

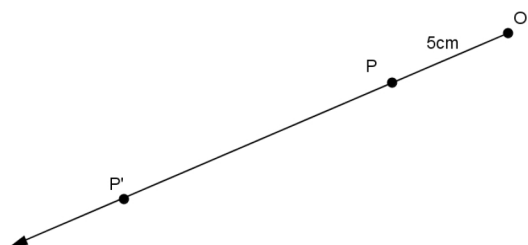
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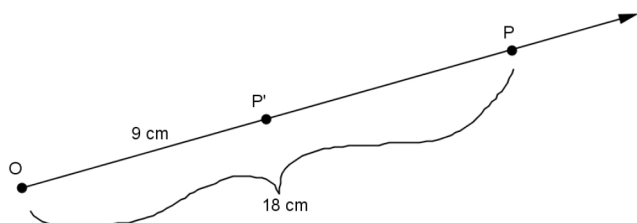
What Lies Behind “Same Shape”?

1. Why do we need a better definition for similarity than “same shape, not the same size”?

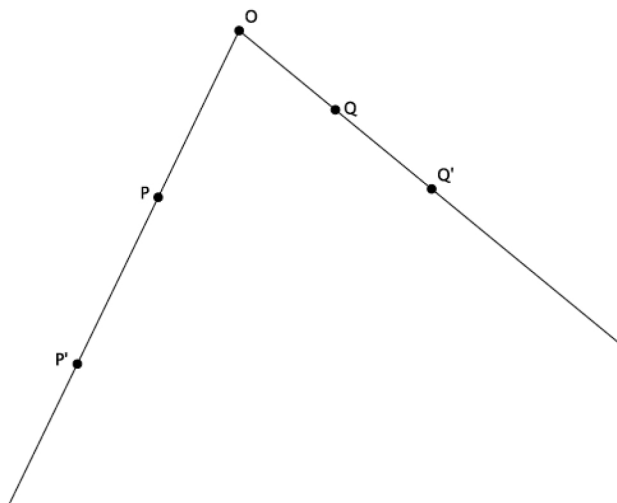
2. Use the diagram below. Let there be a dilation from center O with scale factor $r = 3$. Then $\text{Dilation}(P) = P'$. In the diagram below, $|OP| = 5$ cm. What is $|OP'|$? Show your work.



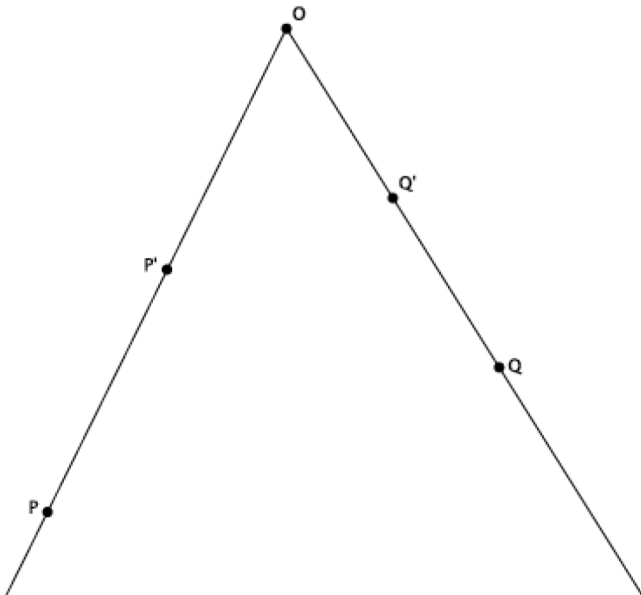
3. Use the diagram below. Let there be a dilation from center O . Then $\text{Dilation}(P) = P'$. In the diagram below, $|OP| = 18$ cm and $|OP'| = 9$ cm. What is the scale factor r ? Show your work.



