

ARTS IMPACT—ARTS-INFUSED INSTITUTE LESSON PLAN (YR2-AEMDD)

LESSON TITLE: Parallel and Perpendicular Lines—Symmetrical Pathway Maps
Dance and Math Lesson

Artist-Mentor – Debbie Gilbert and Joanne Petroff

Grade Level: Fourth Grade

Examples:

Enduring Understanding

Making lines the same distance apart that do not cross creates parallel lines.

Making lines that intersect at right angles creates perpendicular lines.

Target: Creates a symmetrical design.

Criteria: Draws a mirror image pathway map with 5 pairs of parallel lines and 8 pairs of perpendicular lines.

Target: Creates a duo dance that travels on a symmetrical path.

Criteria: With a partner, moves along a mirror image line.

Target: Notates the dance and identifies types of line pairs.

Criteria: Draws the symmetrical pathway of the dance observed and labels at least two pairs of parallel lines and at least two pairs of perpendicular lines.

Teaching and Learning Strategies

Introduction to Arts-Infused Concepts through Classroom Activities:

Arts-Infused Concepts: Lines of Symmetry; Parallel and Perpendicular Lines

☞ Do the BrainDance.

If time is available, explore concepts in everyday life:

☞ Walk in parallel and perpendicular lines on the playground with a classmate or in relation to a stationary object (wall, building side).

☞ Look for lines of symmetry as you observe others sitting, standing or moving.

1. **Prepares students for dancing parallel and perpendicular lines** by discussing lines in dance, math, and everyday living. *Prompts: This is an arts-infused lesson about parallel and perpendicular lines. We'll be doing dance and math at the same time. What do you know about parallel lines? (stay the same distance apart and don't cross) What do you know about perpendicular lines? (cross at right angles) Where do you see parallel lines in this room? Perpendicular?*

Student: Considers and discusses the shared concepts of parallel and perpendicular lines in math and dance and life. Bases the discussion on prior knowledge.

2. **Leads students in *BrainDance* warm-up.** (Originally developed by Anne Green Gilbert, reference: *Brain-Compatible Dance Education*, video: *BrainDance, Variations for Infants through Seniors*). Music: "Geometry BrainDance (4th grade)" #4 *Geometry Dances*. *Prompts: The BrainDance is designed to warm up your body and make your brain work better at the same time. We'll use a few*

examples of our dance and math words "parallel and perpendicular lines" as we do the BrainDance. We'll also use other math terms like symmetry, slides, and flips. We'll dance those in future classes. Hint: In the parts of the BrainDance that specify right or left sides—when you are leading you can be a mirror for the students (so you do left when they do right) or you can face away from them (so you do right when they do right).

Demonstrates the dance using the following sequence of movement patterns:

Breath: Inhales and exhales. Repeats. *Prompts: Your muscles and your brain need oxygen, so inhale through your nose and exhale through your mouth.*

Tactile: Rubs hands. Taps body lightly from head to toe. Stomps feet. *Prompts: Use both hands tapping together equally on each side of your body creating **symmetrical** movement. When you stomp your feet are you doing symmetrical movement?*

Core-Distal: Gradually increases the size of the body, growing from the center of the body into a **large symmetrical shape** and then shrinking back into a small shape. Repeats. *Prompts: Make a big **symmetrical square** shape. Shrink into a small shape. Grow into a big **symmetrical rectangle** shape. Shrink into a small shape. Grow into a big **symmetrical rhombus** shape. Shrink into a small shape.*

Head-Tail: Curls the body forward and backward with head and tailbone. Repeats. Curls from side to side. Repeats. *Prompts: Curl forward and back. That's **symmetrical** movement. Curl from side to side. Is that symmetrical?*

Upper Half and Lower Half: Stabilizes the lower half of the body and only the upper half dances, drawing **parallel and perpendicular lines** with different body parts. *Prompts: The top half of your body is in motion, while the lower half is frozen. Draw parallel lines in the air with your hands, then with your elbows. Draw perpendicular lines with your arms.* Stabilizes the upper half of the body, and only the lower half dances, staying in one spot, drawing **parallel and perpendicular lines** with different body parts. *Prompts: The lower half of your body is in motion, while the upper half is frozen. Draw parallel lines on the ground with your feet, with your knees. Draw perpendicular lines on the ground with your feet, then in the air with your legs.*

