $\frac{4}{2}$

3) Use the coordinating point from your **pre-image** and write it as the denominator of a ratio.

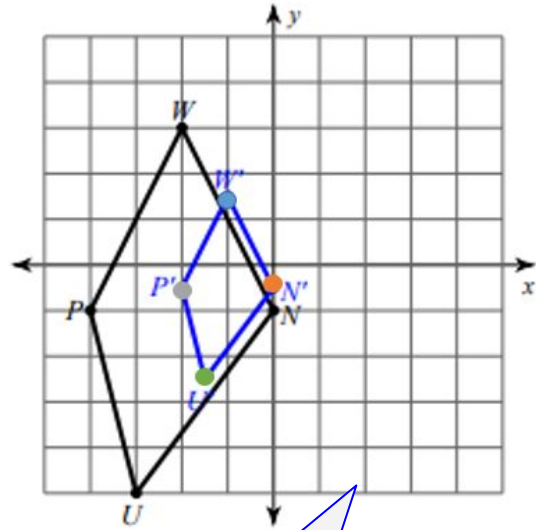
Point D(2,2) and write it as: $\frac{4}{2}$ and $\frac{4}{2}$

4) Reduce the ratio to its simplest form to find the **scale factor**.

Both of those fractions (ratios) reduce to 2 over 1, or 2. So our scale factor is 2.

5) Repeat for each x and y value (on every point) of your figures, to ensure you have the correct **scale factor**.

Example 2: Identify the Dilation Rule



It is okay if the pre-image and image overlap!

1. Decide if it is an enlargement or reduction.

Reduction

2. Identify points from the pre-image and image.

$$N(0, -1) \rightarrow N'(0, -\frac{1}{2})$$

$$W(-2, 3) \rightarrow W'(-1, 1\frac{1}{2})$$

$$P(-4, -1) \rightarrow P'(-2, -\frac{1}{2})$$

$$U(-3, -5) \rightarrow U'(-1\frac{1}{2}, -2\frac{1}{2})$$

3. Compare image points to the pre-image points as ratios.

$$\frac{0}{0} \quad \frac{-\frac{1}{2}}{-1}$$

$$\frac{-1}{-2} \quad \frac{1\frac{1}{2}}{3}$$

$$\frac{-2}{-4} \quad \frac{-\frac{1}{2}}{-1}$$

$$\frac{-1\frac{1}{2}}{-3} \quad \frac{-2\frac{1}{2}}{-5}$$

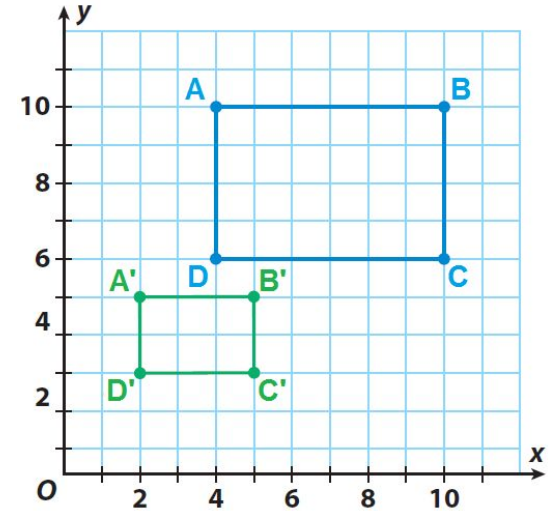
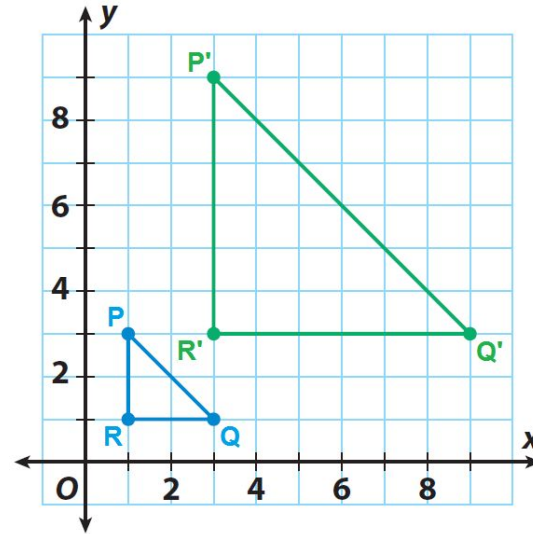
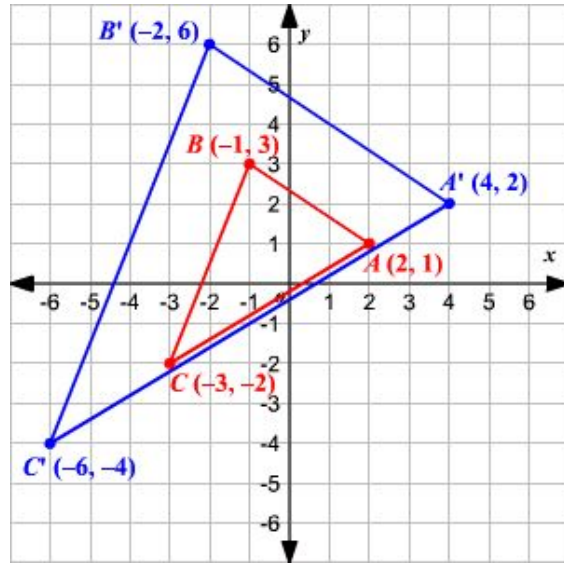
4. Decide on the scale factor after simplifying ratio.

