## ARTS IMPACT LESSON PLAN

Dance and Math Infused Lesson

Lesson Three: Choreographing the Area and Perimeter

Author: Debbie Gilbert Grade Level: Third

Reference: Cathy Carini, Grant Center for the Expressive Arts, Area and Perimeter

Enduring Understanding

Movement around the edges of a rectangle and filling the inside of the rectangle can show perimeter

and area.

Lesson Description (Use for family communication and displaying student art)

In this math and dance lesson, students create dances of the area and perimeter of rectangles. They

review measuring area and perimeter. Students explore bound or tight movement and free or loose

movement. After calculating the area and perimeter of a rectangle, they create a dance with a partner

in which they dance the perimeter with bound movement and the area with free movement.

Learning Targets and Assessment Criteria

Target: Calculates area and perimeter of a polygon.

Criteria: Records the number of square units in the inside surface of a rectangle. Records the

number of units in the distance around a rectangle.

Target: Creates a dance showing perimeter or area.

Criteria: Performs bound movement for the total number of counts matching the measurement of

the distance around a rectangle, or performs free movements for the total number of counts

matching the measurement of the surface inside the boundary of the rectangle.

Vocabulary Materials Learning Standards

Arts Infused:

Rectangle

Shape

Measurement

Math:

Area

Perimeter

Arts:

Bound Energy

Choreographer

Free Energy

Museum Artworks or Performance

Seattle, WA

Pacific Northwest Ballet

UW World Series of Dance

Tacoma, WA

Broadway Center for the Performing Arts

Materials:

Math Dances CD by Debbie Gilbert; Music for

Creative Dance, Volume IV, by Eric

Chappelle; CD player; Drum/percussion

instrument; White board, document camera,

or chart paper & markers; Computer with

internet connection and projector; 8.5x11”

white copy paper: copy Choreographing the

Area and Perimeter Demonstration

Worksheet and Choreographing the Area and

Perimeter Student Worksheets, one per

student; Writing pencils; blue tape (optional);

Class Assessment Worksheet

continued

WA Arts State Grade Level Expectations

For the full description of each WA State Arts Grade Level

Expectation, see: http://www.k12.wa.us/Arts/Standards

1.1.3 Elements: Energy

1.2.1 Skills and Techniques: Focus

1.4.1 Audience Skills

2.1.1 Creative Process

2.2.1 Performance Process

2.3.1 Responding Process

Early Learning Guidelines (Pre-K – Grade 3)

For a full description of Washington State Early Learning

and Child Development Guidelines see:

http://www.del.wa.gov/development/guidelines/

(3rd grade) 3. Touching, seeing, hearing and moving

around: Using the large muscles (gross motor skills): show

good form in basic movement (locomotor skills).

(3rd grade) 6. Learning about my world: Math: determine

the perimeter and area of rectangles. Arts: create and

perform movement, showing balance through coordination

and muscle control; show interest in developing skills

in dance.

Common Core State Standards (CCSS) in Math

For a full description of CCSS Standards by grade level see:

http://www.k12.wa.us/CoreStandards/Mathematics/default.

aspx

3.MD. Geometric measurement: understand concepts of

area and relate to multiplication and to addition

continued

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Pacific Northwest Ballet images:

Mara Vinson in Nacho Duato’s

Rassemblement

Carla Korbes in Twyla Tharp’s Opus 111

©Angela Sterling

Video

The Narrowing - AXIS Dance Company

(2011): duet featuring one dancer who uses

a wheelchair and one who doesn’t

http://www.youtube.com/watch?v=8Fe2XIB0

Dh0

Seattle Art Museum: Nick Cave, In the

Classroom

http://www.youtube.com/watch?v=OcvfW1H

Nnrs&feature=player\_embedded

Refraction excerpt, Alonzo King LINES Ballet

http://www.youtube.com/watch?v=ooUXXE7

PQDU

3.MD.5. Recognize area as an attribute of plane figures and

understand concepts of area measurement.

3.MD. Geometric measurement: recognize perimeter as an

attribute of plane figures and distinguish between linear

and area measurement.

3.MD.8. Solve real world and mathematical problems

involving perimeters of polygons, including exhibiting

rectangles with the same area and different perimeters.

CCSS Mathematical Practices

MP.2. Reason abstractly and quantitatively.

