Inspiring Greatness

INDEPENDENCE SCHOOL DISTRICT

Math Virtual Learning

Grade 8

Geometric Transformations: Dilations

April 22, 2020

Math 8
Lesson: April 22, 2020

Objective/Learning Target:
I can describe the effect of dilations of two-dimensional figures using coordinates.

Warm Up

Dilations are found everywhere in the real world.

The word "**dilate**" is often heard in relation to the human eye.
"The pupils of the eyes were dilated."
As light hits the eye, the pupil enlarges or contracts depending upon the amount of light.

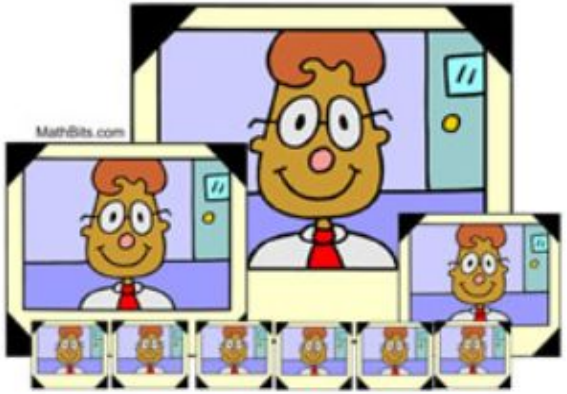
Can you come up with a real-world example? Where have you seen dilations in your life? Can you find one <u>right</u> <u>now</u> around you?

Warm Up *continued*

Some more real life examples of dilations are:

Photography

School or holiday picture packages offer the same photograph in a variety of sizes, from large to medium to small wallet size photos.

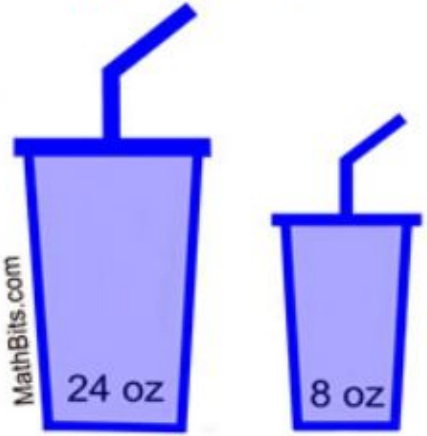


Arts and Crafts

Russian nesting dolls are a set of wooden dolls of decreasing size placed inside one another. After the smallest doll, each doll is an enlargement of its inside doll.

Food Service

Soft drink containers come in a variety of sizes. While some are of different shapes, others are simply enlargements.



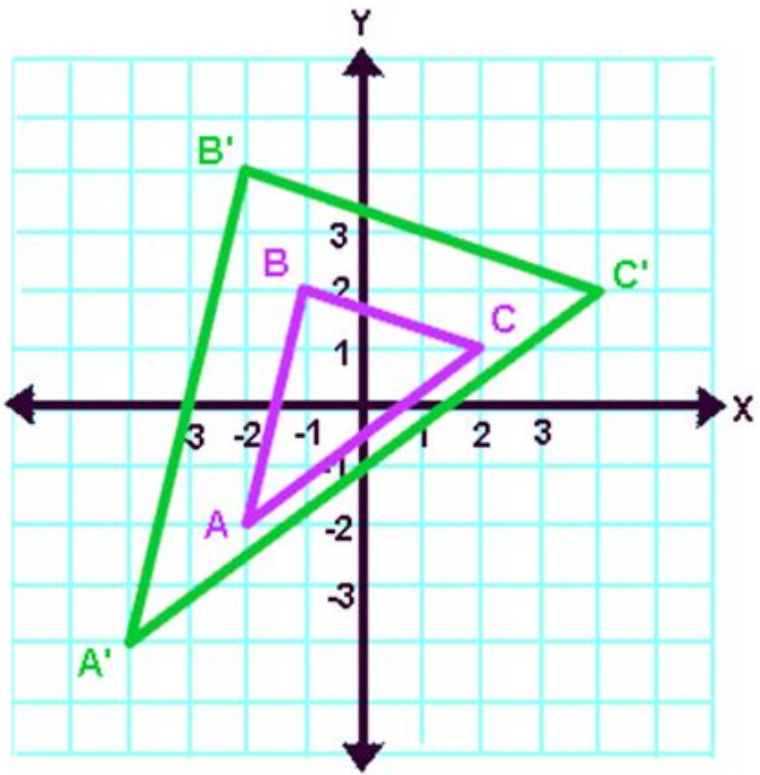
Define: Dilation

A dilation is the image created when the figure is a <u>different</u> <u>size</u>.

1) When your image results in a larger figure (growth), that is called a enlargement. When your image results in a smaller figure (shrunk), that is called a reduction.