Body-Half Right and Left: Stabilizes the left side of the body and only the right side dances, drawing **parallel and perpendicular lines** with an arm and a leg. Repeats on the opposite side. *Prompts: Your left side is frozen and only the right side dances. Draw parallel and perpendicular lines with your right arm and leg. Now the right side is frozen and the left half dances. Draw parallel and perpendicular lines with your left arm and leg.*

Cross-Lateral: Reaches across the body with one hand and then the other. Crosses the center of the body, drawing **parallel lines** with the arms. Repeats several times. Crosses the center of the body, drawing **perpendicular lines** with the arms. Repeats several times. *Prompts: Use your hands to draw parallel lines crossing in front of your body. Now let's draw perpendicular lines.*

Vestibular: Makes a **triangle shape** with whole body. **Slides** (translates) the shape twice to the right. **Flips** (reflects) the shape two times (180° turn to the right/clockwise). Repeats two slides and two flips to the left. Does the same with a **rectangle** and a **pentagon**. *Prompts: Make a triangle shape. How many **vertices** does it have? We'll move to the right first. Slide. Slide. Flip. Flip. To the left. Slide. Slide. Flip. Flip. Make a rectangle shape. How many **vertices** does it have? We'll move to the right first. Slide. Slide. Flip. Flip. To the left. Slide. Slide. Flip. Flip. Make a pentagon shape. How many **vertices** does it have? We'll move to the right first. Slide. Slide. Flip. Flip. To the left. Slide. Slide. Flip. Flip.*

Inhale. Exhale. Inhale. Exhale.

Prompts: When did you use parallel and perpendicular lines in the BrainDance?

Student: Participates in warm-up according to teacher prompts.

3. **Uses a Move and Freeze exploration to review parallel lines and perpendicular lines, symmetrical shapes and locomotor and non-locomotor movements.** Plays the drum and cues the students. *Prompt: When you hear the music you move and when it stops, you freeze in a shape.*

a) *Do a locomotor move, like hopping, to travel through the empty space in the room. (Plays drum for a few seconds then stops playing.) Freeze in a symmetrical shape.*

b) *Do a non-locomotor move, like stretching, to move in one spot. (Plays drum for a few seconds then stops playing.) Freeze in a shape with parallel lines.*

c) *Do another locomotor movement (e.g. walk, skip, crawl). Play drum, then stops. Freeze in a shape with perpendicular lines.*

Refers to locomotor and non-locomotor movement chart for additional suggestions.

Student: Explores concepts as cued by teacher.

Embedded Assessment: Criteria-based room scan

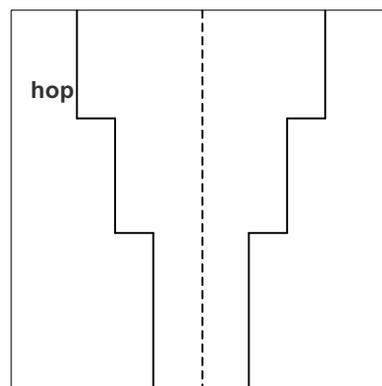
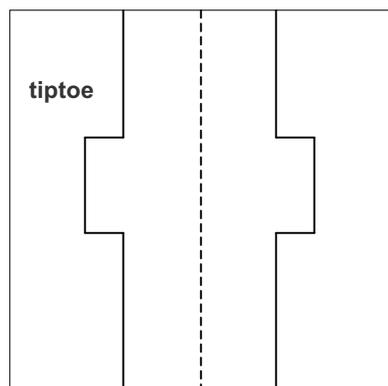
4. **Guides students through choreography of Symmetrical Pathway Dances with a partner. Demonstrates how to create a symmetrical pathway map** by folding a piece of paper in half and drawing a simple pathway on one side of the fold starting at the top of the paper and ending at the bottom. Makes a few sample pathway maps ahead of time to show some examples.

