NAME:____________________ Math _____, Period 5/6

Mr. Rogove Date: 10/27

Learning Objective:

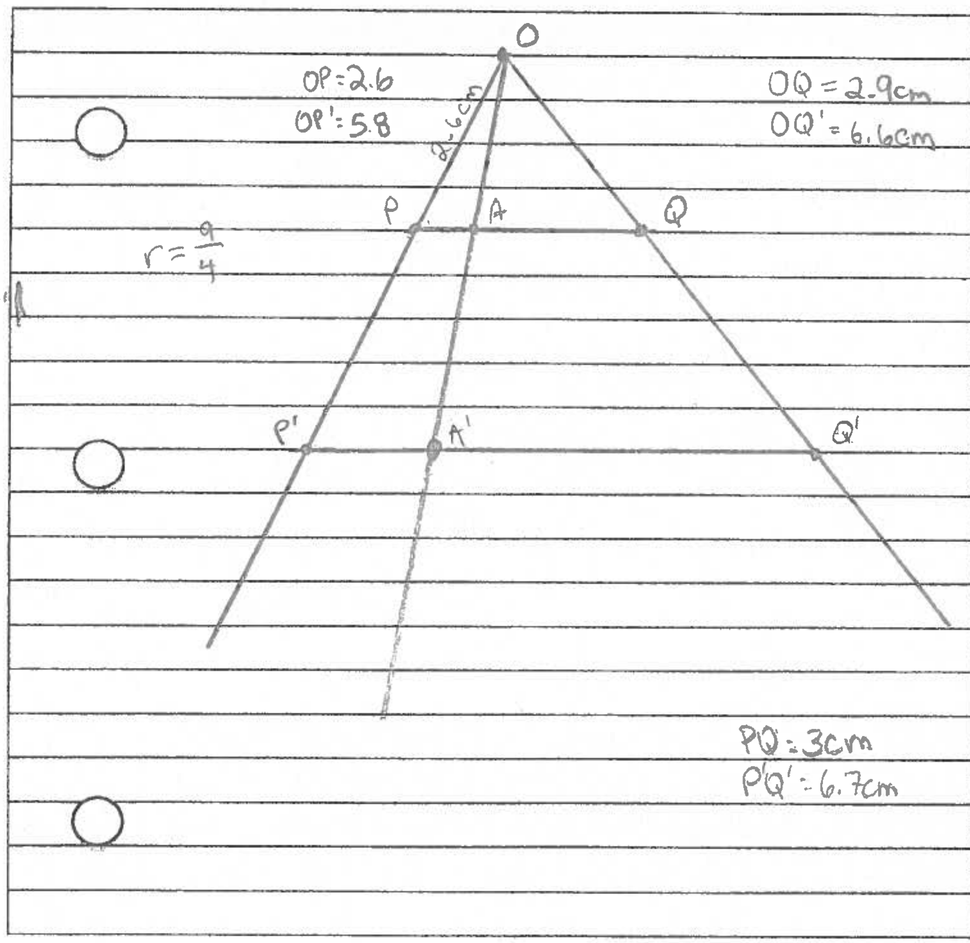
We will verify the Fundamental Theorem of Similarity (G8M3L4)

Concept Development:

The Fundamental Theorem of Similarity (FTS): Given a dilation with center O and scale factor r, then for any two points P *and* Q in the plane so that $O, P,$ and Q are not collinear, the lines PQ and $P'Q'$ are parallel, where $P' = dilation(P)$ and $Q' = dilation(Q)$ and furthermore $|P'Q'| = r|PQ|$.

"Lined Paper" Proof

$r|OP| = |OP'|$



1. On line 2, make center O
2. Mark point P 4 rows down
3. Draw ray $\overrightarrow{OP}$
4. Mark P' 9 rows down from O
5. Find the scale factor.
6. Mark point Q 4 rows down fro and draw ray $\overrightarrow{OQ}$
7. Mark Q' using the same scale fac
8. Connect PQ and connect P'Q'
9. Measure OP & OP'
10. Measure OQ & O

VERIFY THAT THEY HAVE THE SAME SCALE FACTOR

11. Measure PQ and P'Q'
12. Draw another ray from O.
13. Label A & A'

$$|OA| \cdot \frac{9}{4} = |OA'|$$

$$\frac{|P'A'|}{|PA|} = \frac{9}{4}$$

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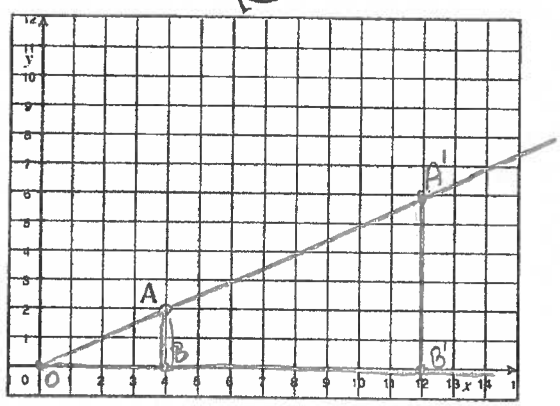
GUIDED PRACTICE:

