Name ____ Date ____________________

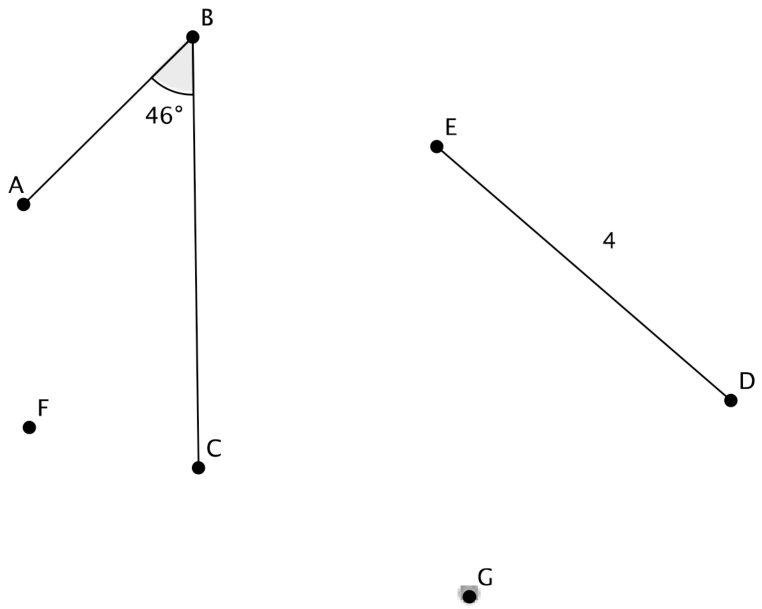
Sequencing Rotations

1. Let $Rotation_1$ be the rotation of a figure d degrees around center O. Let $Rotation_2$ be the rotation of the same figure d degrees around center P. Does the $Rotation_1$ of the figure followed by the $Rotation_2$ equal a $Rotation_2$ of the figure followed by the $Rotation_1$? Draw a picture if necessary.

2. Angle ABC underwent a sequence of rotations. The original size of $\angle ABC = 37°$. What was the size of the angle after the sequence of rotations? Explain.

3. Triangle ABC underwent a sequence of rotations around two different centers. Its image is $\triangle A'B'C'$. Describe a sequence of rigid motions that would map $\triangle ABC$ onto $\triangle A'B'C'$.

1. Refer to the figure below.

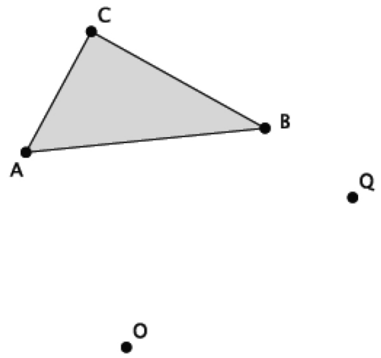


a. Rotate $\angle ABC$ and segment DE d degrees around center F, then d degrees around center G. Label the final location of the images as $\angle A'B'C'$ and $D'E'$.

b. What is the size of $\angle ABC$, and how does it compare to the size of $\angle A'B'C'$? Explain.

c. What is the length of segment DE, and how does it compare to the length of segment $D'E'$? Explain.

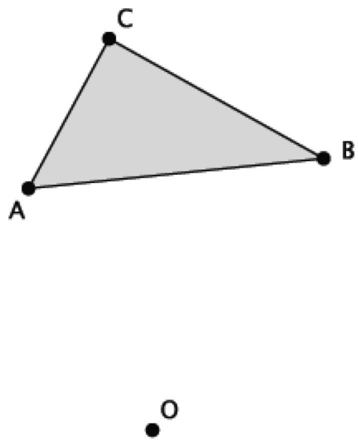
2. Refer to the figure given below.



a. Let $Rotation_1$ be a counterclockwise rotation of $90°$ around the center O. Let $Rotation_2$ be a clockwise rotation of $(-45)°$ around the center Q. Determine the approximate location of $Rotation_1(\triangle ABC)$ followed by $Rotation_2$. Label the image of triangle ABC as $A'B'C'$.

b. Describe the sequence of rigid motions that would map $\triangle ABC$ onto $\triangle A'B'C'$.

3. Refer to the figure given below.



Let R be a rotation of $(-90)°$ around the center O. Let $Rotation_2$ be a rotation of $(-45)°$ around the same center O. Determine the approximate location of $Rotation_1(\triangle ABC)$ followed by $Rotation_2(\triangle ABC)$. Label the image of triangle ABC as $A'B'C'$.

1. Let $Rotation_1$ be the rotation of a figure d degrees around center O. Let $Rotation_2$ be the rotation of the same figure d degrees around center P. Does the $Rotation_1$ of the figure followed by the $Rotation_2$ equal a $Rotation_2$ of the figure followed by the $Rotation_1$? Draw a picture if necessary.