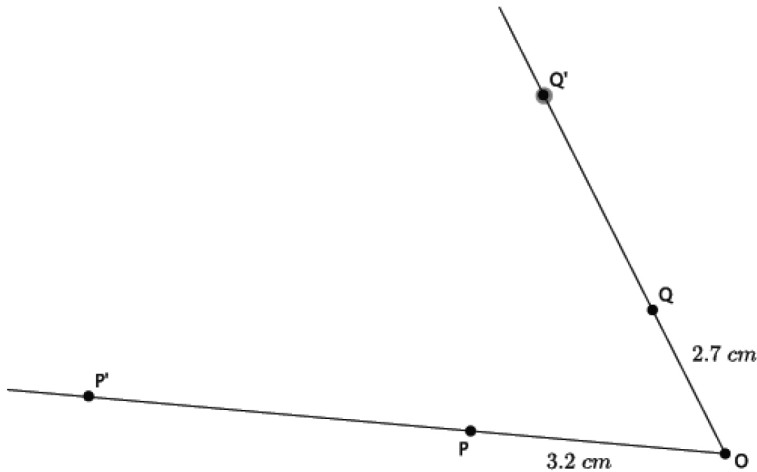
1. Let there be a dilation from center O . Then $\text{Dilation}(P) = P'$ and $\text{Dilation}(Q) = Q'$. Examine the drawing below. What can you determine about the scale factor of the dilation?



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

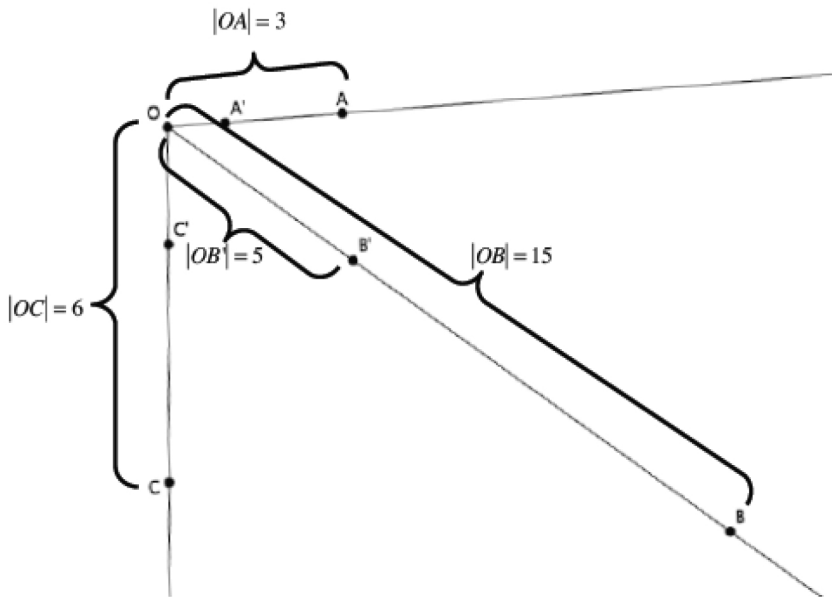


3. Let there be a dilation from center O with a scale factor $r = 4$. Then $Dilation(P) = P'$ and $Dilation(Q) = Q'$. $|OP| = 3.2$ cm, and $|OQ| = 2.7$ cm, as shown. Use the drawing below to answer parts (a) and (b). Drawing not to scale.



- Use the definition of dilation to determine the length of OP' .
- Use the definition of dilation to determine the length of OQ' .

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



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

1. Why do we need a better definition for similarity than “same shape, but not the same size”?

We need a better definition that includes dilation and a scale factor because some figures may look to be similar (e.g., the smiley faces), but we cannot know for sure unless we can check the proportionality. Other figures (e.g., the parabolas) may not look similar but are. We need a definition so that we are not just guessing if they are similar by looking at them.

2. Use the diagram below. Let there be a dilation from center O with scale factor 3. Then $\text{Dilation}(P) = P'$. In the diagram below, $|OP| = 5$ cm. What is $|OP'|$? Show your work.

Since $|OP'| = r|OP|$, then

$$|OP'| = 3 \times 5 \text{ cm},$$

$$|OP'| = 15 \text{ cm}.$$

3. Use the diagram below. Let there be a dilation from center O . Then $\text{Dilation}(P) = P'$. In the diagram below, $|OP| = 18$ cm and $|OP'| = 9$ cm. What is the scale factor r ? Show your work.

