

Your name

Mrs. Theo

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Notes

Dilations

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.

Use the transformation rule to complete each problem.

1) dilation of 2 ^{factor} twice as big

Rule Dilations
 $(x,y) \rightarrow (ax, by)$

Stretches when multiplying by a number bigger than 1

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

Pre Image	Image
D(0, 2)	D'(0, 4) D'(0, 4)
V(-1, -1)	V'(2 · -1, 2 · -1) V'(-2, -2)
H(1, 0)	H'(2 · 1, 2 · 0) H'(2, 0)

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

Shrinks when multiplying by a number less than 1

Pre Image	Image
D(0,2)	D'(0,1)
L(1,5)	L'(0.5, 2.5)
W(5,4)	W'(2.5, 2)

$(x, y) \rightarrow (\frac{1}{2}x, \frac{1}{2}y)$
or $\rightarrow (0.5x, 0.5y)$

How To: Identify a Dilation Rule

- Determine which points are your image and pre-image. *P'N'D'M' is the pre-image. P'N'D'M is the image.*
- Choose a point from your image and write the x and y values as the numerators of each ratio. *Pick point D' and write it as $\frac{4}{2}$ and $\frac{4}{2}$*
- Use the coordinating point from your pre-image and write it as the denominator of a ratio. *Point D and write it as $\frac{4}{2}$ and $\frac{4}{2}$*
- 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.*
- Repeat for each x and y value (on every point) of your figures, to ensure you have the correct scale factor.

New image
Pre image old

Identify the transformation rule for each problem.

$\frac{\text{Image}}{\text{Pre-Image}} = \frac{\text{New}}{\text{Old}}$

Scale Factor is 2
Scale Factor 3
 $\frac{9}{3} = 3$ or $\frac{5}{1}$
 $\frac{5}{10} = \frac{1}{2}$

The table below shows the coordinates of triangle RST and the coordinates of R'S'T' in triangle R'S'T'. Triangle R'S'T' is a dilation of triangle RST.

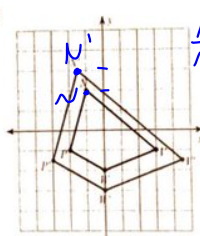
Triangle RST	Triangle R'S'T'
R (-2, -3)	R' (-6, -9)
S (0, 2)	S' (0, 6)
T (2, -3)	T' (6, -9)

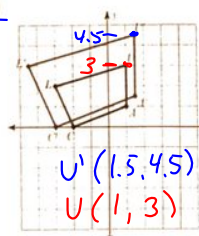
$\frac{-6}{-2} = 3$
 $\frac{0}{0} = 3$
 $\frac{-9}{-3} = 3$

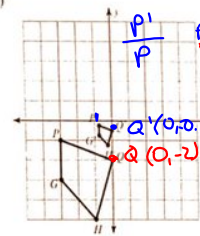
On the grid below, draw triangle RST and triangle R'S'T'.

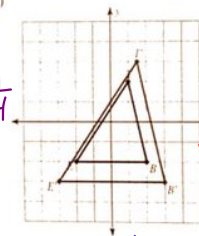
Stretch by 3

Write a rule to describe each transformation.

1)  $\frac{N'}{N} = \frac{3}{2} = 1.5$
 $(x, y) \rightarrow (1.5x, 1.5y)$

2)  $\frac{U'}{U} = \frac{4.5}{3} = 1.5$ or $\frac{1.5}{1}$
 $(x, y) \rightarrow (1.5x, 1.5y)$

3)  $\frac{P'}{P} = \frac{-0.25}{-1} = 0.25$
 $(x, y) \rightarrow (0.25x, 0.25y)$
 $(\frac{1}{4}x, \frac{1}{4}y)$

4)  $\frac{B'}{B} = \frac{3}{2} = 1.5$
 $(x, y) \rightarrow (1.5x, 1.5y)$

Do the following problem with the class, then write down the process on the right:

Dilate $\triangle ADI$, $A(-1, -1)$, $D(0, 2)$, $I(3, 1)$ by a scale factor of 2 from the origin.

A' () B' () C' () How do you do a dilation from the origin?
 $(x, y) \rightarrow (2x, 2y)$

$A(-1, -1) \rightarrow A'(-2, -2)$
 $D(0, 2) \rightarrow D'(0, 4)$
 $I(3, 1) \rightarrow I'(6, 2)$

What are the important pieces of information given for a dilation?

Do the next 4 dilation problems. Check your answers with a neighbor.

1) Dilate $\triangle QRS$ if $Q(-1, 0)$, $R(-1, 2)$, $S(-2, 1)$ by a scale factor of 2 from the origin.

