# Lesson 1: What Lies Behind "Same Shape"?

## Classwork

**Exploratory Challenge**

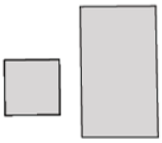
Two geometric figures are said to be similar if they have the same shape but not necessarily the same size. Using that informal definition, are the following pairs of figures similar to one another? Explain.

Pair A:

Yes, same shape, but not the same size

Pair B:

/



No, not the same shape

Pair C:

They are similar.
They are congruent

Pair D:

Yes, they are similiar.
Same shape, diff size.

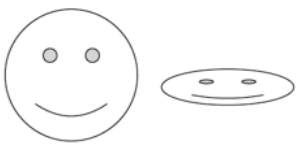
Pair E:

Yes, same shape diff size

Pair F:

Yes, same shape diff size

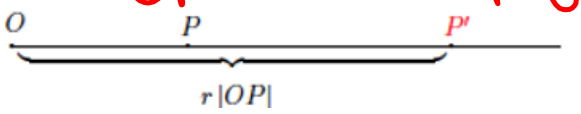
Pair G:



Not Similiar

**Definition:** A ***dilation***, a transformation of the plane with center $O$, with scale factor $r$ ($r > 0$) is a rule that assigns to each point $P$ of the plane a point $Dilation(P)$ so that

1. $Dilation(O) = O$, (i.e., a dilation does not move the center of dilation.)
2. If $P \neq O$, then the point $Dilation(P)$, (to be denoted more simply by $P'$) is the point on the ray $\overrightarrow{OP}$ so that $\frac{\text{dilated segment}}{OP'} = r \cdot \frac{\text{original segment}}{r \cdot OP}$



**Exercises 1–6**

distance / length

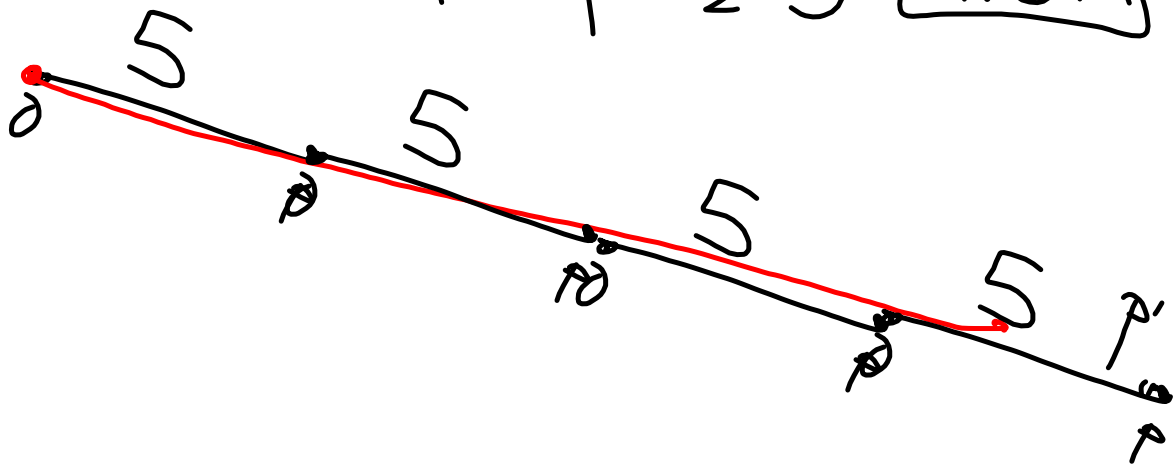
3. Given $|OP| = 5$ in.

   a. If segment $OP$ is dilated by a scale factor $r = 4$, what is the length of segment $OP'$?

$|OP'| = 4 \cdot |OP| = 4 \cdot 5 = 20$ in

   b. If segment $OP$ is dilated by a scale factor $= \frac{1}{2}$, what is the length of segment $OP'$?

$|OP'| = \frac{1}{2}|OP| = \frac{1}{2} \cdot 5 = 2.5$ in



**Exercises 1–6**

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   a. If segment $OP$ is dilated by a scale factor $r = 4$, what is the length of segment $OP'$?

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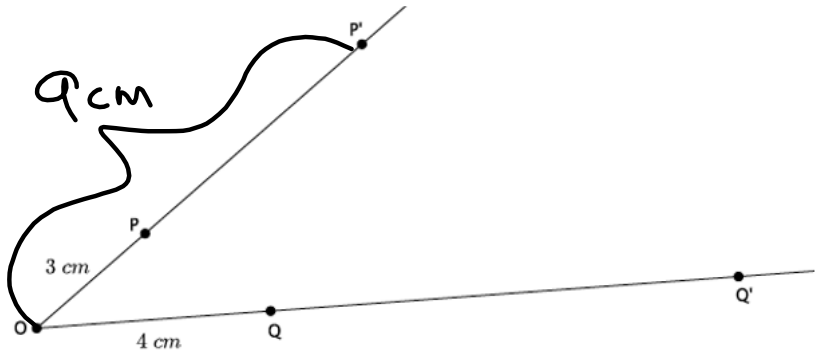
Use the diagram below to answer Exercises 2–6. Let there be a dilation from center $O$. Then $Dilation(P) = P'$ and $Dilaton(Q) = Q'$. In the diagram below, $|OP| = 3$ cm and $|OQ| = 4$ cm, as shown.




4. If the scale factor is $r = 3$, what is the length of segment $OP'$?

$|OP| = 3cm$

$|OP'| = 3 \cdot 3cm = 9cm$

5. Use the definition of dilation to show that your answer to Exercise 2 is correct.

SKIP

6. If the scale factor is $r = 3$, what is the length of segment $OQ'$?

$|OQ'| = 3 \cdot 4 = 12cm$

7. Use the definition of dilation to show that your answer to Exercise 4 is correct.

SKIP

8. If you know that $|OP| = 3$, $|OP'| = 9$, how could you use that information to determine the scale factor?

Always $|OP'| = r \cdot |OP|$

$\frac{9}{3} = \frac{r \cdot 3}{3}$

$r = 3$

## Attachments

Fetty Dilation.png

Fetty Dilation.bmp