# ARTS IMPACT LESSON PLAN

Visual Arts and Math Infused Lesson

Lesson Three: Multiplication in Symmetrical Assemblages

Author: Meredith Essex Grade Level: Third

Enduring Understanding

Multiplication can be represented by equal rows of repeated shapes. Symmetry can create order and

balance in a composition.

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

Three diverse artworks are analyzed with focus on repetition, multiplication, and symmetry. Students

visually represent multiplication problems by drawing rows or arrays of dots. Next, sponge-painted

backgrounds for assemblages are created. Glass mosaic beads/buttons (for rows/groups of numbers)

are arranged in symmetry and glued to backgrounds to show multiplication. Last, students match

equations with each other’s assemblages. As an extension, students can explore division within a

similar process.

Learning Targets and Assessment Criteria

Target: Represents multiplication in composition.

Criteria: Organizes correct number of identical groups of mosaic gems/buttons to express a

repeated addition problem.

Target: Makes composition in formal balance.

Criteria: Organizes rows in symmetry.

Target: Uses craftsmanship in assemblage.

Criteria: Sponges paint to create an evenly textured ground, glues glass mosaic gems/

buttons securely.

Target: Identifies equations represented in assemblages.

Criteria: Compares and writes multiplication equations for own and another’s art.

Extension Criteria: Compares and writes division equations for own and another’s art.

Vocabulary Materials Learning Standards

Arts Infused:

Horizontal

Shape

Symmetry

Vertical

Math:

Array

Divide

Equation

Expression

Group

Multiply

Row

Arts:

Assemblage

Balance

Composition

continued

Museum Artworks or Performance:

Seattle, WA

Seattle Art Museum

Tacoma, WA

Tacoma Art Museum

Materials

White cardstock: 8.5x11”, copy

multiplication cards from lesson and cut

into individual cards; Mat board: approx.

5x5”-8x8” rectangles; Metallic acrylic

paint: silver, copper, and gold; Paint

trays; Sponges; White chalk; Matching

buttons or mosaic glass gems: approx.

3/8”-1/2”; Cups/trays/ziplock bags: to

store buttons/gems; Scissors; Tacky glue;

Arts Impact sketchbooks; Art mats; Class

Assessment Checklist

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

1.1.2 Elements: Shape

1.1.5 Elements: Space,

1.1.7 Principles of Design: Balance, repetition

1.2.1 Skills and Techniques: Painting, gluing

2.1.1 Creative Process

2.3.1 Responding Process

4.2.1 Connection between Visual Arts and Math

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) 6. Learning about my world: Math: Build skills to

multiply and divide up to 10 x 10 accurately. Arts: Explain

own artwork to others.

continued

ARTS IMPACT VISUAL ARTS AND MATH INFUSION – Third Grade Lesson Three: Multiplication in Symmetrical Assemblages

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Craftsmanship

Dot

Ground

Repetition

Space

Sparkly

Texture

Connections

Everyday Mathematics

Units 4, 7 and 9 - Multiplication and

Division

Seattle Art Museum images:

Tenebrae Service, mid 20th century,

William Hoppe, 72.62

Hanging, late 19th-early 20th century,

Persian, 35.101

Cabinet, ca.1881-82, Attributed to Herter

Brothers (Christian Herter), 2006.5

Common Core State Standards (CCSS) in Math

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

http://www.k12.wa.us/CoreStandards/Mathstandards/

3.OA.3. Use multiplication and division within 100 to solve

word problems in situations involving equal groups, arrays,

and measurement quantities.

3.OA.5. Apply properties of operations as strategies to

multiply and divide.

CCSS Mathematical Practices

MP 1. Make sense of problems and persevere in solving

them.

MP 4. Model with mathematics.

MP 6. Attend to precision.

MP 7. Look for and make use of structure.

MP 8. Look for and express regularity in repeated reasoning.

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Pre-Teach

Sketchbook Activity: Using small dots or circles, practice organizing number

groups of 3 to 10 in rows and rectangular arrays (rows and columns). Look for

and draw rows and arrays seen all around us.

Lesson Steps Outline

Day One

1. Warm-Up: Guide students to practice making groups of dots representing

multiplication problems. Demonstrate organizing groups of dots in arrays

and rows.

2. Introduce and guide art and math analysis of Tenebrae Service by William

Hoppe from the Seattle Art Museum collection. Focus on groups of shapes,

arrays, and multiplication.

3. Introduce Hanging, Persian, and Cabinet attributed to Herter Brothers

(Christian Herter) from the Seattle Art Museum collection and compare with

focus on groups of shapes, multiplication, and balance in composition.

4. Distribute cards with multiplication problems on them. Review how groups of

dots representing numbers can be represented in rows or arrays. Demonstrate

creating a plan for a multiplication composition arranged in symmetry.