Q' () R' () S' ()

$Q(-1, 0) \rightarrow Q'(-2, 0)$
 $R(-1, 2) \rightarrow R'(-2, 4)$
 $S(-2, 1) \rightarrow S'(-4, 2)$
 $(x, y) \rightarrow (2x, 2y)$

2) Dilate $\triangle TRK$ if $T(-1, -2)$, $R(1, 0)$, $K(0, 1)$ by a scale factor of 3 from the origin.

T' () R' () K' ()

3) Dilate $\triangle XYZ$ if $X(-4, 0)$, $Y(-4, 4)$, $Z(-2, -2)$ by a scale factor of $\frac{1}{2}$ from the origin.

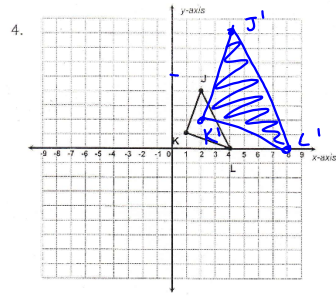
X' () Y' () Z' ()

4) Dilate $\triangle HAT$ if $H(-1, -1)$, $A(1, 0)$, $T(-1, 2)$ by a scale factor of 4 from the point $(-1, 2)$.

H' () A' () T' ()

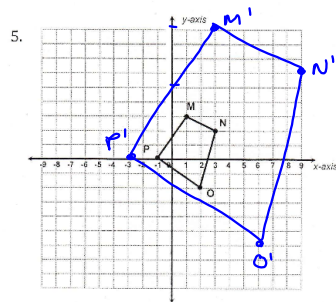
Directions: Answer the following questions to the best of your ability. For the y-axis, use the same scaling as the x-axis

- In Math, the word dilate means to stretch or shrink a figure.
- If a scale factor is less than 1, then your figure gets smaller.
- If a scale factor is greater than 1, then your figure gets bigger.



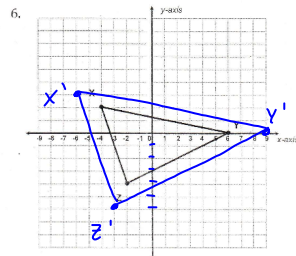
Graph the dilated image of triangle JKL using a scale factor of 2 and (0,0) as the center of dilation.

J: $(2, 4)$ J': $(4, 8)$
 K: $(1, 1)$ K': $(2, 2)$
 L: $(4, 0)$ L': $(8, 0)$
 $(x, y) \rightarrow (2x, 2y)$



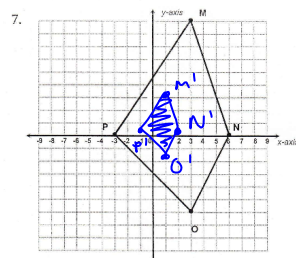
Graph the dilated image of quadrilateral MNOP using a scale factor of 3 and the origin as the center of dilation.

M: $(1, 3)$ M': $(3, 9)$
 N: $(3, 2)$ N': $(9, 6)$
 O: $(2, -2)$ O': $(6, -6)$
 P: $(-1, 0)$ P': $(-3, 0)$
 $(x, y) \rightarrow (3x, 3y)$



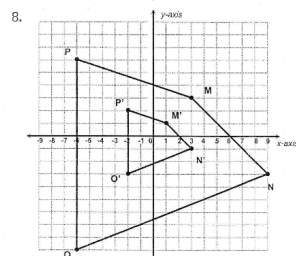
Graph the dilated image of triangle XYZ using a scale factor of 1.5 and (0,0) as the center of dilation.

X: $(4, 2)$ X': $(6, 3)$
 Y: $(6, 0)$ Y': $(9, 0)$
 Z: $(-2, 4)$ Z': $(-3, 6)$
 $(x, y) \rightarrow (1.5x, 1.5y)$



Graph the dilated image of quadrilateral MNOP using a scale factor of 1/3 and the origin as the center of dilation.

M: $(3, 9)$ M': $(1, 3)$
 N: $(6, 0)$ N': $(2, 0)$
 O: $(3, -6)$ O': $(1, -2)$
 P: $(-3, 0)$ P': $(-1, 0)$
 $(x, y) \rightarrow (\frac{1}{3}x, \frac{1}{3}y)$



Describe the dilation of quadrilateral MNOP, using the origin as the center.

The image is $\frac{1}{3}$ the size (shrank by $\frac{1}{3}$)

$P'(-2, 2)$ $\frac{-2}{-6} = \frac{1}{3}$
 $P(-6, 6)$