MP.4. Model with mathematics.

MP.6. Attend to precision.

MP.7. Look for and make use of structure.

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Pre-Teach

Practice the Math BrainDance, see lesson step 3. Explore finding area

and perimeter.

Lesson Steps Outline

Day One

1. Introduce dancing the area and perimeter of a rectangle. Analyze

photographs or video of dancers using free and bound movement.

2. Remind students about agreements for appropriate dance behavior.

3. Lead students in Math BrainDance warm-up.

Music: “Math BrainDance (Third Grade)” #4, Math Dances by Debbie Gilbert

4. Introduce and lead exploration of free and bound movement. Use a drum or

other instrument for accompaniment.

! Criteria-based process assessment: Moves with bound and free energy.

5. Demonstrate calculating and dancing the perimeter and area of a rectangle

with a partner.

Music: “Totem Pole” #13, Music for Creative Dance, Volume IV, by

Eric Chappelle

6. Support students as they calculate and dance the perimeter and area of a

rectangle with a partner. Distribute worksheet and pencils to each duo.

Music: “Totem Pole” #13, Music for Creative Dance, Volume IV, by

Eric Chappelle

! Criteria-based teacher checklist, self-assessment: Records the number of

square units in the inside surface of a rectangle. Records the number of units in

the distance around a rectangle. Performs bound movement for the total number

of counts matching the measurement of the distance around a rectangle, or

performs free movements for the total number of counts matching the

measurement of the surface inside the boundary of the rectangle.

ICON KEY:

" = Indicates note or reminder for teacher

! = Embedded assessment points in the lesson

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7. Lead reflection.

! Criteria-based reflection: Analyzes how rectangles with different perimeters

can have the same area.

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Day Two

1. Review measuring area and perimeter.

2. Remind students about agreements for appropriate dance behavior.

3. Lead students in Math BrainDance warm-up.

Music: “Math BrainDance (Third Grade)” #4, Math Dances by Debbie Gilbert

4. Support students as they refine and rehearse their area and perimeter dances.

Music: “Totem Pole” #13, Music for Creative Dance, Volume IV, by

Eric Chappelle

! Criteria-based teacher checklist: Performs bound movement for the total

number of counts matching the measurement of the distance around a

rectangle, or performs free movements for the total number of counts matching

the measurement of the surface inside the boundary of the rectangle.

5. Direct performance of the area and perimeter dances and response. Review

performer and audience expectations.

Music: “Totem Pole” #13, Music for Creative Dance, Volume IV, by

Eric Chappelle

! Criteria-based reflection: Makes a connection between dance and math.

! Criteria-based teacher checklist: Performs bound movement for the total

number of counts matching the measurement of the distance around a

rectangle, or performs free movements for the total number of counts matching

the measurement of the surface inside the boundary of the rectangle.

6. Lead reflection.

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LESSON STEPS\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Day One

3 Prepare the classroom for dance.

Moving Desks/Set-up

1. Introduce dancing the area and perimeter of a rectangle. Analyze photographs or video

of dancers using free and bound movement.

• Dancing Mathematicians, what is the perimeter of a rectangle? (distance around a shape) How

do you find the measurement of the perimeter? (e.g. count units on the sides, P = 2L + 2W)

• What is the area of a rectangle? (measure of the size of the surface inside a two-dimensional

space of a region) How do you find the measurement of the area? (e.g. count the tiles that fill

the polygon, A = LW)

• Let’s do a hand dance. Draw the perimeter of a rectangle in the air with your hand. Now, show

the area of the rectangle by filling it with movement.

3 You may use these photos: Pacific Northwest Ballet: Mara Vinson in Nacho Duato’s Rassemblement

and Carla Korbes in Twyla Tharp’s Opus 111. You could also choose to find your own photos or videos

that represent a variety of styles and cultures. If you would like to use video examples of bound and

free movement, preview the video clips below. You could show them before or after the

dance explorations.

The Narrowing - AXIS Dance Company (2011): duet featuring one dancer who uses a wheelchair

and one who doesn’t

http://www.youtube.com/watch?v=8Fe2XIB0Dh0

Seattle Art Museum: Nick Cave, In the Classroom

http://www.youtube.com/watch?v=OcvfW1HNnrs&feature=player\_embedded

Refraction excerpt, Alonzo King LINES Ballet

http://www.youtube.com/watch?v=ooUXXE7PQDU

• Dancing Mathematicians, today we are going to dance the area and perimeter of rectangles.