Scale Factor of $\frac{1}{2}$

Practice 2

[Link: Printable Graph Paper](#)

Identify the transformation rule for each problem.



Answers on next page

Practice 2: *Answer Key*

Dilation of 2

Dilation of 3

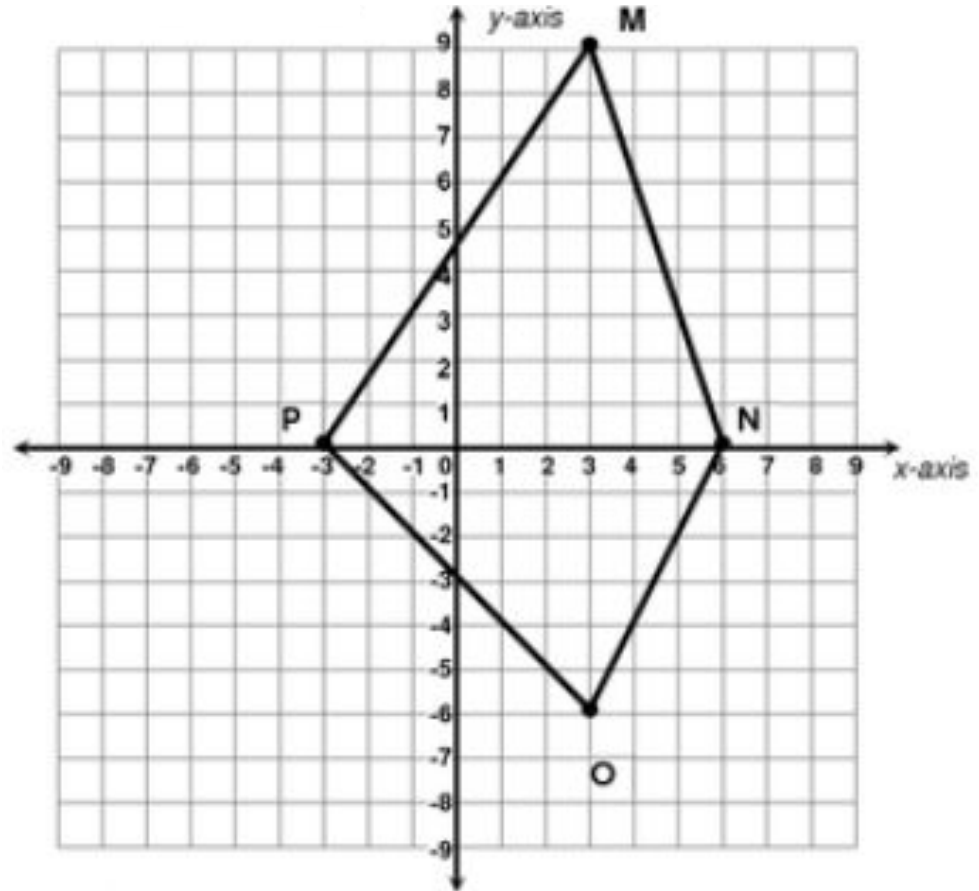
Dilation of $\frac{1}{2}$

Exit Ticket

Dilate the figure MNOP by a scale factor of $\frac{1}{3}$.

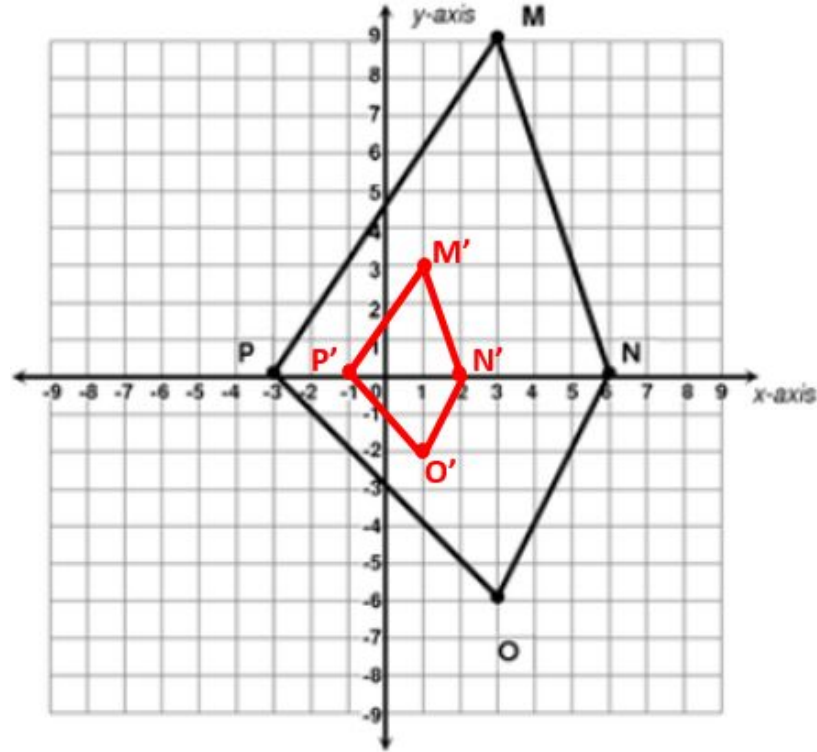
Check your answer on next page.

[Link: Printable Graph Paper](#)



Exit Ticket

Answer Key



$M'(1,3), N'(2,0), O'(1,-2), P'(-1,0)$

Additional Resources:

[Video - Dilations on a Grid](#)

[Dilations on a Grid - Additional practice problems](#)

[Video - Dilation lesson](#)

[Dilations - Check your knowledge](#)

[Printable Graph Paper](#)

[Virtual Graph Paper](#)