Criteria-based peer assessment: Organizes correct number of identical groups

to show a multiplication (repeated addition) expression.

5. Share example of bead multiplication assemblage on sponge-painted

mat board.

6. Demonstrate and guide selecting mat board color and spongepainting

ground.

Criteria-based teacher checklist: Sponges paint to create an evenly

textured ground.

ICON KEY:

3 = Indicates note or reminder for teacher

= Embedded assessment points in the lesson

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Day Two

1. Demonstrate and guide selecting, counting, mapping out, and arranging glass

mosaic gems/buttons.

Criteria-based teacher checklist: Organizes correct number of identical groups

of glass mosaic gems/buttons to express a repeated addition problem and

organizes rows in symmetry.

2. Demonstrate gluing glass mosaic gems/button rows using craftsmanship.

Criteria-based teacher checklist: Glues mosaic gems/buttons securely.

3. Guide completing multiplication problem/equation representing own and a

partner’s assemblage.

Criteria-based teacher checklist: Compares and writes multiplication equations

for own and another’s art.

4. Guide criteria-based group reflection.

Group criteria-based reflection: Identifies and shares equations seen in

assemblages. Analyzes how compositions are balanced.

5. Extension: Challenge students to interpret their assemblage (and another’s)

as a division problem and record equations.

Criteria-based self-assessment: Compares and writes division equations for

own and another’s art.

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

Day One

1. Warm-Up: Guide students to practice making groups of dots representing multiplication

problems. Demonstrate organizing groups of dots in arrays and rows.

• In your sketchbook, show the multiplication expression: 3x3 by clearly drawing three groups of

3 in a single array.

• Now, let’s show 5 x 4: Organize and show five groups of 4 as individual rows or arrays.

• Now, let’s show 3 x 6. Now for the next more artistic question: How can we organize the groups

showing multiplication in a way that is balanced and interesting to look at?

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2. Introduce and guide art and math analysis of Tenebrae Service by William

Hoppe from the Seattle Art Museum collection. Focus on groups of shapes,

arrays, and multiplication.

3 The Seattle Art Museum’s collection is available on-line at:

http://www.seattleartmuseum.org/emuseum/code/collection.asp. To find the images in this lesson,

enter the accession number for the work of art in the search box on the collections page of SAM’s

website. Accession numbers for these works of art are listed in the materials box at the beginning of

the lesson.

• Where do we see anything that resembles a row, shape, or array in this art?

• Where do we see repetition of groups of shapes in this art?

• Where can you find multiplication in this art? If we were to write a multiplication problem for all

or part of this artwork, what might it be?

• What other math do you see in this art? Fractions, geometric shapes?

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Responding to Art in

the Classroom

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3. Introduce Hanging, Persian, and Cabinet attributed to Herter Brothers (Christian Herter)

from the Seattle Art Museum collection and compare with focus on groups of shapes,

multiplication, and balance in composition.

• In these three very different works of art, where do you see groups of shapes or evidence

of multiplication?

• What do these artworks have in common (symmetry)?

• Where do we see rows, shapes, or arrays in balance?

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4. Distribute cards with multiplication problems on them. Review how

groups of dots representing numbers can be represented in rows or arrays.

Demonstrate creating a plan for a multiplication composition arranged

in symmetry.

3 In distributing multiplication cards, you may choose to differentiate by matching equations with

students based on their ability.

• With 5 x 5, how can I arrange five rows of 5 in symmetry? They could be horizontal rows

forming one large array in the center, or they could be two vertical rows on each side with a

horizontal row in the center.

• Sketch some rows of dots in symmetry that show your multiplication problem.

Criteria-based peer assessment: Organizes correct number of identical groups to show a

multiplication (repeated addition) expression.

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Prompting for Creativity

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5. Share example of bead multiplication assemblage on sponge-painted mat board.

• We are going to be showing our multiplication problem/equation in an assemblage: art that is

made out of found materials that are 3-dimensional.

• We are going to be using glass mosaic gems/buttons for our rows and/or arrays.

• We will be counting and arranging them using our ideas for creating a composition in part two

of this lesson.

• Right now, we are going to create a sparkling textural metallic color ground—an interesting

surface that our beads/buttons will be glued to.

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6. Demonstrate and guide selecting mat board color and

sponge-painting ground.

3 Place 3-4 small trays at each table group with a small amount of acrylic

metallic colored paint and one sponge per student. Place paper under mat

board to protect table.

• Choose a color of mat board that jumps out at you. Write your name

on the back of it (the white side).

• Choose a color of metallic paint at your table that you feel will look

good on your color background.

• Creating a textured, sparkly “ground” means sponge painting a light

consistent sponge texture but not completely covering up your

background/color. The idea is to add some sparkle or sheen. Sponging

is an up and down motion used to create the textural color effect all

over your mat board.

