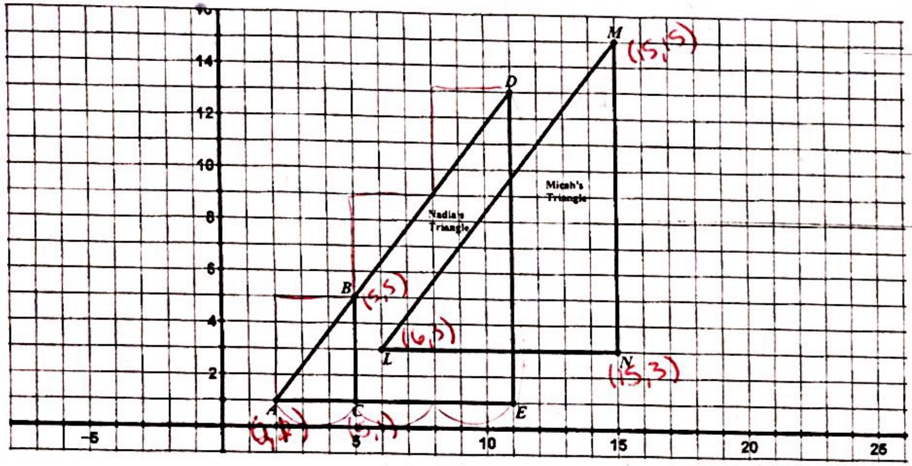
Name:__________________ Date:____________ Per._____

U11 CWK #1

Properties of Dilations

1. Ms. Williams gave her students the grid shown below with ΔABC graphed on it. She then asked her students to create a triangle that was the same shape as the original triangle but has sides lengths that are three times larger. Micah created ΔLMN shown below and Nadia created ΔADE shown below.



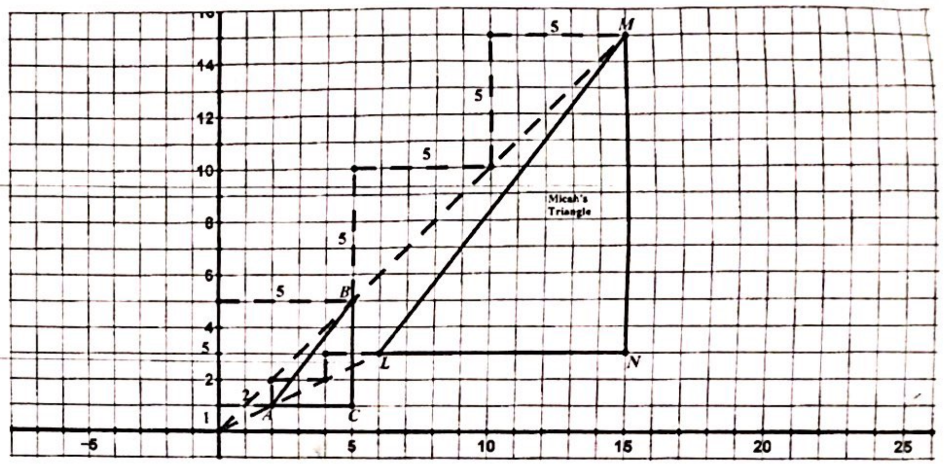
a. The teacher asked the class who had done the assignment correctly, Nadia or Micah? Iya said they were both correct. Hendrix disagreed and said they could not both be correct because the triangles were not in the same location in the coordinate plane. Who do you agree with and why?

b. The teacher asked Micah and Nadia to explain the methods they used to create the triangles.

Nadia's Method: Using a ruler, I slid C along the line containing the points A and C until my new segment was three times larger than $\overline{AC}$ and labeled the new point E. I then used my ruler to slide B along the line containing the points A and B as shown below and labeled the new point D. Lastly, I checked to make sure $\overline{DE}$ was 3 times larger than $\overline{BC}$ and it was!

Micah's Method: I noticed that the slope of the line passing through the origin and A had a rise of 1 and a run of 2. Since I wanted the image to be three times larger than ΔABC, I placed the point that corresponds to A three slope triangles (with a rise of 1 and a run of 2) from the origin. I used the same method to plot the point that corresponds to B. The slope of the line passing through the origin and B has a rise of 5 and a run of 5. Again, I moved three slope triangles with a rise of 5 and a run of 5 from the origin and plotted M. The slope of the line passing through C and the origin has a rise of 1 and a run of 5. I moved three slope triangles with a rise of 1 and a run of 5 from the origin and plotted N.

1



Compare the two methods used. What is the same about the resulting triangles? What is different? What accounts for the differences in the triangles?

In the previous example, Micah and Nadia both **dilated** ΔABC. A **dilation** is a transformation that produces an image that is the same shape as the original figure but the image is a different size.

Every dilation has a center of dilation and a scale factor. The **center of dilation** is a fixed point in the plane from which all points are expanded or contracted. The **scale factor** describes the size change from the original figure to the image. We use the letter r to represent scale factor. The dilation is an enlargement if the scale factor is greater than 1 and a reduction if the scale factor is between 0 and 1.

