

Lesson 5: Definition of Rotation and Basic Properties

Classwork

Exercises

1. Let there be a rotation of d degrees around center O . Let P be a point other than O . Select d so that $d \geq 0$. Find P' (i.e., the rotation of point P) using a transparency.



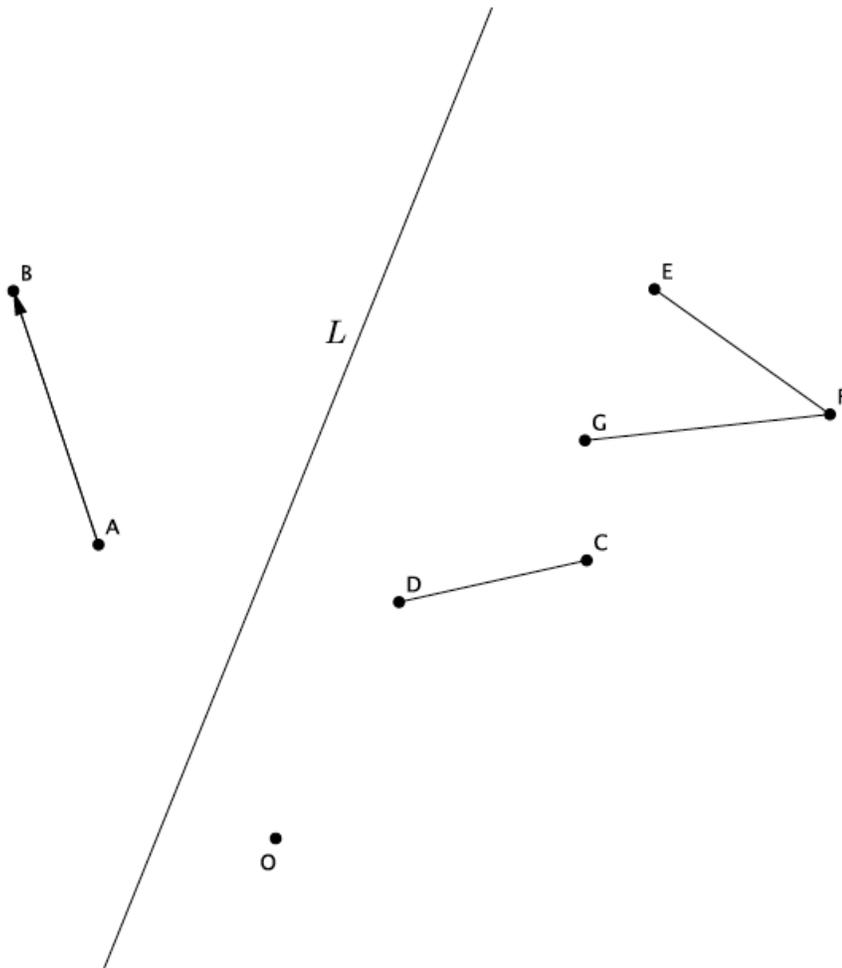
2. Let there be a rotation of d degrees around center O . Let P be a point other than O . Select d so that $d < 0$. Find P' (i.e., the rotation of point P) using a transparency.



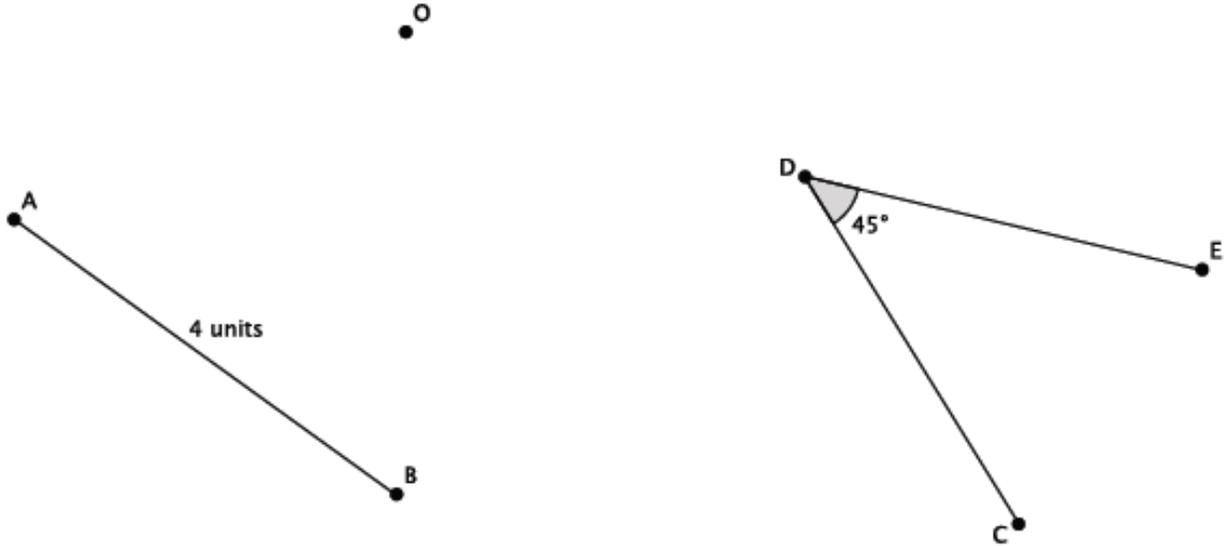
3. Which direction did the point P rotate when $d \geq 0$?