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• We’ll use bound or tight movements to dance the perimeter. Look at the tight shape made by

the dancer in this photograph.

• We’ll use free or loose movement to dance the area. Look at the free shape made by the

dancer in this photograph.

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2. Remind students about agreements for appropriate dance behavior.

• Remind me, how can you be creative and safe at the same time?

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3. Lead students in Math BrainDance warm-up. (BrainDance originally developed by

Anne Green Gilbert, www.creativedance.org, reference: Brain-Compatible Dance

Education, video: BrainDance, Variations for Infants through Seniors.)

Music: “Math BrainDance (Third Grade)” #4, Math Dances by Debbie Gilbert

• The BrainDance is designed to warm up your body and make your brain

work better at the same time. Notice when we use area and perimeter in

the BrainDance.

Breath

• Dancing Mathematicians, breathe gently.

Tactile

• Tap the top of your head five times. Tap your shoulders five times. Tap your stomachs five

times. Tap your knees five times. Tap your feet five times. That was five sets of five. How many

counts total was that?

Core-Distal

• Grow into a huge shape, filling the area of a gigantic polygon. Shrink into a small shape, filling

the area of a tiny polygon.

Head-Tail

• Curl your backbone forwards and backwards four times. Bend from side to side four times. That

was two sets of four. How many counts total was that?

Upper Half

• Freeze the lower half of your body. Draw the perimeter of a giant rectangle in the air with your

hand. Cover the area of the rectangle with big movements with your arms.

Lower Half

• Freeze the upper half of your body. Draw the perimeter of a small rectangle on the floor with

your toes. Cover the area of the rectangle with small movements with your feet.

Body-Half Right

• Freeze the left side of your body. Dance with the whole right side of your body. Dance with one

half of your right side. Dance with one fourth of your right side. Dance with one eighth of your

right side.

Movement Safety

BrainDance by

Artist Mentor

BrainDance by

Students

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Body-Half Left

• Freeze the right side of your body. Dance with the whole left side of your body. Dance with one

half of your left side. Dance with one fourth of your left side. Dance with one eighth of your

left side.

Eye-Tracking

• Focus on your right thumb. Watch it as you draw the perimeter of a polygon in the air. Watch

your left thumb as you draw the perimeter of a polygon in the air.

Cross-Lateral

• Reach across your body up high, up high, down low, down low. We’ll count to eight: 1, 2, 3 …

8. Let’s cut that in half: 1, 2, 3, 4. Let’s cut that in half again: 1, 2.

Vestibular

• Turn, then freeze in a rectangle shape. Turn, then freeze in a square shape. Turn, then freeze

in a rhombus shape. Turn, then freeze in a different quadrilateral shape.

Breath

• Breathe gently, Dancing Mathematicians.

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4. Introduce and lead exploration of free energy and bound energy movement.

Use a drum or other instrument for accompaniment.

• Dancers can move with free or loose movement. (Demonstrate.)

• Look for the empty spaces around you so you don’t touch anyone. Move freely with your arm.

Move freely with your backbone. Move freely with your whole body in one spot.

• Dancers can move with bound or tight movement. When you do bound movement, all your

muscles are really tight. (Demonstrate.)

• Do bound movement with your shoulders. Do bound movement with your legs. Do bound

movement with your whole body as your travel around the room.

þ Criteria-based process assessment: Moves with bound and free energy.

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5. Demonstrate calculating and dancing the perimeter and area of a rectangle with

a partner.

Music: “Totem Pole” #13, Music for Creative Dance, Volume IV, by Eric Chappelle

3 Use the board, document camera, or chart paper to show filling out the

demonstration worksheet.

• I’ll need an assistant to be my partner. First, we’ll look at our rectangle and find our perimeter.

How should we do that?

• Next, we’ll find the area of our rectangle. How should we do that?

• We will be choreographers, or inventors of dances, and create an area and perimeter dance.

