Lesson 5: Definition of Rotation and Basic Properties

Classwork

Exercises

1. Letthere 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.



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



1. Which direction did the point $P$ rotate when $d\geq 0$?
2. Which direction did the point $P$ rotate when $d<0$?
3. Let $L $be a line, $\vec{AB}$ be a ray, $CD$ be a segment, and $∠EFG$ be an angle, as shown. Let therebe a rotation of $d$degrees around point $O$. Find the images of all figures when $d\geq 0$.



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



* 1. What is the length of the rotated segment $Rotation(AB)$?
	2. What is the degree of the rotated angle $Rotation\left(∠CDE\right)$?
1. Let $L\_{1}$ and$ L\_{2}$ be parallel lines. Let there be a rotation by $d$ degrees, where $-360<d<360$, about $O$.
Is $\left(L\_{1}\right)^{'}∥\left(L\_{2}\right)'$?



1. Let $L$ be a line and $O$ be the center of rotation. Let there be a rotation by $d$ degrees, where $d\ne 180$ 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 therebe arotation by $-90°$ around the center $O$*.*



1. Explain why a rotation of $90$ degrees around any point $O$ never maps a line to a line parallel to itself.
2. 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?
3. 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?