a. **Draws the map.** Begins with a short vertical line segment. Makes a right angle and draws a short horizontal line segment. Makes a right angle and draws a short vertical line segment. Makes a right angle and draws a short horizontal line segment. Makes a right angle and draws a short vertical line segment, **making a total of five line segments.**

b. **Directs a partner to draw a pathway as a mirror image.**

c. **Analyzes parallel and perpendicular lines.** *Prompts: Look at our map. How many pairs of parallel lines do you see? (5) How many pairs of perpendicular lines do you see? (8) Is the map symmetrical? Why?* Labels lines with symbols. (parallel "||", perpendicular "⊥")

d. **Dances the map.** Demonstrates walking the pathway. Guides student to think about which locomotor movement to perform as they travel on the pathway. **(Note: So that students can focus on the pathway, let students select one type of locomotor movement only (e.g. jump, hop) for their map.** If you choose to repeat the lesson, after students are successful with one type of movement, they could choose up to five movements, one for each line segment.) Asks the follower for the drawing process to choose the movement to do along the pathway. Dances the pathway map with partner.



e. **Asks audience to draw the pathway they are observing.** For the demonstration by you and your partner, they can draw it in the air.

f. **Guides creating and rehearsal process.** Divides students into duos to create dances. *Prompts: Fold the paper in half. Identify the leader. The leader draws a simple pathway on half of the paper.*

Draw the map.

1. short vertical line segment
2. right angle and short horizontal line segment
3. right angle and short vertical line segment
4. right angle and short horizontal line segment
5. right angle and short vertical line segment
6. Your partner draws the mirror image pathway.

Prompts: Check your work. Do you have 5 pairs of parallel lines? Do you have eight pairs of perpendicular lines? Is your map symmetrical?

- g. **Dance the map.** *Prompts: If you were the follower for the drawing, you get to decide what locomotor movement to perform on your pathway. Imagine your line of symmetry (the fold of your paper) as a line on the floor that extends from the front of the room to the back of the room as you rehearse your study. (Note: you may use tape to make lines of symmetry on the floor for students to use as a reference, or they can use imaginary lines. A line of symmetry running from the front of the room to the back gives the best perspective on the dance studies.) Music: "Travel Notes": "American Fiddler" #13, "Andean Altitude" #14, "Saharan Campsite" #15, *Music for Creative Dance, Volume II.**

Student: Works with a partner to create the symmetrical pathway map; decides on locomotor movement; rehearses.

Embedded Assessment: Criteria-based teacher checklist; criteria-based self-assessment

5. Leads performance and observation of the students' symmetrical pathway dances. Asks each duo to find another duo and show them their dance. Directs the duo that is observing to draw the pathway they saw danced and to label at least two pairs of parallel lines and at least two pairs of perpendicular lines on the Peer Assessment Worksheets. Describes how to notate this on the peer assessment worksheet. *Prompts: Observers, draw the pathway map that you saw. You can watch one of the dancers and draw her/his pathway, and then when they are done dancing, you can draw the mirror image—the dancer's pathway. Label at least two pairs of parallel lines and at least two pairs of perpendicular lines. You can ask the performers to do their dance twice if it helps you.*

Performance process notes: Depending on the time and space you have available, you might want to adapt the performing process. You have a few options, the only requirement is that each duo creates and performs their pathway map dance and notates one other duo's dance.

- As above, half of the class performs in duos at one time, with each duo observing and drawing the dance of one other duo, then reversing roles. This strategy requires the largest space.
- 2-3 duos perform at a time and observers select one of the dances to draw.
- One group performs at a time and observers select one of the dances to draw. You could choose to have them draw all the dances, but inform students which drawing will be assessed if they make more than one drawing.
- One group leads the entire class through their dance (follow the leader in two lines). The second group in line peels off and draws the map. Continue until all have had a chance to lead and draw. (After each duo has had a chance to perform its dance and notate one other dance, if time permits, you can ask a few groups at a time to perform for the rest of the class, with audience either just watching or notating everyone's dance.)

Student: Performs and notates.

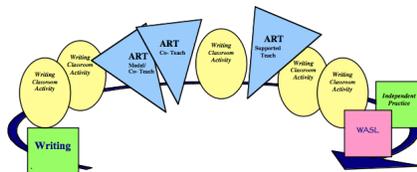
Embedded Assessment: Criteria-based teacher checklist; criteria-based peer assessment

6. Facilitates a reflective discussion. *Prompts: Performers—How did you translate the pathway picture into movement? Did you have certain strategies that helped you create the symmetrical pathway through the space? Audience—where did you see parallel and perpendicular lines? What did*

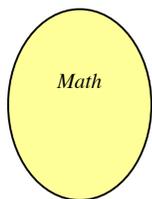
the performers do to make sure you saw the symmetrical pathway in their dance study? Students—how can what we learned today by dancing help you in math?

