4-1 Triangle Similarity with Dilations

1. Similar Triangles:
   - Corresponding ANGLES are congruent
   - Corresponding SIDES are proportional
   - Have the same shape, but not the same size

2. Dilation:
   - A transformation that enlarges or reduces a pre-image to create a similar image

   A dilation requires a center point and a scale factor. The letter ε usually represents the scale factor.

   In the above figure - Triangle A'B'C' is a dilation of triangle ABC
3. Scale Factor:
- Is the ratio:
  - the distance from the center of dilation to a point on the image: to the distance from the center of dilation to the corresponding point on the pre-image.
- When |r| is greater than 1, the dilation is an enlargement.
- When |r| is between 0 and 1, the dilation is a reduction.
- If P' lies on CP, and CP' = r(CP)
- If r < 0, P' lies on CP (the ray opposite CP) and |r|(CP)

4. Dilations preserve angle measure, betweenness of points, and collinearity, but do NOT preserve distance. Therefore, a dilation is a similarity transformation.

Vocabulary
- Image: The Dilation
- Preimage: Before the Dilation
- Dilation: To get bigger/smaller
- Center of Dilation: A point that you dilate from
- Scale Factor: How much you dilate by
- Similar: Close but not the same

5. Constructing dilations.

ex) Find the measure of the dilation image $A'B'$ or the preimage $AB$ using the given scale factor.

a) $AB = 12, r = 2$

$$\frac{A'B'}{AB} = 2 \Rightarrow A'B' = 24$$

b) $A'B' = 36, \frac{r}{r'} = \frac{1}{4}$

$$\frac{AB}{A'B'} = \frac{36}{9} = 4$$

Steps:
1) Draw CJ, CK, and CL. Since r is negative, J', K', and L' will lie on CJ', CK', and CL' respectively.
2) Locate J', K', and L' so that CJ' = (1/2)(CL), CK' = (1/2)(CK), and CL' = (1/2)(CL).
3) Draw triangle J'K'L'
5. Triangle JK'L' is a dilation of Triangle JKL. The center of the dilation is the origin.

a. List the coordinates of the vertices of Triangle JKL and Triangle JK'L'. How do the coordinates of the image compare to the coordinates of the pre-image?

\[
L: (12, 10) \quad J': (6, 5) \\
J: (10, 4) \quad J': (5, 2) \\
K: (3, 6) \quad K': (4, 3) \\
\]

b. Use the scale factor of \(\frac{1}{2}\) to determine the coordinates of the vertices of the image.

c. How do you think you can use the scale factor to determine the coordinates of the vertices of an image?

*The point \((x, y)\) dilated can be described as \((kx, ky)\) when the center of dilation is at the origin.*