Prompting for Creativity

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• I will dance the perimeter. My partner, who will be dancing the area, will freeze in a low shape

in the middle of the rectangle. To do my perimeter dance, I need to know the perimeter

measurement of my rectangle. We discovered that was 14 units. I’ll dance around the edge of

my rectangle with 14 bound, or tight movements (2 on the short sides and 5 on the long sides).

I’ll count to 14 as I move. Then, I’ll freeze.

• My partner will dance the area. To do that, she needs to know the area measurement of my

rectangle. We discovered that was 10 square units. She will cover or fill the space inside the

rectangle with 10 free or loose movements. She’ll count to 10 as she moves. Then, she’ll freeze.

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6. Support students as they calculate and dance the perimeter and area of a

rectangle with a partner. Distribute worksheet and pencils to each duo.

Music: “Totem Pole” #13, Music for Creative Dance, Volume IV, by Eric Chappelle

" Copy enough student worksheets from the lessons so that each duo has one. There

are four different rectangles. The worksheets all have rectangles with an area of 12. The perimeters

are different (6L and 2W, 2L and 6W, 3L and 4W, 4W and 3L). Don’t use the demonstration worksheet

since the area for that is different.

" Optional: Put tape or spots on the floor to define the rectangles.

• First, calculate the perimeter and area of your rectangle and write them on your worksheet.

How will you figure out what the area is? How will you figure out what the perimeter is?

• One of you will dance the perimeter by dancing with tight or bound energy around the edge of

your rectangle. Dance the same number of counts as the measurement of the perimeter,

counting softly to yourself as you move. End by freezing in a low shape. The other dancer will

be frozen during the perimeter dance in a low shape in the middle of the rectangle.

• Next, the other dancer dances the area by filling or covering the space with free or loose

movements. Dance the same number of counts as the measurement of the area, counting

softly as you move. End by freezing in a shape.

• Practice your dance. Ask yourselves, do the number of counts you are dancing match the

measurement of your perimeter and area? Are they the same or different from each other?

Why?

! Criteria-based teacher checklist, self-assessment: Records the number of square units in the inside

surface of a rectangle. Records the number of units in the distance around a rectangle. Performs bound

movement for the total number of counts matching the measurement of the distance around a

rectangle, or performs free movements for the total number of counts matching the measurement of

the surface inside the boundary of the rectangle.

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7. Lead reflection.

• Dancing Mathematicians, look at your worksheets. Let’s compare our rectangles. What were the

perimeters of your rectangles? What were the areas? What did you notice? Why do you think

that is true?

! Criteria-based reflection: Analyzes how rectangles with different perimeters can have the same area.

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Area and

Perimeter Dance

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Day Two

1. Review measuring area and perimeter.

• Dancing Mathematicians, remind me what is the area of a rectangle? How do we measure it?

• What is the perimeter of a rectangle? How do we measure it?

• Today, we’ll refine and rehearse our area and perimeter dances and perform them for

each other.

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2. Remind students about agreements for appropriate dance behavior.

• Remind me, how can you be creative and safe at the same time?

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3. Lead students in Math BrainDance from Day One.

• The BrainDance is designed to warm up your body and make your brain work better at the

same time. Notice when we use area and perimeter in the BrainDance.

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4. Support students as they refine and rehearse their area and perimeter dances.

Music: “Totem Pole” #13, Music for Creative Dance, Volume IV, by Eric Chappelle

" To help the students remember their dances, pass out their worksheets from the previous lesson.

Consider how the students will have to increase or decrease the scale of their movements depending

on the amount of space you have available.

• Let’s review what happens in our dances and then you can practice with your partner.

• One of you dances the perimeter by dancing with tight or bound energy around the edge of

your rectangle. Dance the same number of counts as the measurement of the perimeter,

counting softly to yourself as you move. End by freezing in a low shape. The other dancer

freezes during the perimeter dance in a low shape in the middle of the rectangle.

• Next, the other dancer dances the area by filling or covering the space with free or loose

movements. Dance the same number of counts as the measurement of the area, counting

softly as you move. End by freezing in a shape.

• Mathematicians check their work to make sure it is the best it can be. Choreographers refine

their work for the same reason.

• If you are doing bound energy, how can you make it tighter? If you are doing free energy, how

can you make it looser?

• Perimeter dancers, make sure you are making 90 degree angles at the corners of your

rectangle. Area dancers, make sure you are filling the whole area with movement.