   No. If the sequence of rotations were around the same center, then it would be true. However, when the sequence involves two different centers, the order in which they are performed matters because the images will not be in the same location in the plane.

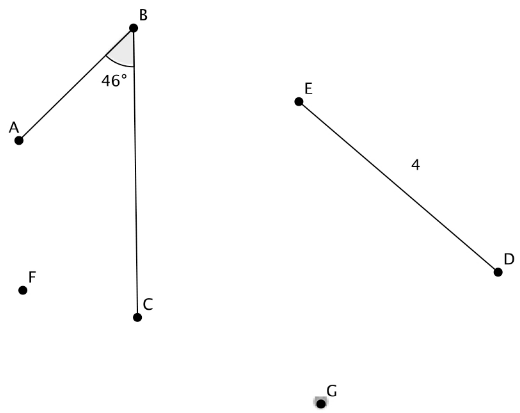
2. Angle ABC underwent a sequence of rotations. The original size of $\angle ABC = 37°$. What was the size of the angle after the sequence of rotations? Explain.

   Since sequences of rotations enjoy the same properties as a single rotation, then the measure of any image of $\angle ABC$ under any sequence of rotations will remain $37°$. Rotations and sequences of rotations preserve the measure of degrees of angles.

3. Triangle ABC underwent a sequence of rotations around two different centers. Its image is $\triangle A'B'C'$. Describe a sequence of rigid motions that would map $\triangle ABC$ onto $\triangle A'B'C'$.

   Translate $\triangle ABC$ along vector $\overrightarrow{BB'}$. Then, rotate $\triangle ABC$ d degrees around point B' until $\triangle ABC$ maps onto $\triangle A'B'C'$.

1. Refer to the figure below.



a. Rotate $\angle ABC$ and segment DE d degrees around center F, then d degrees around center G. Label the final location of the images as $\angle A'B'C'$ and $D'E'$.

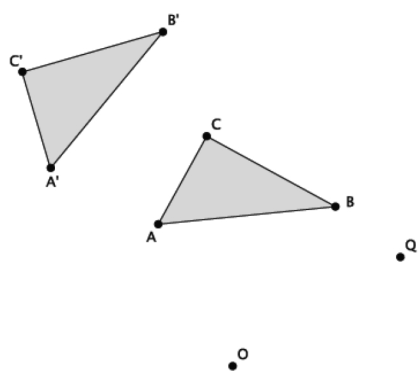
b. What is the size of $\angle ABC$, and how does it compare to the size of $\angle A'B'C'$? Explain.

The measure of $\angle ABC = 46°$. The measure of $\angle A'B'C' = 46°$. The angles are equal in measure because a sequence of rotations will preserve the degrees of an angle.

c. What is the length of segment DE, and how does it compare to the length of segment $D'E'$? Explain.

The length of segment DE is 4 cm. The length of segment $D'E'$ is also 4 cm. The segments are equal in length because a sequence of rotations will preserve the length of segments.

2. Refer to the figure given below.

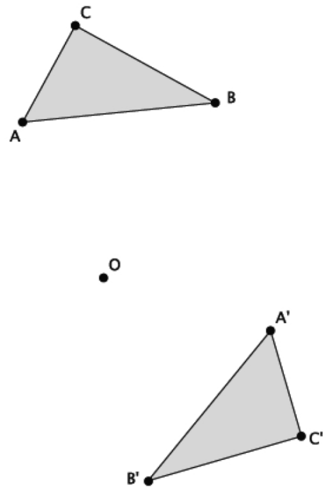


a. Let $Rotation_1$ be a counterclockwise rotation of $90°$ around the center O. Let $Rotation_2$ be a clockwise rotation of $(-45)°$ around the center Q. Determine the approximate location of $Rotation_1(\triangle ABC)$ followed by $Rotation_2$. Label the image of triangle ABC as $A'B'C'$.

b. Describe the sequence of rigid motions that would map $\triangle ABC$ onto $\triangle A'B'C'$.

The image of ABC is shown above. Translate $\triangle ABC$ along vector $\overrightarrow{AA'}$. Rotate $\triangle ABC$ d degrees around center A'. Then, $\triangle ABC$ will map onto $\triangle A'B'C'$.

3. Refer to the figure given below.



Let R be a rotation of $(-90)°$ around the center O. Let $Rotation_2$ be a rotation of $(-45)°$ around the same center O. Determine the approximate location of $Rotation_1(\Delta ABC)$ followed by $Rotation_2(\Delta ABC)$. Label the image of triangle ABC as $A'B'C'$.

The image of ABC is shown above.