Lesson 6: Rotations of 180 Degrees

Classwork

**Example 1**

 The picture below shows what happens when there is a rotation of $180° $around center $O.$

**Example 2**

The picture below shows what happens when there is a rotation of $180°$ around center $O$, the origin of the coordinate plane.



Exercises 1–9

1. Using your transparency, rotate the plane $180 $degrees, about the origin. Let this rotation be$ Rotation\_{0}$. What are the coordinates of $Rotation\_{0}\left(2, -4\right)$?
2. Let $Rotation\_{0}$ be the rotation of the plane by $180$ degrees, about the origin. Without using your transparency, find $Rotation\_{0}\left(-3, 5\right)$.
3. Let $Rotation\_{0}$ be the rotation of $180$ degrees around the origin. Let $L$ be the line passing through $(-6,6)$ parallel to the $x$*-*axis. Find $Rotation\_{0}\left(L\right)$. Use your transparency if needed.

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1. Let $Rotation\_{0}$ be the rotation of $180$ degrees around the origin. Let $L$ be the line passing through $(7,0)$ parallel to the $y$-axis. Find $Rotation\_{0}\left(L\right)$. Use your transparency if needed.



1. Let $Rotation\_{0}$ be the rotation of $180 $degrees around the origin. Let $L$ be the line passing through $(0,2)$ parallel to the $x$*-*axis. Is $L$ parallel to $Rotation\_{0}\left(L\right)$?

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1. Let $Rotation\_{0}$ be the rotation of $180 $degrees around the origin. Let $L$ be the line passing through $(4,0)$ parallel to the $y$*-*axis. Is $L$ parallel to $Rotation\_{0}\left(L\right)$?



1. Let $Rotation\_{0}$ be the rotation of $180$ degrees around the origin. Let $L$ be the line passing through $(0,-1)$ parallel to the $x$*-*axis. Is $L$ parallel to $Rotation\_{0}\left(L\right)$?



1. Let $Rotation\_{0}$ be the rotation of $180$ degrees around the origin. Is $L$ parallel to $Rotation\_{0}\left(L\right)$? Use your transparency if needed.



1. Let $Rotation\_{0}$ be the rotation of $180 $degrees around the origin. Is $L$ parallel to $Rotation\_{0}\left(L\right)$? Use your transparency if needed.



Lesson Summary

* A rotation of $180$ degrees around $O$ is the rigid motion so that if $P$ is any point in the plane, $P$, $O$, and $Rotation(P)$ are *collinear* (i.e., lie on the same line).
* Given a $180$-degree rotation, $R\_{0}$ around the origin $O$ of a coordinate system, and a point $P$ with coordinates $(a, b)$, it is generally said that $R\_{0}\left(P\right)$ is the point with coordinates $(-a, -b)$.

Theorem: Let $O$ be a point not lying on a given line $L$. Then, the $180$-degree rotation around $O$ maps $L$ to a line parallel to $L$.

Problem Set

Use the following diagram for Problems 1–5. Use your transparency as needed.



1. Looking only at segment $BC$, is it possible that a $180°$ rotation would map $BC$ onto $B'C'$? Why or why not?
2. Looking only at segment $AB$, is it possible that a $180° $rotation would map $AB$ onto $A'B'$? Why or why not?
3. Looking only at segment $AC$, is it possible that a $180° $rotation would map $AC$ onto $A'C'$? Why or why not?
4. Connect point $B$ to point $B'$, point $C$ to point $C'$, and point $A$ to point $A'$. What do you notice? What do you think that point is?
5. Would a rotation map triangle $ABC$ onto triangle $'B'C'$ ? If so, define the rotation (i.e., degree and center). If not, explain why not.
6. The picture below shows right triangles $ABC$ and $A'B'C'$, where the right angles are at $B$ and $B'$*.* Given that $AB=A^{'}B^{'}=1$, and $BC=B^{'}C^{'}=2$, and that $AB$is not parallel to $A'B'$, is there a $180°$ rotation that would map $∆ABC$ onto $△A'B'C'$ ? Explain.