4. Which direction did the point P rotate when $d < 0$?

5. Let L be a line, \overrightarrow{AB} be a ray, CD be a segment, and $\angle EFG$ be an angle, as shown. Let there be a rotation of d degrees around point O . Find the images of all figures when $d \geq 0$.



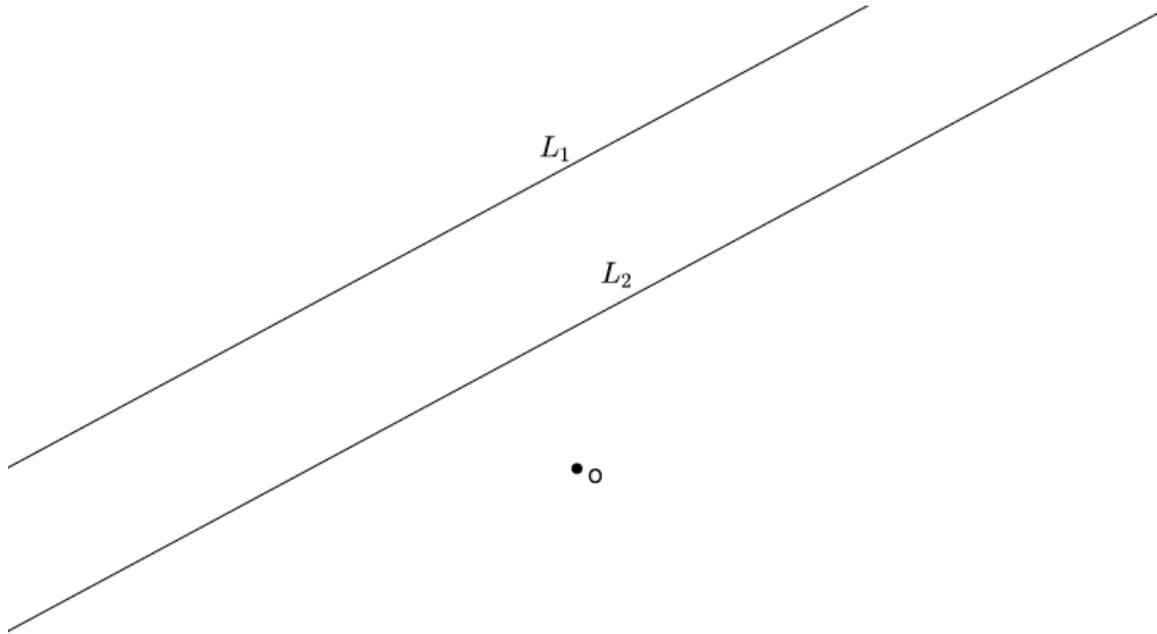
6. Let \overline{AB} be a segment of length 4 units and $\angle CDE$ be an angle of size 45° . Let there be a rotation by d degrees, where $d < 0$, about O . Find the images of the given figures. Answer the questions that follow.



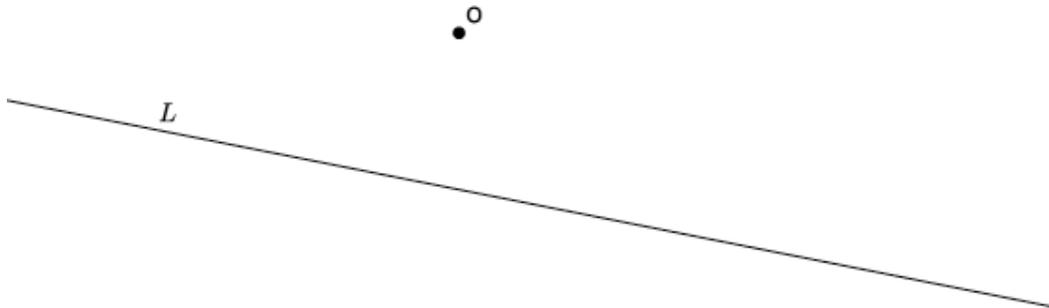
- a. What is the length of the rotated segment $Rotation(AB)$?

- b. What is the degree of the rotated angle $Rotation(\angle CDE)$?

7. Let L_1 and L_2 be parallel lines. Let there be a rotation by d degrees, where $-360 < d < 360$, about O . Is $(L_1)' \parallel (L_2)'$?



8. Let L be a line and O be the center of rotation. Let there be a rotation by d degrees, where $d \neq 180$ about O . Are the lines L and L' parallel?



Lesson Summary

Rotations require information about the center of rotation and the degree in which to rotate. Positive degrees of rotation move the figure in a counterclockwise direction. Negative degrees of rotation move the figure in a clockwise direction.

Basic Properties of Rotations:

- (Rotation 1) A rotation maps a line to a line, a ray to a ray, a segment to a segment, and an angle to an angle.
- (Rotation 2) A rotation preserves lengths of segments.
- (Rotation 3) A rotation preserves measures of angles.

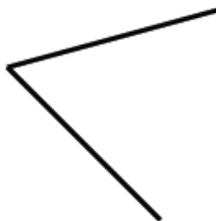
When parallel lines are rotated, their images are also parallel. A line is only parallel to itself when rotated exactly 180° .

Problem Set

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?