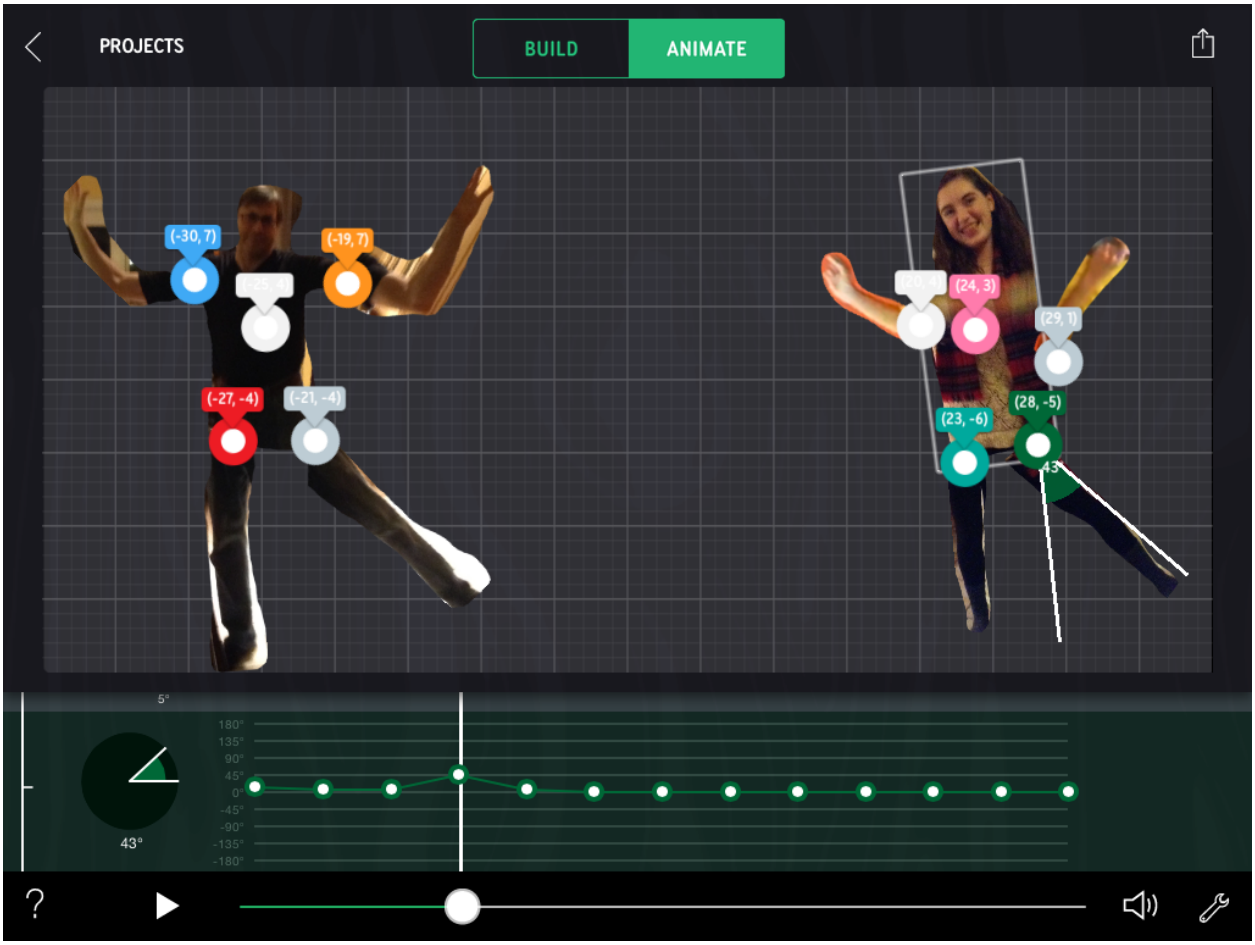
Choreo Graph Activity 3: Create A Synchronized Dance Troupe

Symmetry, Angles of Rotation, and Translation

Overview

Students will use angles of rotation, translations, and symmetry to create a synchronized dance with two or more dancers.



Big Idea

Students will plan out a synchronized dance—first on paper and then in the Choreo Graph app. Students have to define what it means to be synchronized and then put their definition into action, evaluating the translations and the angles of rotation of the dancers and their limbs and sequencing those events over time. When students create the same dance moves on different dancers, they develop strategies to compare and standardize the mathematical angles and translations. Sharing those strategies with classmates encourages the use of mathematical language.

Learning Objectives

- Apply understanding of angle rotation, angle measurement and translations to create a synchronized dance.
- Model synchronization and symmetry using animation tools.

License: This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.

- Analyze both angles and coordinates for translations used in the dance.

