“Rotation” Classroom Activities

Short description: Learn the meaning of the geometric term rotation and see several examples in this animated “Math Shorts” video.

Long description: In this animated “Math Shorts” video, learn about rotation, which describes how a geometric shape turns around a point, called the center of rotation. When a geometric shape rotates on a coordinate plane, it stays exactly the same distance from the center of rotation whether it rotates a quarter-turn or a full-turn, and whether it rotates clockwise or counter-clockwise. However, even though the shape stays the same as it rotates, its coordinates change.

Activity Text

Learning Outcomes
Students will be able to

- rotate a polygon around a point
- determine whether one polygon is a rotation of another

Common Core Standards: 8.G.A.3, 8.G.A.1

Vocabulary: rotation, point of rotation, x-axis, y-axis, similar, coordinates, coordinate plande

Materials: Graph paper, rulers, projector or document camera, compass (for teacher), Rotations handouts (so that each group gets two different problems) [see Student Handout]

Preparation: Prepare a coordinate grid. On a separate piece of graph paper, draw another coordinate grid and a polygon. Cut out the polygon and the origin. This cutout will be used to demonstrate the idea of rotating around a point in the introduction.

Procedure
1. Introduction (10 minutes, whole group)
Lead a discussion about objects that rotate. Wheels and the hands of a clock are good frames of reference that help convey that rotating objects always spin around a central point. Say that the idea of rotation is used in geometry, too.

Using a projector or document camera, show students a coordinate grid with the x- and y-axes labeled. Place a cutout polygon (with origin included) onto the paper. Holding the origin down with a pencil, slowly rotate the shape, stopping at 90º, 180º, and 270º to show students what these orientations look like. Emphasize that the rotation is taking place around a specific point.

Return the polygon to its original location. Now identify the coordinates of the polygon’s vertices. Label them with A, B, C, etc., and record the coordinates. Then rotate the polygon again, stopping at 90º, 180º, and 270º to mark the vertices of the rotated polygon: A’, B’, and C’. Again, record the coordinates.

Finally, place the pivot of a compass on the point of rotation, and size the compass so that it reaches vertex A. Swing the compass around the coordinate plane and show students how it swings through all instances of A’. Repeat for B’ and C’. This demonstrates that during a rotation, each point in a polygon stays the same distance away from the point of rotation.

2. Video (5 minutes, whole group)
Show students the Rotation video. If you have already discussed the term reflection, ask students to think about how a rotation is different than a reflection as they watch the triangle spin around the given point in the animation.

3. Activity (10 minutes, pairs)
Divide the group into pairs of students. Tell them that they will be doing a rotation activity in which each group will be given two rotations from the [Rotation] handout. Each group will try to determine whether one figure is a rotation of the other figure around the given point. Students can use rulers, physical models, or their understanding of the coordinate plane to help them decide.

If the figure is a rotation, the student pair must add one more rotation to the grid. If the figure is not a rotation, the student pair must add one accurate rotation to the grid.

4. Wrap Up (5 minutes, whole group)
As a whole group, go through each of the five rotations. Lead a brief discussion, asking students for their ideas (and proofs) about which ones represented actual rotations. You should ask:

- Which ones were rotations?
- How do you know?
- What techniques/mathematics did you use to create new rotations?
- How are rotations different than other transformations that you have learned about?