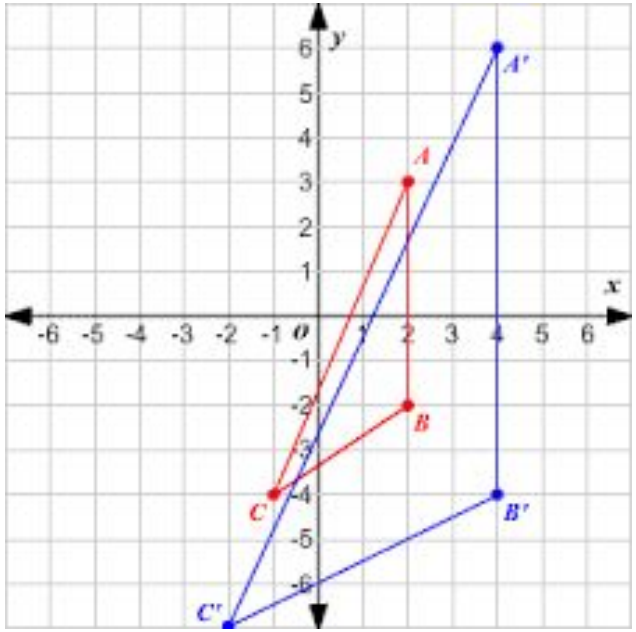
2) The amount of shrink or growth between the pre-image and image is called the scale factor or ratio.

3) You can dilate a figure about any point, though the most commonly used point is the origin (0,0). This is called the center of dilation.

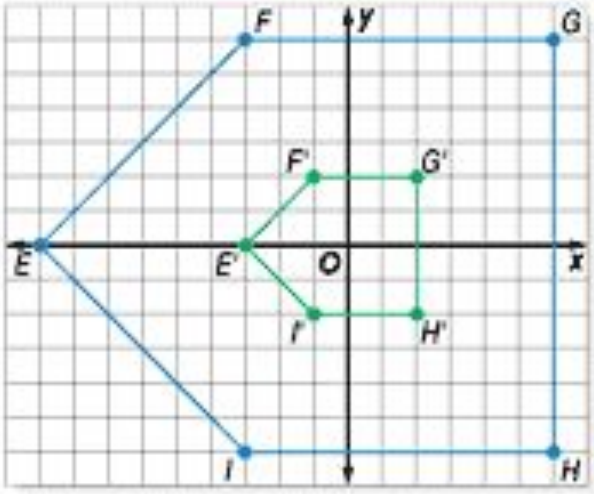


Example 1:

Look at the figures below and decide if they are a <u>reduction</u> or <u>enlargement</u>. *Don't forget to identify which is the pre-image and image.*



Answer: Enlargement



Answer: Reduction

How to: Dilation Rules

To find the new coordinates of the image, use the formula: $(x,y) \rightarrow (rx, ry)$

*where r is the **ratio** (or scale factor) and you multiply it by each value of x and y.*

- If the scale factor is greater than 1, the image is an enlargement. (It expands)
- If the scale factor is between 0 and 1, the image is a reduction. (It contracts)
- If the scale factor is 1, the figure and the image are the exact same size (congruent).

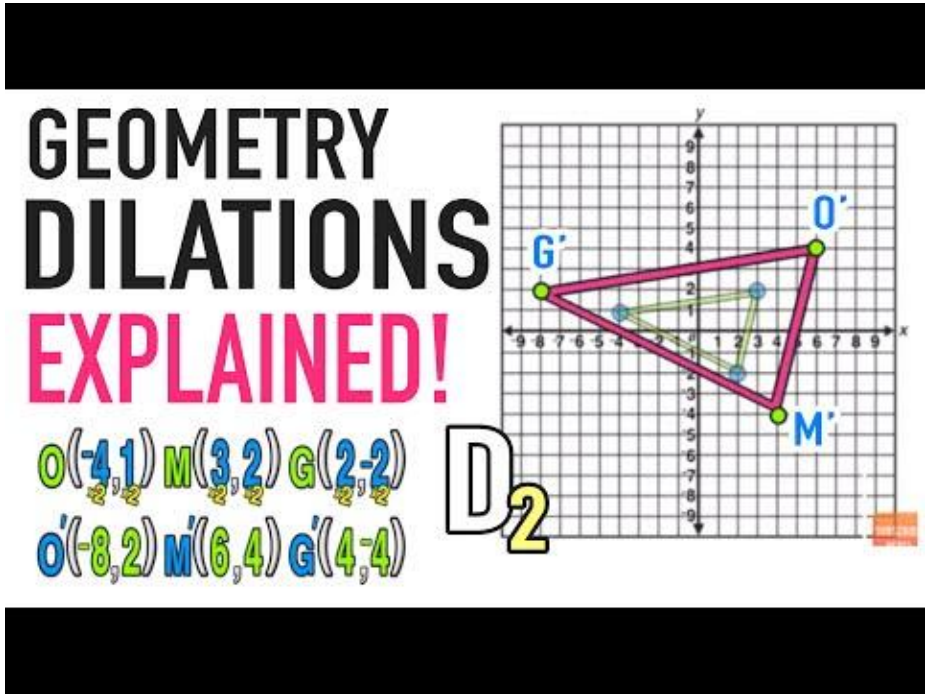
Example: The coordinates of a triangle are given: A(1,1), B(3,3), and C(2,4).
Dilate the figure by a scale factor of 2.

