

ACTIVITY TITLE: Mimes and Math – The Geometry of Movement

Activity code: ncEDE01



 DURATION	90 minutes
 AGE RANGE	13-14
 TOPICS	MATHEMATICS GEOMETRY PERFORMING ARTS



Description of the project

In this creative, movement-based STEAM activity, students will explore the relationship between geometry and performance art by designing and presenting choreographed mime routines. The goal is to analyze how physical gestures can embody mathematical principles such as symmetry, rotation, proportion, and geometric transformations.

Through collaborative creation and performance, students will study how angles, reflections, and spatial patterns are visually expressed through the body. Using tools like geometry cards, they will translate physical gestures into mathematical concepts and vice versa highlighting the precision and elegance of mathematics in motion.

The activity encourages cross-disciplinary thinking by merging performing arts with mathematical analysis and design-based planning. Students will engage in cultural reflection and discuss gender equity in performance roles, while also developing critical observation, teamwork, and creative communication.

By the end of the session, students will:

- Create and perform an original mime routine based on geometric choreography.
- Apply key mathematical concepts such as angles, symmetry, transformations, and scale to physical movement.
- Translate gestures into mathematical expressions.
- Reflect on the role of body expression in culture, identity, and inclusive representation.
- Justify creative and mathematical choices through peer review and collaborative feedback.



Objectives: What will I learn?

- **Recognize and apply geometric concepts such as angles, mirror symmetry, and transformations** by designing and performing movement-based sequences, to understand how mathematical structures can guide artistic expression and spatial awareness.
- **Analyze body movement through mathematical models** by sketching poses to visualize, interpret, and communicate mathematical relationships through physical gestures.
- **Explore mathematical ideas in real-world art contexts** by studying how performance art, like mime, relies on geometric precision and visual patterns, to appreciate the value of math in creative, interdisciplinary fields.
- **Create choreographies based on patterns, spatial structures, and repetition** by working collaboratively to compose, rehearse, and refine routines, to gain hands-on experience in applying mathematical logic to aesthetic performance.
- **Develop collaboration, observation, and creative expression** by participating in group tasks and performing to peers, to build interpersonal skills.



Materials: What do I need?

1. Provided by the teacher/institution:

- Tape or chalk to mark stage/grid on the floor
- Rulers, graph paper
- Printed geometry cards (rotations, reflections, angles)
- Video clips of classic mime performances, for example, [Derek: Classic Mime](#)

2. Provided by students:

- Comfortable clothes for movement
- Pencil and notebook

3. Downloadable resources:

- [Mime Movement Analysis Worksheet](#)
- [Geometric transformations](#)
- [Geometry Cards](#)
- [Bios of Role Models](#)



Previous preparation

- **Introduce Purpose and Role Models:**
 Begin by introducing the goal of the activity: to explore how geometry lives in the human body through mime and movement. To promote equity and expand cultural awareness, introduce a role model like Margaret Watts Hughes, a pioneer who visualized sound through physical patterns, or a notable contemporary mime artist who challenges gender roles.
- **Form Groups and Assign Rotating Roles:**
 Organize students into diverse groups of 3. Assign rotating roles to ensure inclusive participation and shared leadership. Example roles:

 - Choreographer (leads movement design)
 - Geometric Analyst (identifies angles and transformations)
 - Performer/Observer (executes or sketches movement).
- **Print and Prepare Materials:**
 Ensure that the following materials are printed and shared with each group:

 - Mime Movement Analysis Worksheet
 - Geometric transformations
 - Geometry Cards
 - Bios of Role Models
- **Review Prior Concepts Through Media:**
 Show a short clip of mime performance (e.g., [Marcel Marceau](#)). Guide discussion with questions:

 - What geometric patterns do you notice in the movement?
 - How do reflections or symmetry appear in mime gestures?
 - How does the performer use space mathematically? (e.g. The performer uses symmetry when he moves both arms outward at the same angle from his shoulders...)
- **Activate Prior Knowledge:**
 Review transformations (rotation, translation, reflection, dilation) using examples from dance or body gestures and from the worksheet “Body transformations”.



RESEARCH



Have a look at these resources

Why This Matters – Context and Relevance

At first glance, mime may seem like a silent art form meant only for entertainment but beneath the surface, it's a rich, interdisciplinary tool for mathematical discovery. Movement, especially in mime and dance, is full of geometric structure: symmetry, rotation, reflection, and spatial patterning.

Understanding how performers use their bodies to express mathematical ideas helps students develop spatial reasoning, visualization, and physical intelligence. At the same time, it promotes creativity, expression, and collaboration—core STEAM goals.

By connecting physical gestures with geometry, students begin to see mathematics not as abstract symbols, but as something alive, embodied, and powerful. Through this activity, students become both artists and mathematicians.

