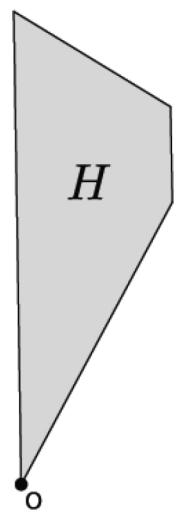
Name _____ Date _____

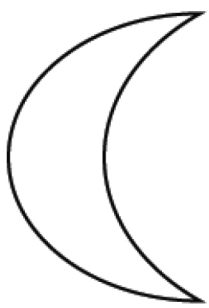
Definition of Rotation and Basic Properties

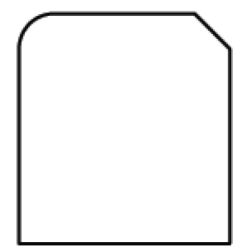
1. Given the figure H, let there be a rotation by d degrees, where $d \geq 0$, about O. Let $Rotation(H)$ be H'.



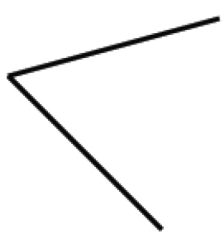
2. Using the drawing above, let $Rotation_1$ be the rotation d degrees with $d < 0$, about O. Let $Rotation_1(H)$ be H''.

1. Let there be a rotation by $-90°$ around the center O.





O



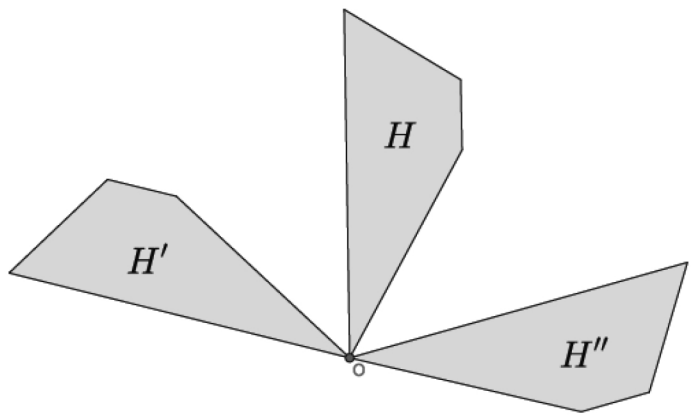
2. Explain why a rotation of 90 degrees around any point O never maps a line to a line parallel to itself.

3. A segment of length 94 cm has been rotated d degrees around a center O. What is the length of the rotated segment? How do you know?

4. An angle of size $124°$ has been rotated d degrees around a center O. What is the size of the rotated angle? How do you know?

1. Given the figure H, let there be a rotation by d degrees, where $d \geq 0$, about O. Let $Rotation(H)$ be H'.

   Sample rotation shown below. Verify that the figure H' has been rotated counterclockwise with center O.

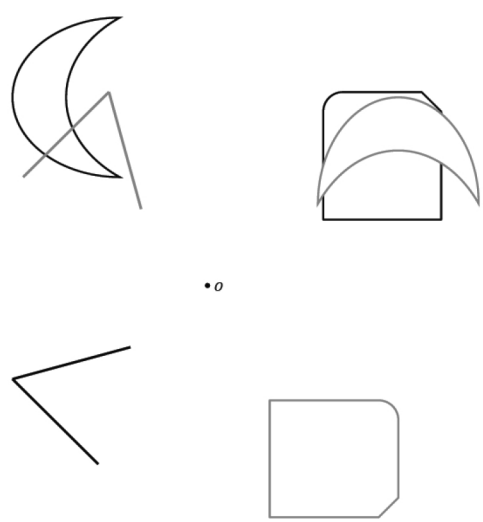


2. Using the drawing above, let $Rotation_1$ be the rotation d degrees with $d < 0$, about O. Let $Rotation_1(H)$ be H''.

   Sample rotation shown above. Verify that the figure H'' has been rotated clockwise with center O.

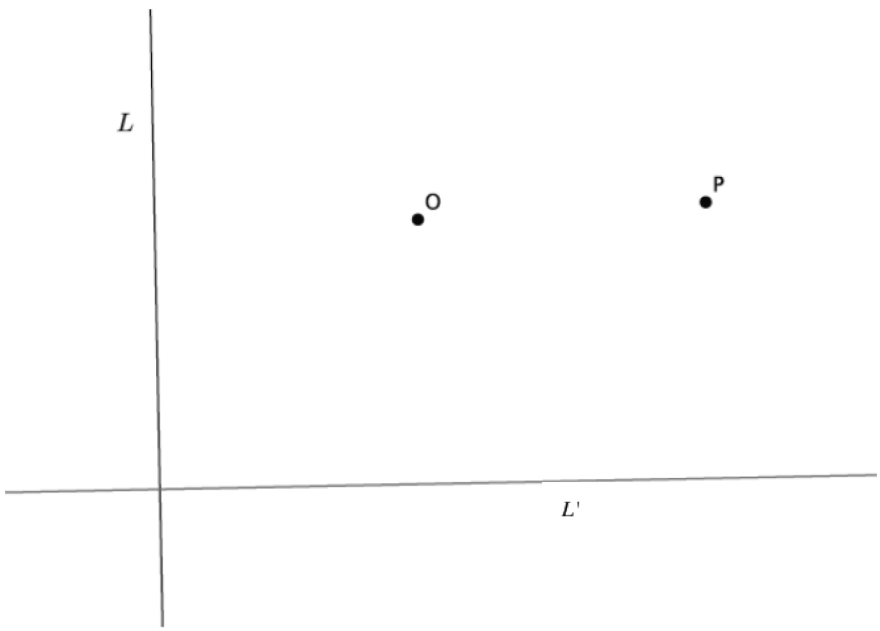
1. Let there *be a* rotation by $-90°$ around the center O.

   Rotated figures are shown in red.



2. **Explain why a rotation of 90 degrees around any point O never maps a line to a line parallel to itself.**

A 90 degree rotation around point O will move a given line L to L'. Parallel lines never intersect, so it is obvious that a 90 degree rotation in either direction does not make lines L and L' parallel. Additionally, we know that there exists just one line parallel to the given line L that goes through a point not on L. If we let P be a point not on L, the line L' must go through it in order to be parallel to L. L' does not go through point P; therefore, L and L' are not parallel lines. Assume we rotate line L first and then place a point P on line L' to get the desired effect (a line through P). This contradicts our definition of parallel (i.e., parallel lines never intersect); so, again, we know that line L is not parallel to L'.



3. **A segment of length 94 cm has been rotated d degrees around a center O. What is the length of the rotated segment? How do you know?**

The rotated segment will be 94 cm in length. (Rotation 2) states that rotations preserve lengths of segments, so the length of the rotated segment will remain the same as the original.

4. **An angle of size $124°$ has been rotated d degrees around a center O. What is the size of the rotated angle? How do you know?**

The rotated angle will be $124°$. (Rotation 3) states that rotations preserve the degrees of angles, so the rotated angle will be the same size as the original.