Multiply each x and y value by 2: A(1 **x2**, 1 **x2**), B(3 **x2**, 3 **x2**), C(2 **x2**, 4 **x2**)

Answer: **A'(2,2), B'(6,6), C'(4,8)**

Video: Dilations

Click to watch the video on how to perform dilations.



Take notes on your <u>own piece of paper</u>.

Practice 1: Complete the dilation for each set of points. *Answer Key provided.*

1. H(-3,2), I(-2,3), J(-1,1) Dilate with a scale factor of 4

2. E(-1,3), D(0,5), C(4,3) Dilate with a scale factor of 2

3. U(2,-4), V(2,1), W(4,-4) Dilate with a scale factor of 3

4. G(-3,-2), H(-4,0), I(-2,3), J(-1,-2) Dilate with a scale factor of 5

5. T(-4,-6), U(-6,-2), V(-4,-2), W(0,-6) Dilate with a scale factor of ½

6. F(-3,0), G(-3,5), H(2,5), I(2,0) Dilate with a scale factor of 2

Practice 1: *Answer Key*

1. H’(-12,8), I’(-8,12), J’(-4,4)

2. E’(-2,6), D’(0,10), C’(8,6)

3. U’(6,-12), V’(6,3), W’(12,-12)

4. G’(-15,-10), H’(-20,0), I’(-10,15), J’(-5,-10)

5. T’(-2,-3), U’(-3,-1), V’(-2,-1), W’(0,-3)

6. F’(-6,0), G’(-6,10), H’(4,10), I’(4,0)

How to: Identify the Rule (Dilations)

1) Determine which points are your image and pre-image.

If given: X(-5,-1), W(-2,0), V(-5,-3) & X'(-15,-3), W'(-6,0), V'(-15,-9)

then XWV is your pre-image and XWV is your image.

2) Choose a point from your image and write it as the numerator of a ratio.

For the example, pick point X'(-15,-3) and write it as: $\frac{-15}{}$ *and* $\frac{-3}{}$

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

For the example, pick point X(-5,-1) and write it as: $\frac{-15}{-5}$ *and* $\frac{-3}{-1}$

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

Both of those fractions (ratios) reduce to 3 over 1, or 3. So our scale factor is 3.

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

Example 3: Identify the Scale Factor (Dilation)

What is the scale factor used to get from the pre-image point to the image point?

Enlargement

$A(-1,7) \rightarrow A'(-2, 14)$

X-value: $\frac{-2}{-1} = 2$

Y-value: $\frac{14}{7} = 2$

Answer:

Scale Factor = 2

Reduction

$B(6,-15) \rightarrow B'(2,-5)$

X-value: $\frac{2}{6} = \frac{1}{3}$

Y-value: $\frac{-5}{-15} = \frac{1}{3}$

Answer:

Scale Factor = ⅓

Link for Video Tutorial

Practice 2: Determine the transformation rule. *Answer Key provided.*

1) K(1, 0), L(4, 1), M(1, 4), N(-2, 3) → K'(3,0), L'(12,3), M'(3,12), N'(-6,9)

2) E(-8, -8), F(-6, -10), G(-2, -8), H(-6, -6) → E'(-4,-4), F'(-3,-5), G'(-1,-4), H'(-3,-3)

3) P(5, 2), Q(8, 2), R(8, 5), S(5, 5) → P'(10,4), Q'(16,4), R'(16,10), S'(10,10)

4) A(0, -2), B(5, -2), C(5, 1), D(0,0) → A'(0,-10), B'(25,-10), C'(25,5), D'(0,0)

5) J(2, 5), K(1, 0), L(5, 1) → J'(8,20), K'(4,0), L'(20,4)

6) U(0, 8), V(12, 4), W(8, 4) → U'(0,2), V'(3,1), W'(2,1)

Practice 3: *Answer Key*

1) Dilation, scale factor of 3

2) Dilation, scale factor of ½

3) Dilation, scale factor of 2

4) Dilation, scale factor of 5

5) Dilation, scale factor of 4

6) Dilation, scale factor of ¼

Additional Resources:

Scale Ella

Dilations Jeopardy Game

Dilations and Scale Factor - Khan Academy

Finding Scale Factor Practice

Printable Graph Paper

Virtual Graph Paper