Vocabulary

- Acute
- Obtuse
- Right angles
- Coordinate notation
- Lines of symmetry
- Translation

Grades

Middle School, 6-8

Standards Addressed

Common Core State Standards-Math

Geometry

8.G.A.2. Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations. Given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.

8.G.A.3. Describe the effect of translations, rotations, and reflections on two-dimensional figures using coordinates.

8.G.A.4. Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.

Common Core State Standards-Math

Mathematical practices.

MP2: Reason abstractly and quantitatively.

Students create a dance visually and then have to determine the quantitative moves before making it virtual.

MP4: Model with mathematics.

Students outline their dance using the angles of rotation and the coordinate notation for the translation.

Classroom Strategies

Single-device implementation

Create a dance with two animated dancers who are not in sync. Play the animation for students on your interactive white board or projector and invite students to suggest the angles of rotation for certain parts and the coordinates of the dancers' positions to make the dancers more synchronized.

Multiple-device implementation

This activity works when classrooms have 1:1 devices but it is also great for groups of 2 or more per iPad. Have the group consider what moves they would like to create by first acting it out, then sketching it, and finally animating a dance troupe of 2 or more dancers.

Tips and Tricks

Examples of Synchronized Dances: To get started, have students watch a video that has synchronized moves (e.g., Michael Jackson's Thriller video). Elicit responses about the different mathematical concepts they can visualize as they watch a performance of a synchronized dance. Prompt students to think about what it means to be synchronized—does this mean the moves contain the same angles of rotation? Does everything happen at the same time?

App Features

Begin by entering Make Some Moves. In **Build** mode, students will:

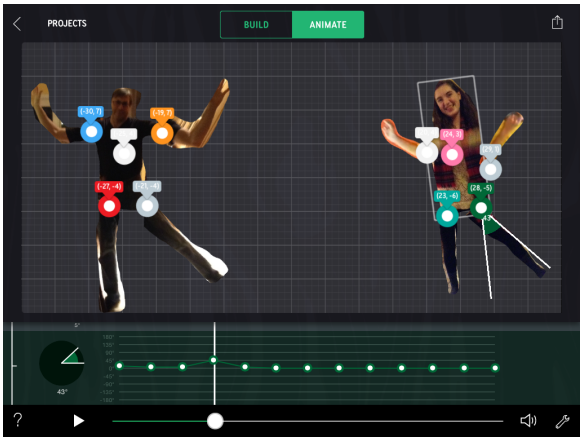
- Take pictures
- Trace and cut out parts of your photo that you want to animate
- Add graphic or musical elements below:

License: This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.

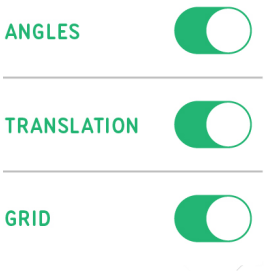
In **Animate** mode, students will use the:

Graph Controllers. Choreo Graph uses keyframes much like other movie editing software. At each point in the keyframe, the student can manipulate how each part of the animation rotates. Each point or node represents the position of that part at a specific time. Stretch the points up and down to set the degrees of rotation. The steeper the line on the graph, the faster the part moves.

Students can also set the location of their animated parts by selecting the part they want to move, choosing a node on the line graph (or moment in the animation), and then dragging the part to a new position on the stage. They can set the location of parts for the entire animation sequence by repeating this process for each node on the line graph.



Toggle on math tools to notice:



-Degrees each part has rotated

-Path the main parts moved

-The location of each part and its coordinates

License: This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.

Expected Activity Time

Part 1: Make a Synchronized Dance (20-40 minutes)
Part 2: Share and Improve Your Synchronized Dance (20-40 minutes)

Materials and Prep

- Synchronized Dance Student Sheets
- IPad with Choreo Graph app (5 for class), single for demo
- Wifi access for sharing to other iPads and online project space
- Sample videos of synchronized dance routines (e.g., Michael Jackson in Thriller, etc.)

Introducing the Activity

Create your own synchronized dance with 2 or more dancers using the Choreo Graph App. You can use pictures of your friends, famous people or everyday things (e.g., you could make a dance troupe of cats, or fruits, or skeletons). Be creative! Use the math tools in Choreo Graph to get your dancers in sync.

To Do

Part 1: Make a Synchronized Dance (20-40 minutes)
Have students:

- Decide whether or not the troupe will have a lead performer, and how many dancers will be in the troupe.
- Make a few sketches about how the troupe will look onstage at the start, midway through, and at the end.
- Create a dance for the first troupe member. (Dance must have a minimum of 10 different steps.) Sketch out the different steps of the dance and chart out the features in mathematical terms.
- Create dance movements for the other troupe members. Mathematically represent the dance movements of the other dancers on a chart.
- Now synchronize your full troupe using the Choreo Graph app.

