## 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

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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

Fourth Grade—Dance and Math—Parallel and Perpendicular Lines

4-8

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.

Fourth Grade—Dance and Math—Parallel and Perpendicular Lines

4-8

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 “ll”, 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.

tiptoe hop

Fourth Grade—Dance and Math—Parallel and Perpendicular Lines

4-8

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 peals 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

Fourth Grade—Dance and Math—Parallel and Perpendicular Lines

4-8

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

Arts:

locomotor movement

non-locomotor movement

pathways

shape

Arts Infused:

flip

line segment

lines of symmetry

parallel

perpendicular

slide

symmetrical

Museum Artworks or Performance:

Broadway Center for the Performing Arts, Tacoma,

WA: Do Jump, Peking Acrobats

Art Materials or Performance Materials:

CD player

Music for Creative Dance, Volume II

Geometry Dances

drum

BrainDance chart

locomotor and non-locomotor movement chart

sample pathway maps

paper and markers

blue painter’s tape

peer assessment worksheets

assessment checklist

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

MEL 1.3.1 geometric sense: understands concept of

parallel and perpendicular lines

Math State Frameworks

Grade 4: explains parallel and perpendicular lines

and gives examples to demonstrate them

Math

Math

Math

Fourth Grade—Dance and Math—Parallel and Perpendicular Lines

4-8

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:

Fourth Grade—Dance and Math—Parallel and Perpendicular Lines

4-8

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

LESSON TITLE: Parallel and Perpendicular Lines—Symmetrical Pathway Maps

ASSESSMENT WORKSHEET

Disciplines MATH DANCE AND MATH DANCE AND MATH

Concept SYMMETRY

PARALLEL

PERPENDICULAR

The Map

SYMMETRY

PARALLEL

PERPENDICULAR

The Dance

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:

Total

4

at least two pairs

of parallel lines

at least two pairs

of perpendicular

lines

1.

2.

3.

4.

5.

6.

7.

8.

9.

10.

11.

12.

13.

14.

15.

16.

17.

18.

19.

20.

21.

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:

Fourth Grade—Dance and Math—Parallel and Perpendicular Lines

4-8

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.