Real-World Examples: Geometry in Motion

- Margaret Watts Hughes, a 19th-century singer and inventor, created visual patterns using sound vibrations, an early form of mathematical performance art.
- Pilobolus Dance Company and Chunky Move (Australia) use mathematical forms rotational symmetry, fractal-like patterns, and scaling in their choreography.
- Modern animation and motion-capture technologies are built on geometric transformations every movement is mapped on coordinate planes.
- Breakdancers and hip-hop performers use body symmetry, rotations, and spatial grids instinctively these movements can be analyzed mathematically.
- Physiotherapists and AI motion tracking tools model human movement with geometric accuracy to support rehabilitation or avatar animation.

Updated Prompt Questions to Spark Inquiry and Engagement

- How is symmetry used in movement or dance routines you've seen or performed?
- Can you think of a time when your body "mirrored" someone else's movement? What geometric transformation was that?
- How could geometry help someone choreograph a performance more effectively?
- In what ways is performing a routine similar to solving a math problem?
- Why do you think it's important to express math with more than just numbers?

- If you had to explain angles and transformations without speaking, how would you do it with your body?



CREATE



Some things you need before beginning

Before choreographing your geometric mime routine, take a moment to explore the fascinating connections between movement, mathematics, and meaning. These concepts will help students see their bodies as both expressive tools and mathematical instruments.

- **Geometry is everywhere in performance.**
From ballet to martial arts, movements often follow geometric principles: symmetry (in poses), rotation (in turns), and translation (in sequences across space). These concepts give structure, elegance, and clarity to physical movement.
- **Your body is a living coordinate system.**
Imagine your arms as X-axes, your legs as vectors, and your torso as a central point. When you move in space, especially in planned, repeated gestures, you're modeling mathematical transformations in real time.
- **Mime is math without words.**
Mimes express stories, emotions, and ideas using only physical gestures. By adding geometric rules, like “mirror every movement” or “rotate 90° before each pose”, you create logic-based movement that also tells a visual story.
- **Geometry in movement helps you become a better problem-solver.**
Planning a routine using spatial constraints, rhythm, and symmetry improves visual thinking, coordination, and even empathy (by imagining how the audience will interpret your motion).
- **Real-world connections:**
 - Architects and urban designers use body movement to model how people interact with space.
 - Game designers map character movements using geometric and spatial grids.
 - Rehabilitation therapists use angles, reflections, and symmetry to design healing movement routines.



Now, follow these steps

Step 1. Warm-up: Geometry in Motion:

- Begin with a silent, guided movement session using *Geometry Pose Cards*.
- Students freeze in specific poses; classmates describe the transformation type using math vocabulary: e.g., “You rotated 90° counterclockwise around your center.”

- Practice “mirror miming” using geometry cards: one student creates a shape; the partner mirrors it
- Prompt for critical thinking:
 - “What transformations did you see in your partner’s movement?”
 - “How does mirroring feel different than rotating?”

Step 2. Cultural and Gender Awareness

- *Part A: Recognizing Cultural and Gender Dimensions of Movement*
 - Begin with a slide or video montage showing diverse cultural gestures and symbolic body movement traditions:
 - [Indigenous Australian ceremonial gestures](#)
 - [Contemporary street dance](#)
 - Ask students to observe:
 - “How is meaning communicated differently across cultures?”
 - “What assumptions do we have about who should move, and how?”
 - Ask students to identify a movement related to the geometric transformations:
 - Use the Geometric transformations worksheet as reference (rotation, translation, reflection, dilation)
 - Ask them to sketch the movement using arrows, symmetry lines, or angle labels to show the transformation involved (they could screenshot one pose from the video chosen and draw on it to show how they identify the geometric transformation).
 - Write a short note: “*What does this movement express? How is geometry part of that meaning?*”
- *Part B: Role Models*
 - Use Bios of Role Models document to provide each group with a short bio of a Role Model.
 - As a group, discuss:
 - “What message or value does this person bring into their work?”
 - “How did they challenge who belongs in math or performance?”
 - Each group chooses one idea from the bio that inspires their team. Then they complete this sentence:

“Inspired by [Name], we will [design choice] to show [value/message].”

 - Examples:

“Inspired by Pina Bausch, we will include stillness to express emotion.”

Step 3. Analysis Phase: Decode Mime Through Math:

- Provide students with a Mime Movement Analysis Worksheet.
- Watch short mime sequences. Students break down movements using sketches and describe observed geometric transformations.
- Trace lines of symmetry, angles, and body proportions using annotations.

- Then, students should reflect on:
 - “Can you describe this movement as a sequence of geometric transformations?”
 - “Does this pose express balance, tension, or flow? How?”