• When you practice your dance, think about how you can use your whole body, not just your

feet or your arms, to show either bound or free movement.

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! Criteria-based teacher checklist: Performs bound movement for the total number of counts matching

the measurement of the distance around a rectangle, or performs free movements for the total number

of counts matching the measurement of the surface inside the boundary of the rectangle.

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5. Direct performance of the area and perimeter dances and response. Review

performer and audience expectations.

Music: “Totem Pole” #13, Music for Creative Dance, Volume IV, by Eric Chappelle

" Depending on the amount of space available, you can have one or two duos perform

at a time.

• What do the performers want from their audience? What does the audience want from

the performers?

• Each group will perform its dance. Audience, describe the free and bound movements that you

saw. How could you tell when the dancers were dancing the perimeter? How could you tell

when the dancers were dancing the area?

! Criteria-based teacher checklist, peer assessment: Performs bound movement for the total number

of counts matching the measurement of the distance around a rectangle or performs free movements

for the total number of counts matching the measurement of the surface inside the boundary of

the rectangle.

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6. Lead reflection.

• Dancing Mathematicians, what did you discover about math when you danced the area and

perimeter? What did you discover about dance when you danced the area and perimeter?

• The next time you measure area and perimeter in math, think about how you danced them and

it will help you remember what they are and how to measure them.

! Criteria-based reflection: Makes a connection between dance and math.

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Audience and

Performer Expectations

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Choreographing the Area and Perimeter Demonstration Worksheet

Teacher name: Date:

5

2

What is the perimeter of your rectangle? \_\_\_\_\_\_\_ units

What is the area of your rectangle? \_\_\_\_\_\_\_ square units

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Choreographing the Area and Perimeter Student Worksheet

Name: Date:

6

2

What is the perimeter of your rectangle? \_\_\_\_\_\_\_ units

What is the area of your rectangle? \_\_\_\_\_\_\_ square units

ARTS IMPACT DANCE AND MATH INFUSION – Third Grade Lesson Three: Choreographing the Area and Perimeter

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Choreographing the Area and Perimeter Student Worksheet

Name: Date:

2

6

What is the perimeter of your rectangle? \_\_\_\_\_\_\_ units

What is the area of your rectangle? \_\_\_\_\_\_\_ square units

ARTS IMPACT DANCE AND MATH INFUSION – Third Grade Lesson Three: Choreographing the Area and Perimeter

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Choreographing the Area and Perimeter Student Worksheet

Name: Date:

4

3

What is the perimeter of your rectangle? \_\_\_\_\_\_\_ units

What is the area of your rectangle? \_\_\_\_\_\_\_ square units

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Choreographing the Area and Perimeter Student Worksheet

Name: Date:

3

4

What is the perimeter of your rectangle? \_\_\_\_\_\_\_ units

What is the area of your rectangle? \_\_\_\_\_\_\_ square units

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ARTS IMPACT LESSON PLAN Dance and Math Infusion

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" Teachers may choose to use or adapt the following self-assessment tool.

STUDENT SELF-ASSESSMENT WORKSHEET

Disciplines MATH DANCE/MATH Total

Concept Area Perimeter Perimeter and Area 4

Criteria

Student Name

Records the

number of

square units

in the inside

surface of a

rectangle.

Records the

number of

units in the

distance

around a

rectangle.

Bound or Free Movement Measurement

Performs bound movement

for distance around a

rectangle, or performs free

movements for surface

inside the boundary of the

rectangle.

Performs movement for

the total number of counts

matching the measurement

of the perimeter or area.

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CLASS ASSESSMENT WORKSHEET

Disciplines MATH DANCE/MATH Total

Concept Area Perimeter Perimeter and Area 4

Criteria

Student Name

Records the

number of

square units

in the inside

surface of a

rectangle.

Records the

number of

units in the

distance

around a

rectangle.

Bound or Free Movement Measurement

Performs bound movement

for distance around a

rectangle, or performs free

movements for surface

inside the boundary of the

rectangle.

Performs movement for

the total number of counts

matching the measurement

of the perimeter or area.

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30.

Total

Percentage

What was effective in the lesson? Why?

What do I want to consider for the next time I teach this lesson?

What were the strongest connections between dance and math?

Teacher: Date:

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