In the example on the previous page, the scale factor for both Nadia and Micah was 3; however Nadia's center of dilation was A: (2, 1) while Micah's was the origin (0, 0).

2. We will use the example on the previous page to examine some of the **properties of dilations.**
   a. Find the following ratios for Nadia's triangle:

   $\frac{AD}{AB} =$ 3 $\qquad \frac{DE}{BC} = \frac{12}{4} = 3 \qquad \frac{AE}{AC} = \frac{9}{3} = 3$

   b. Find the following ratios for Micah's triangle:

   $\frac{LM}{AB} = \qquad \frac{MN}{BC} = \frac{12}{4} = 3 \qquad \frac{LN}{AC} = \frac{9}{3} = 3$

Dilation: growing or shrinking

2

d. Complete the following sentence. Under a dilation, **corresponding angles** are... congruent (scale factor)

congruent

e. Complete the following sentence. Under a dilation, **corresponding segments** are...

similar

f. Complete the following sentence. Under a dilation, **corresponding vertices**...

g. Complete the following sentence. Under a dilation, **segments connecting corresponding vertices**...

h. In the table below, list the coordinates of the corresponding vertices in Micah's dilation:

x3

A:	(2, 1)	L:	(6, 3)
B:	(5, 5)	M:	(15, 15)
C:	(5, 1)	N:	(15, 3)

x3

i. Write a coordinate rule for Micah's dilation using the information in the table above.

$(x, y) \rightarrow (3x, 3y)$

scale factor

j. In the table below, list the coordinates of the corresponding vertices in Nadia's dilation:

x3 -4

A:	(2, 1)	A:	(2, 1)
B:	(5, 5)	D:	(11, 13)
C:	(5, 1)	E:	(11, 1)

k. Write a coordinate rule for Nadia's dilation using the information in the table above. Remember that Nadia's center of dilation is not at the origin. Think about how this shift off the origin will affect the coordinate rule.

$(x, y) \rightarrow (3x-4, 3x-2)$

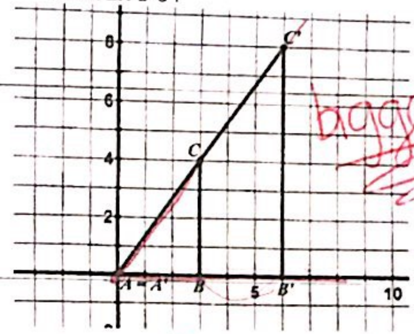
scale factor

x-2 of x

x-2 of y 3

...one figure has been dilated to obtain a new figure. Determine the scale factor and center of dilation. Determine the coordinate rule for the dilation when asked.

3. In the picture below, ΔABC has been dilated to obtain $\Delta A'B'C'$.



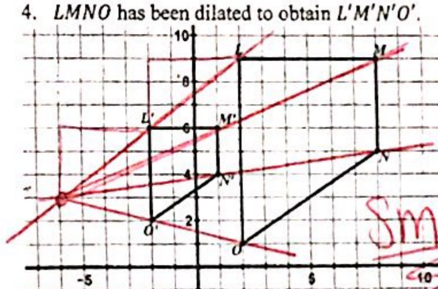
bigger

Scale Factor: 2

Center of Dilation: Origin (0,0)

Coordinate Rule: $(x, y) \rightarrow (2x, 2y)$

4. $LMNO$ has been dilated to obtain $L'M'N'O'$.



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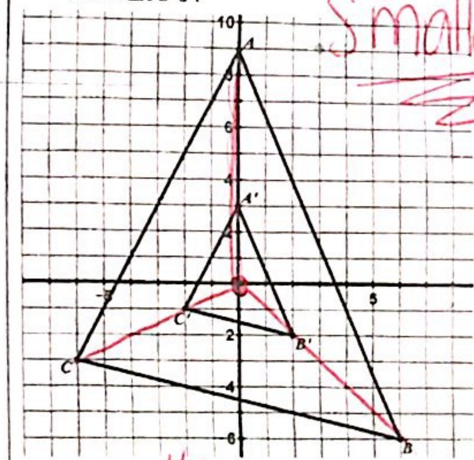
Scale Factor: ~~2~~ 1/2

Center of Dilation: (-6, 3)

5. In the picture below, ΔABC has been dilated to obtain $\Delta A'B'C'$.

Smaller

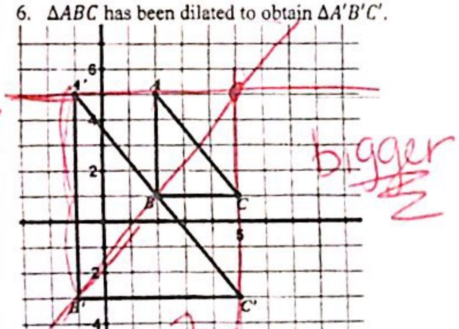


Scale Factor: 1/3

Center of Dilation: Origin (0,0)

Coordinate Rule: $(x, y) \rightarrow (\frac{1}{3}x, \frac{1}{3}y)$

6. ΔABC has been dilated to obtain $\Delta A'B'C'$.



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Scale Factor: 2

Center of Dilation: (5, 5)