Step 4. Design and Iteration: Build a Mathematical Routine:

- In groups, students create a 3–5 move mime routine with required elements:
 - One reflection (mirror pose or movement across a symmetry line)
 - One rotation (turning around a central point or axis)
 - One translation (moving the same shape or pose across space without rotating)
 - One dilation (changing size proportionally, e.g. doubling arm length visually)
- Go further! Think about the following:
 - Can your routine express an idea related to sustainability?
 - Can you reuse a movement in a different context to symbolize recycling?
 - Can you show balance through symmetry or repetition?
 - Can you invent a gesture that represents regeneration (e.g., shrinking and growing)?
- Optionally, you can use simple recycled objects from recycled or scrap materials (like string, paper, or fabric) to enhance your performance visually.

Step 5. Design Reflection: Making Meaning Visible:

- After building their routine, each team will write a short reflection that explains the mathematical structure and design intention of their performance. This helps students articulate the thinking behind their movements—both technically and creatively. Students should respond to:
 - Describe _____ your _____ routine.
→ What story, emotion, or message were you trying to express through your movements?
 - Identify _____ the _____ math.
Where in your routine did you use reflection, rotation, translation and dilation?
(*Explain each using math terms—e.g., “We reflected the arm position across a vertical axis during move 2.”*)
 - Explain _____ your _____ design _____ choices.
→ Why did you choose those particular movements or shapes?
→ How did geometry help you communicate more clearly or creatively?
 - Connect _____ to _____ identity _____ and _____ culture.
→ Did your routine include a symbol, formation, or role inspired by a culture, experience, or _____ role _____ model?
→ What meaning did it add?



COMMUNICATE

After building your mathematical mime routine, it's time to share it with your peers and reflect on how movement, math, and meaning come together.

- Each group will perform their routine silently for the class: use gestures, timing, and formation to clearly communicate ideas without words. The routine should include at least one reflection, rotation, translation, and dilation. Let the geometry speak through movement.
- After performing, each group will briefly respond to these questions:
 - What message or feeling were you trying to express with your routine?
 - Which movement or transformation do you think communicated it best—and why?
 - Did your routine reflect an identity, culture, or value your team felt connected to?



It is time to share!

Share your amazing work and inspire others!

#MimeMathSTEAM

- LinkedIn: <https://www.linkedin.com/company/steambrace-project/posts/?feedView=all>
- Instagram: https://www.instagram.com/steambrace_eu/
- X: https://www.instagram.com/steambrace_eu/



KEEP ON LEARNING



How can I make a similar project by myself?

- Can you choreograph a solo routine using only one type of transformation (e.g., only translations)? What message could you express with just that motion?
- How could you remix a traditional cultural dance or gesture to include geometric transformations—while respecting its origins?
- Could you turn your routine into a comic strip or storyboard? How would you represent the transformations visually?
- What would it look like to create a math-based routine with a partner who moves differently than you do (e.g., taller/shorter, uses a wheelchair, different flexibility)? How would you adapt the routine for balance and inclusion?
- Can you teach someone outside of school how to create a movement based on reflection or dilation? What tools or language would you use to explain it?
- Could you animate your routine in Scratch or another digital tool? How would you code the timing and transformation?
- How does movement express identity across cultures? What kinds of symbols, body

language, or spatial design do people in your culture use—and how might you turn that into a routine?



Which are other connected projects?

1. Geometry Performance Documentary – Movement with Meaning

- Record your team’s final routine and create a short documentary about the math and message behind it.
- Include interviews with team members explaining:
 - Which transformations were used
 - What the routine expresses about culture or identity
 - How the team worked fairly and collaboratively
- Add voiceover narration or visual overlays (e.g., arrows showing transformations).

2. Choreography Coder – Animate Your Routine in Scratch

- Recreate your routine as a simple animation or sprite-based performance in Scratch or another coding tool.
- Use motion blocks to rotate, reflect, or translate your character.
- Program dialogue or sound effects to highlight the math concepts or emotions in each move.

3. Transformation Puzzle Cards – Design a Geometry Game

- Create a deck of mime transformation challenges (e.g., “Create a routine with 2 reflections and 1 dilation”).
- Turn them into a team game where players must act out each transformation and others must guess the math terms.
- Bonus: Add cultural storytelling prompts to each card.

4. Movement Map – Cultural Geometry Across the Globe

- Research gesture, symmetry, and symbolism in global dance or ritual traditions (e.g., West African stepping, Japanese Noh movement, Mexican folklórico).
- Choose one and create a short poster or video showing:
 - Where the geometric transformations are
 - What cultural story or identity they express
 - How movement is used as language or resistance



LINKS FOR FURTHER INFORMATION

- “Math Dance” (TED-Ed Video) – How body movement can teach math-
<https://youtu.be/Ws2y-cGoWqQ>
- Mathematics in the World of Dance - geometry and symmetry live inside choreography-
chrome- <https://archive.bridgesmathart.org/2012/bridges2012-453.html#gsc.tab=0>

- **Chrome Music Lab** – to create rhythms and patterns to match routines-
<https://musiclab.chromeexperiments.com/Song-Maker/>

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