Part 2: Share and Improve Your Synchronized Dance (20-40 minutes)
Have students:

- Share their dance with classmates, explaining how they mathematically synchronized the dance with all of the members in their troupe.
- Discuss any challenges faced or adjustments made to the original dance.
- Take notes on strategies other groups used to make their dances synchronized.
- Revise original dance using feedback and suggestions from classmates to make dancers more synchronized. .

Discussion

While students are creating their synchronized dance moves, it's important to prompt their thinking around the following areas:

- How did you synchronize the dancers? Use some of the mathematics in the dance to discuss how this was done.
- Is there any symmetry in your dance? Share sketches.
- If you had a lead performer, how was that performer different? (Again, use angles of rotation and coordinates to explain the differences.)

License: This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.

- Did some dancers move more than others? If so, why?

In their discourse, listen for language such as:

- Their arms rotated ____ degrees
- The degrees of the angle was the same, but in the opposite direction (mirror image symmetry)
- I had to move or translate on every other point in the timeline

Extensions and Inquiring Further

After creating their final troupe and seeing troupes made by their classmates, have students describe what they would make next. Urge them to think creatively and use the data and tools they have access to in the app (e.g. coordinates, angles of rotation, grid) to describe their dream troupe choreography in Choreo Graph. If students share just the data with classmates, could someone else replicate their dance troupe?

License: This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.

Name: _____ Date: _____

Part 1: Make a Synchronized Dance

- Decide whether or not the troupe will have a lead performer, and how many dancers will be in your troupe.
- Make a few sketches about how the troupe will look onstage at the start, midway through, and at the end.
- Create a dance for the first troupe member. The dance must have a minimum of 10 different steps.
- Sketch out the different steps in the dance and chart out the features in mathematical terms.
- Create dance movements for the other troupe members. Mathematically represent the dance movements of the other dance members on your chart.
- Now create your full troupe using the Choreo Graph app. You can use pics of your friends or pictures that you take of other people, famous people, or even inanimate objects (you could make a dance troupe of fruit, or cars, or skeletons). Be creative!

License: This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.

Name: _____ Date: _____

Part 1: My Synchronized Dance

- Sketch the formation of all of your troupe members in the beginning, middle, and end of your dance.
- Create your 10 step dance and determine the rotations and translations needed for one person to complete your dance
- Create the dance moves for the other troupe members based on the positions from your initial sketch.

Dance Formation Sketch

Use the chart below to sketch your troupe's dance formations.

Beginning	Middle	End

License: This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.

Name: _____ Date: _____

Sketch of Dance Steps (Initial Troupe Member)

1	**2**	**3**	**4**	**5**
6	**7**	**8**	**9**	**10**

License: This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.

Name: _____ Date: _____

10-Step Dance for First Troupe Member

Step	Body Part	Pivot Point	Angle of Rotation	Translation (x,y)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

License: This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.

Name: _____ Date: _____

10-Step Dance for Second Troupe Member

Step	Body Part	Pivot Point	Angle of Rotation	Translation (x,y)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

License: This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.

Name: _____ Date: _____

10-Step Dance for Third Troupe Member

Step	Body Part	Pivot Point	Angle of Rotation	Translation (x,y)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

License: This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.

Name: _____ Date: _____

Part 2: Share and Improve Your Synchronized Dance

- Share your dance with the rest of your class, explaining how you mathematically synchronized all of the members in your troupe. Share any challenges or adjustments you had to make to your original dance.
- As other groups share their dances, take notes on strategies used to make their dances synchronized.
- Revise original dance using feedback from your classmates to make dancers more synchronized.

License: This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.

Name: _____ Date: _____

Improved Synchronized Dance

Sketch your full dance with and include all of the members of your dance troupe in the chart below.

1	**2**	**3**
4	**5**	**6**
7	**8**	**9**
10	**Bonus**	**Bonus**

License: This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.

Name: _____ Date: _____

Part 2: Share and Improve Your Synchronized Dance Reflection Questions:

1. Do all your dancers do the same move? Or are there pairs doing the same move while others do different moves?

2. How did you synchronize the dancers? Use some of the mathematics in your dance to discuss how you did this.

3. Is there any symmetry in your dance? Make a rough sketch (use stick figures if you want) and include the line of symmetry.

4. Did some dancers move more than others? If so, why? How?

5. If you had a lead performer, how were they different from the other dancers? (Again, use the mathematics to explain the differences.)

6. After creating your final troupe performance and seeing performances made by your classmates describe what you would like to make next. Think creatively and use the mathematics in the app to describe your dream troupe choreography using Choreo Graph.

License: This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.