How to use the FTS to Determine Points of Dilation on a Coordinate Plane

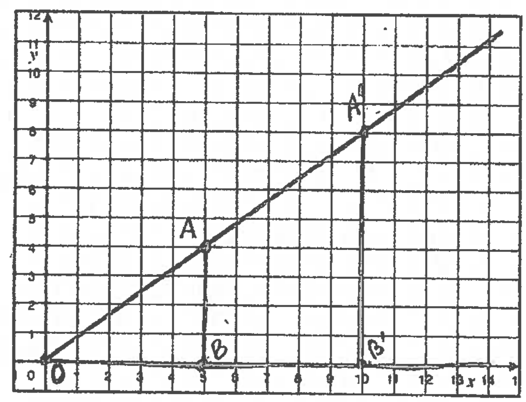
1. Locate the center of dilation (for this lesson, it will be the origin).
2. Locate the original point that is being dilated. Draw a ray from the origin through the point and label the point A.
3. Draw a vertical line from Point A to the x-axis, and label the point of intersection with the x-axis B.
4. Find B' by multiplying the distance of segment OB by the given scale factor.
5. Draw a vertical line from B' to the ray OA. The point of intersection with your ray is the dilation of A.

Find *A'* when *A* is dilated from the origin by a scale factor of 3.

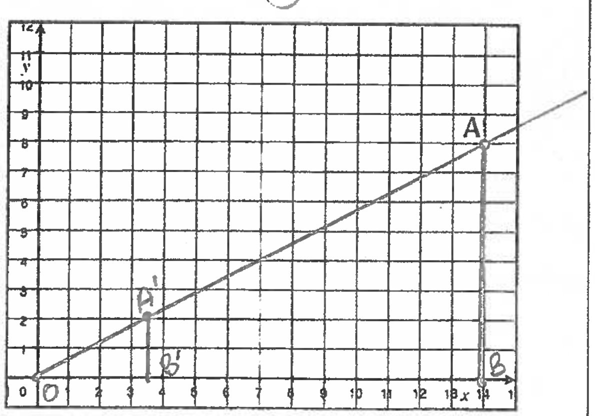


A' (12, 6)

Find *A'* when *A* is dilated from the origin by a scale factor of 2.

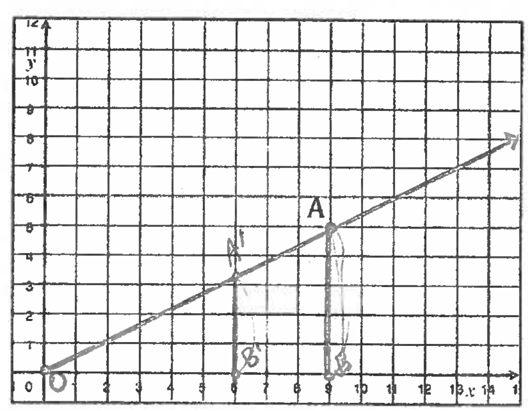


Find *A'* when *A* is dilated from the origin by a scale factor of $\frac{1}{4}$.



A' = (3.5, 2)

Find *A'* when *A* is dilated from the origin by a scale factor of $\frac{2}{3}$.



A' (6 $\frac{10}{3}$)

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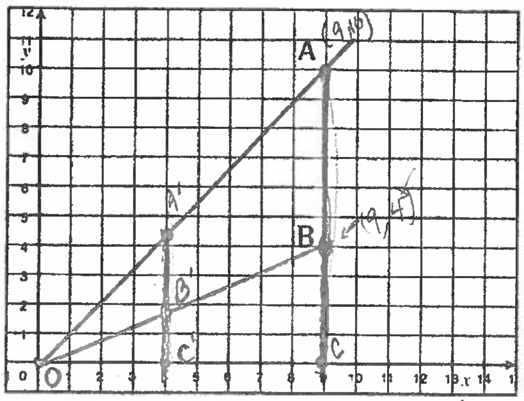
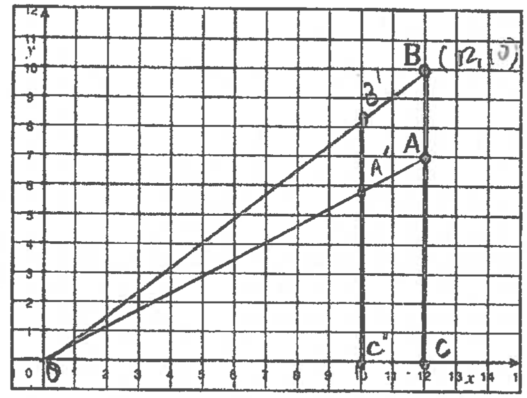
Find A' and B' when A and B are dilated from the origin by a scale factor of $\frac{4}{9}$.