Student: Participates in the discussion.

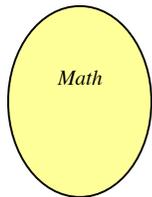
Embedded Assessment: Criteria-based teacher checklist; criteria-based self-assessment; criteria-based class critique



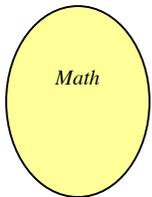
Before next DANCE lesson:



1. Repeat the BrainDance frequently to reinforce the learning.



2. Explore the math concepts using your math curriculum.



If time is available, explore the concepts in other ways:

3. Repeat the Mirror Dance (from *Lines of Symmetry* lesson) with leaders drawing parallel or perpendicular lines.
4. Do a “hand dance” to help remember parallel or perpendicular lines. Make parallel and perpendicular shapes and movements with only your hands.

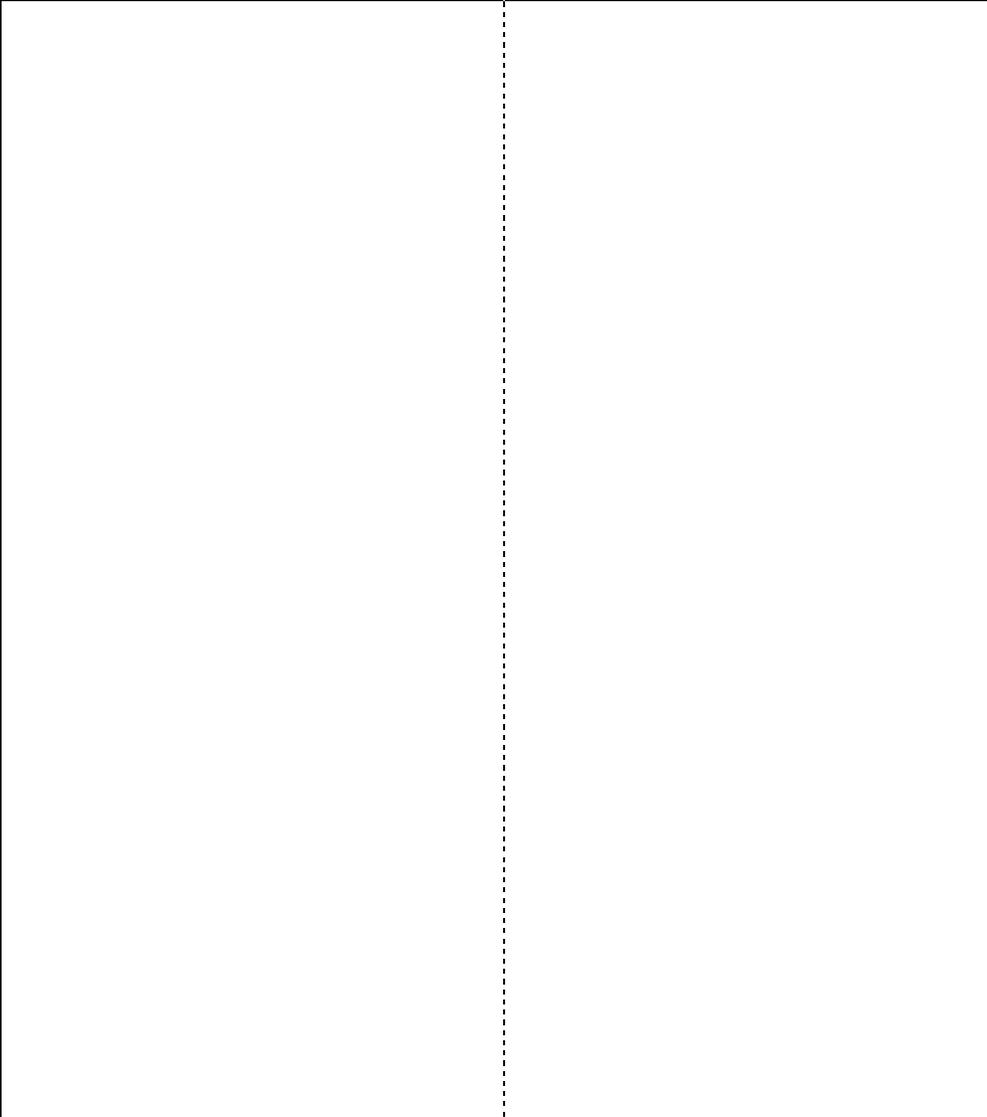
Independent Practice: Hand dance it! Draw it on paper! Parallel lines – same distance apart – never cross! Perpendicular lines cross at right angles.

