Lesson Summary

**Definition:** For a positive number $r$, a dilation with center $O$ and scale factor $r$ is the transformation of the plane that maps $O$ to itself, and maps each remaining point $P$ of the plane to its image $P'$ on the ray $\overrightarrow{OP}$ so that $|OP'| = r|OP|$. That is, it is the transformation that assigns to each point $P$ of the plane a point $\text{Dilation}(P)$ so that

1. $\text{Dilation}(O) = O$ (i.e., a dilation does not move the center of dilation).

![Diagram](Diagram1.png)

2. If $P \neq O$, then the point $\text{Dilation}(P)$ (to be denoted more simply by $P'$) is the point on the ray $\overrightarrow{OP}$ so that $|OP'| = r|OP|$.

In other words, a dilation is a rule that moves each point $P$ along the ray emanating from the center $O$ to a new point $P'$ on that ray such that the distance $|OP'|$ is $r$ times the distance $|OP|$.

**Problem Set**

1. Let there be a dilation from center $O$. Then, $\text{Dilation}(P) = P'$ and $\text{Dilation}(Q) = Q'$. Examine the drawing below. What can you determine about the scale factor of the dilation?
2. Let there be a dilation from center \( O \). Then, \( \text{Dilation}(P) = P' \) and \( \text{Dilation}(Q) = Q' \). Examine the drawing below. What can you determine about the scale factor of the dilation?

![Diagram of a dilation showing points P, Q, O, P', and Q']

3. Let there be a dilation from center \( O \) with a scale factor \( r = 4 \). Then, \( \text{Dilation}(P) = P' \) and \( \text{Dilation}(Q) = Q' \). \( |OP| = 3.2 \text{ cm} \), and \( |OQ| = 2.7 \text{ cm} \), as shown. Use the drawing below to answer parts (a) and (b). The drawing is not to scale.

![Diagram showing points P, Q, O, P', and Q' with distances labeled]

a. Use the definition of dilation to determine \( |OP'| \).

b. Use the definition of dilation to determine \( |OQ'| \).
4. Let there be a dilation from center $O$ with a scale factor $r$. Then, $\text{Dilation}(A) = A'$, $\text{Dilation}(B) = B'$, and $\text{Dilation}(C) = C'$. $|OA| = 3$, $|OB| = 15$, $|OC| = 6$, and $|OB'| = 5$, as shown. Use the drawing below to answer parts (a)–(c).

|OA| = 3

- Using the definition of dilation with lengths $OB$ and $OB'$, determine the scale factor of the dilation.
- Use the definition of dilation to determine $|OA'|$.
- Use the definition of dilation to determine $|OC'|$. 

a. Using the definition of dilation with lengths $OB$ and $OB'$, determine the scale factor of the dilation.

b. Use the definition of dilation to determine $|OA'|$.

c. Use the definition of dilation to determine $|OC'|$. 

a. Using the definition of dilation with lengths $OB$ and $OB'$, determine the scale factor of the dilation.

b. Use the definition of dilation to determine $|OA'|$.

c. Use the definition of dilation to determine $|OC'|$. 

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