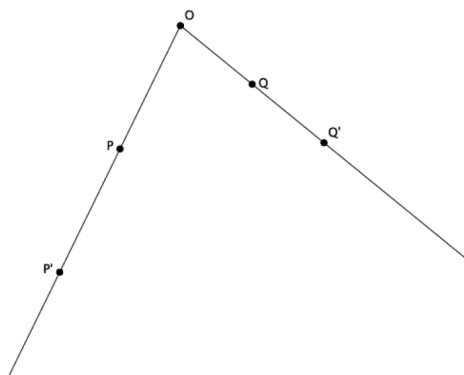
Since $|OP'| = r|OP|$, then

$$9 \text{ cm} = r \times 18 \text{ cm},$$

$$\frac{1}{2} = r.$$

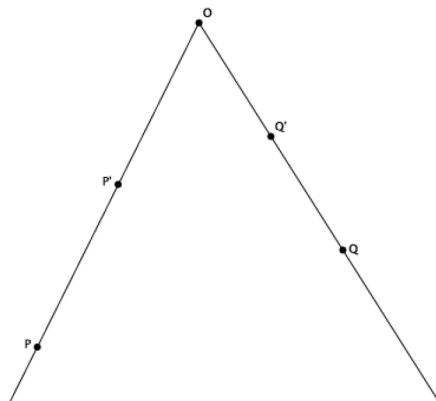
Have students practice using the definition of dilation and finding lengths according to a scale factor.

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?



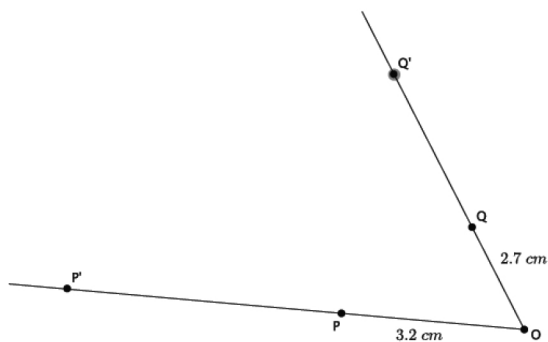
The scale factor must be greater than one, $r > 1$, because the dilated points are farther from the center than the original points.

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



The scale factor must be greater than zero but less than one, $0 < r < 1$, because the dilated points are closer to the center than the original points.

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



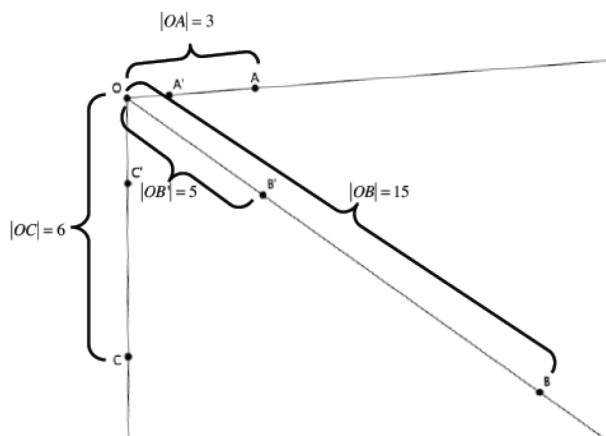
- a. Use the definition of dilation to determine the length of OP' .

$|OP'| = r|OP|$; therefore, $|OP'| = 4 \times (3.2) = 12.8$ and $|OP'| = 12.8$ cm.

- b. Use the definition of dilation to determine the length of OQ' .

$|OQ'| = r|OQ|$; therefore, $|OQ'| = 4 \times (2.7) = 10.8$ and $|OQ'| = 10.8$ cm.

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).



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

$$|OB'| = r|OB|, \text{ which means } 5 = r \times 15; \text{ therefore, } r = \frac{1}{3}.$$

- b. Use the definition of dilation to determine the length of OA' .

$$|OA'| = \frac{1}{3}|OA|; \text{ therefore, } |OA'| = \frac{1}{3} \times 3 = 1, \text{ and } |OA'| = 1.$$

- c. Use the definition of dilation to determine the length of OC' .

$$|OC'| = \frac{1}{3}|OC|; \text{ therefore, } |OC'| = \frac{1}{3} \times 6 = 2, \text{ and } |OC'| = 2.$$