A' $\left(4, \frac{40}{9}\right) = \left(\frac{4}{9}\cdot 9, \frac{4}{9}\cdot 10\right)$

B' $\left(4, \frac{16}{9}\right) = \left(\frac{4}{9}\cdot 9, \frac{4}{9}\cdot 4\right)$

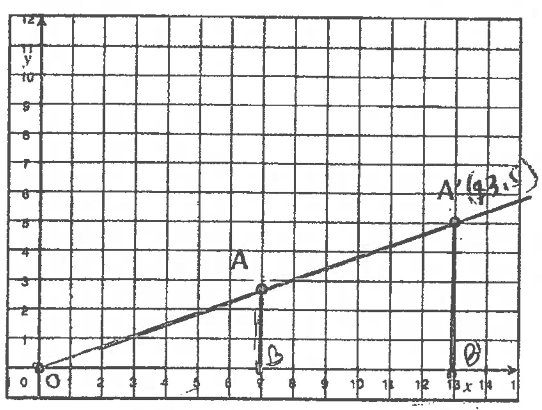
Find A' and B' when A and B are dilated from the origin by a scale factor of $\frac{5}{6}$.



A' $\left(10, \frac{35}{6}\right)$

B' $10, \frac{25}{3})$

Find the scale factor of the dilation from A to A'.

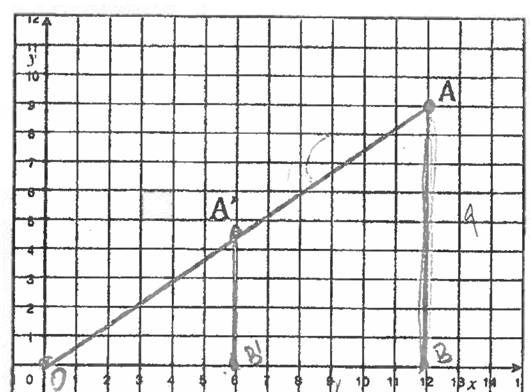


$r = \frac{|OA'|}{|OA|} = \frac{|OB'|}{|OB|} = \frac{|A'B'|}{|AB|}$

$r = \frac{13}{7}$

A $\left(7, \frac{35}{13}\right)$

Find the scale factor of the dilation from A to A'.



$\frac{|OB'|}{|OB|} = \frac{6}{12} = \boxed{\frac{1}{2} = r}$

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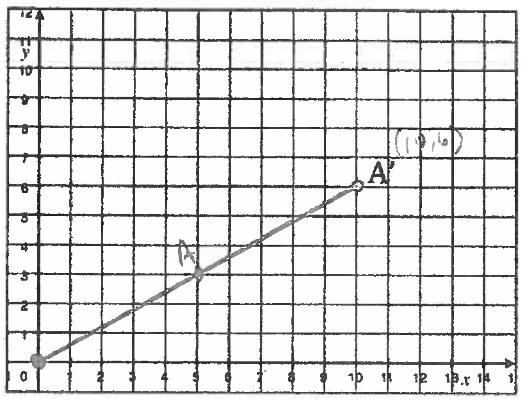
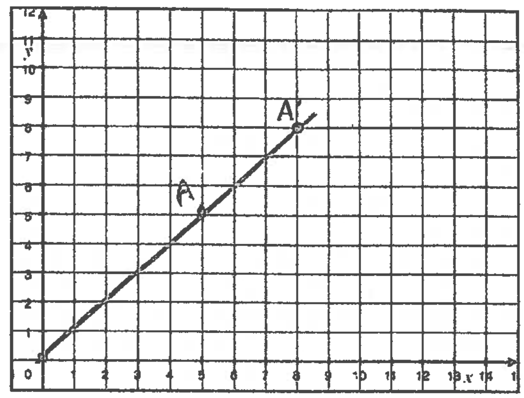
Find A when A' has been dilated from the origin by a scale factor of 2.  A - (5,3)	Find A when A' has been dilated from the origin by a scale factor of $\frac{8}{5}$.  A - (5,5)

Line of Learning:
What have you learned about the concepts of similarity in general and dilations specifically?

1. When you dilate on a coordinate plane, your dilations may not have integer coordinates.

2. If r > 1, the dilation expands the point
If r < 1, the dilation shrinks the point.

3. Express coordinate points as improper fractions (or decimals)

7. If you dilate a shape by scale factor of r, the area of new shape is $A \cdot r^2$

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4. The scale factor tells us how much to multiply by

5. Similarity shows a proportional relationship.

*6. If we dilate 2 points from the same center by the same scale factor and connect the points, the resulting lines will be parallel