Lesson Overview
In this lesson, students will use Choreo Graph to explore the concept of rotation. They will create a single dancer, place a point on his/her hand, and examine the effect of this point after simple rotations around the origin. For an extra challenge, in Part 2, students will devise a system to predict coordinates as their dancers rotates around his or her mark.

This lesson is designed to start simple with a low barrier entry, allowing students to familiarize themselves with Choreo Graph’s interface and practice the basic geometric concept of rotation. But, Part 2’s extension easily scales up the activity for students looking for a challenge and the opportunity to explore coordinate rotation more deeply.
Intro Info

While audiences watch a performance, they often aren’t aware of the precise movements that the dancers have been practicing for months or years. Getting the angles and motions exactly right requires lots of practice in front of a mirror.

Learning Objectives:

SWBAT
- Investigate the concept of rotation on coordinate axes
- Use coordinate notation for describing rotations

What you need to get started

A set of iPads with the Choreo Graph app

Time Needed

Depending on how much time you want to spend on this project, anywhere from 1 class period (if students are already familiar with Choreo Graph) to 3 class periods.

Collaboration and Group Work

These lessons are designed for students to work individually, in pairs, or in groups. Each student should do all the work on their own sheets, and the iPad should be shared across group members as equally as possible.

We suggest that groups be no larger than four students. Four or more students in a group will require extra attention to make sure that every group member is contributing equally.

Lesson Plan

Introduction
1) Discuss and/or review the concept of coordinate rotation, and how rotation appears in dance. You could show a video of dance with examples of rotations.

To do
1) Students will follow the instructions on their sheets.
2) The lesson guides students through creating a simple dance consisting of basic rotations around the origin. Sample screenshots for each rotation are shown below.

3) They will keep track of coordinates at each rotation in a chart.

4) In part 2 they will move the same dancer to (5,3) so that the origin is no longer the center of rotation. They will be asked to devise a system and predict the coordinates on the hand after the same basic rotations.

5) There are questions at the ends of parts 1 and 2, also shown below.

6) Feel free to edit questions and charts.

7) Circulate the room and check for understanding, help students as needed.

Sharing
1) Spend some time allowing the students to share their work with the class. In this lesson, students can share difficulties they might be having as well as successes in finding coordinates after basic rotations.
2) They can save their dances and email them to you.
3) You might also invite students to start noticing rotations outside the classroom.

Wrapup
1) If necessary, have students label their iPads so they will be able to return to them for the next lessons.

Part 1
1) Choreo Graph shows angles from 0 to 180, and 0 to -180 degrees. What is a positive angle that corresponds to -90?
2) What do you notice about the coordinates for 180 and -180 degrees?
3) Describe the pattern that you see in the coordinates as your dancer rotates around the origin.

Part 2
1) Knowing what you learned in Part 1, devise a system to make coordinate predictions for keyframes 10-13. Describe your system here. Make sketches if necessary.
2) Were your predictions correct? If not, what went wrong?
3) When dancers perform, they are trying to “hit their mark.” How does that phrase relate to this activity?
Below are images with rotations of 0, 90, 180 and -90, -180. Notice the pattern in the coordinates at the starting point, and then at each rotation. This lesson also defines negative angle measurements so students will notice that -90, -180 result in the same coordinate transformation as 270 and 180 respectively.