Vocabulary	Materials and Community Resource	WA Essential Learnings & Frameworks
<p>Arts: locomotor movement non-locomotor movement pathways shape</p> <p>Arts Infused: flip line segment lines of symmetry parallel perpendicular slide symmetrical</p>	<p>Museum Artworks or Performance: Broadway Center for the Performing Arts, Tacoma, WA: <i>Do Jump, Peking Acrobats</i></p> <p>Art Materials or Performance Materials: CD player <i>Music for Creative Dance, Volume II</i> <i>Geometry Dances</i> drum BrainDance chart locomotor and non-locomotor movement chart sample pathway maps paper and markers blue painter’s tape peer assessment worksheets assessment checklist</p>	<p>AEL 1.1 concepts: pathways; parallel and perpendicular lines AEL 1.1.2 principles of organization: creates movement sequences AEL 1.2 skills and techniques: performs sequences AEL 1.4: audience skills AEL 2.1 applies creative process: organizes elements into a creative work AEL 4.2: dance and math connection</p> <p>MEL 1.3.1 geometric sense: understands concept of parallel and perpendicular lines</p> <p>Math State Frameworks Grade 4: explains parallel and perpendicular lines and gives examples to demonstrate them</p>



Peer Assessment Worksheet – Symmetrical Pathway Maps

Name: _____ Date: _____

Performers' Names	Draw what you saw: the mirror image pathway the dancers created. Label at least two parallel line pairs and two perpendicular line pairs. You can use these symbols. parallel: perpendicular: ⊥
	

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LESSON TITLE: Parallel and Perpendicular Lines—Symmetrical Pathway Maps

ASSESSMENT WORKSHEET

Disciplines Concept	MATH SYMMETRY PARALLEL PERPENDICULAR The Map	DANCE AND MATH SYMMETRY PARALLEL PERPENDICULAR The Dance	DANCE AND MATH SYMMETRY PARALLEL PERPENDICULAR The Observation		
Students	Draws a mirror image pathway map, incorporating 5 pairs of parallel lines and 8 pairs of perpendicular lines	With a partner, moves along a mirror image line	Draws the symmetrical pathway of the dance observed and labels: at least two pairs of parallel lines at least two pairs of perpendicular lines		Total 4
1.					
2.					
3.					
4.					
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12.					
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22.					
23.					
24.					
25.					
26.					
27.					
28.					
Total					
Percentage					

Criteria-based Reflection Questions: (Note examples of student reflections.)

Self-Reflection: *How can what we learned today by dancing help you in math?*

Peer to Peer: *Where did you see parallel and perpendicular lines in the dances?*

Thoughts about Learning:

Which prompts best communicated concepts? Which lesson dynamics helped or hindered learning?

Lesson Logistics:

Which classroom management techniques supported learning?

Teacher: _____ Date: _____

ARTS IMPACT—ARTS-INFUSED LEARNING FAMILY LETTER

DANCE AND MATH LESSON -

Parallel and Perpendicular Lines—Symmetrical Pathway Maps

Dear Family:

Today your child participated in a **dance and math** lesson. We talked about how **parallel lines** stay the same distance apart and do not cross while **perpendicular lines** intersect at right angles.

- We drew a **mirror image pathway** that had 5 pairs of parallel lines and 8 pairs of perpendicular lines.
- Collaborating with a partner, we danced the symmetrical pathway through the space.
- We notated the dance we observed and labeled parallel and perpendicular lines.
- We learned that both mathematicians and dancers use parallel and perpendicular lines.

You could look around the house to find objects with parallel or perpendicular lines. When do you move in parallel lines (e.g. on the highway)? When would you move in perpendicular lines (e.g. at an intersection)?

Enduring Understanding

Making lines the same distance apart that do not cross creates parallel lines.

Making lines that intersect at right angles creates perpendicular lines.