Criteria-based teacher checklist: Sponges paint to create an evenly textured ground.

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Sponge Painting Grounds for

Assemblage Arrays

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Day Two

1. Demonstrate and guide selecting, counting, mapping out, and arranging glass mosaic

gems/buttons.

• Choose glass mosaic gems/buttons with the color of your ground in mind. If you have large

numbers, choose small beads or buttons. If you have small numbers, choose large beads or

buttons to fill the space. Think about combinations that stand out; you might want to use

complementary or warm and cool colors together in your assemblage.

• If a multiplication problem is 6x5, how many groups of 5 beads/buttons are needed?

Count carefully.

• Now that the correct number of groups has been counted, it is time to arrange them.

Look at composition ideas you have already sketched. (Optional: you can draw dots in chalk on

your ground for each row.)

• Arrange your glass mosaic gems/buttons in symmetry, making

sure each row can be clearly seen.

• Talk with a partner about your composition: check each other’s

math and symmetry.

Criteria-based teacher checklist: Organizes correct number of identical groups of glass mosaic

gems/buttons to express a repeated addition problem and organizes rows in symmetry.

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2. Demonstrate gluing glass mosaic gems/button rows using craftsmanship.

• Now that every row is arranged and your math and symmetry (formal balance)

has been checked, it is time to glue. Both mathematicians and artists use

precision in their work. Craftsmanship means care to keep our symmetry and

glue securely so that the beads will not fall off.

• Move one mosaic gem/button at a time, just to the side, and

squeeze a thick dab exactly matching the places where your

mosaic gem or bead was. You can also carefully put a dab of

glue on the mosaic gem or bead and place it securely on the

background. Make sure there is enough glue under each glass

mosaic gem/button.

• Repeat until all rows are glued down. It important to use enough glue!

• Leave your assemblage on your table without touching or disturbing it until the glue sets.

Criteria-based teacher checklist: Glues mosaic gems/buttons securely.

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Assemblage: Gluing with

Tacky Glue

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3. Guide completing multiplication problem/equation representing own and a

partner’s assemblage.

• Write the multiplication expression for your assemblage.

• Now calculate how many mosaic gems/buttons total you have in all the rows. Add the total to

make an equation.

• Talk with a partner about his or her composition. Figure out the multiplication equation for their

composition and share with the group.

Criteria-based teacher checklist: Compares and writes multiplication equations for own and

another’s art.

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4. Guide criteria-based group reflection.

3 Once glue has set, it is helpful to line all assemblages up on a flat table in an

array/grid configuration for students to analyze. Art can also be ordered from

smallest to greatest in grid. Once glue dries, this is a great way to display them

as one work of art on a bulletin board.

• Let’s order our assemblages from smallest to largest.

• Look at all of our work as a group. Find and share the specific multiplication equations you

discovered in other’s assemblages.

• Notice the ways that artists organized their compositions. How are they balanced?

Group criteria-based reflection: Identifies and shares equations seen in assemblages. Analyzes how

compositions are balanced.

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5. Extension: Challenge students to interpret their assemblage (and another’s) as a

division problem and record equations.

• If you divide that total number of beads by the number of rows you have, what is the answer?

(The number is equal to the number of beads in each row.)

• Record the equation that represents your assemblage as a division problem. Also record a

partner’s division equation.

Criteria-based self-assessment: Compares and writes division equations for own and

another’s art.

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Guiding Reflecting on

Student Art

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3 x 3 4 x 4

3 x 5 4 x 6

3 x 7 4 x 8

5 x 3 6 x 3

5 x 5 6 x 5

5 x 7 6 x 7

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4 x 8 7 x 3

4 x 9 7 x 5

4 x 10 7 x 7

8 x 3 9 x 3

8 x 4 9 x 5

8 x 5 9 x 4

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8 x 6 8 x 8

6 x 6 8 x 7

5 x 4 5 x 6

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ARTS IMPACT LESSON PLAN Visual Arts and Math Infusion

Third Grade Lesson Three: Multiplication in Symmetrical Assemblages

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

STUDENT SELF-ASSESSMENT WORKSHEET

Disciplines MATH VISUAL ARTS MATH Total

6

(or 7)

Concept Multiplication Balance Craftsmanship Multiplication/Division

Criteria

Student Name

Organizes correct

number of identical

groups mosaic

gems/buttons to

express a repeated

addition problem

Organizes

rows in

symmetry

Sponges

paint to

create an

evenly

textured

ground

Glues

glass

mosaic

gems/

buttons

securely

Writes

multiplication

equation for

own art

Writes

multiplication

equation for

another’s art

Extension

Writes

division

equations

for own and

another’s art

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ARTS IMPACT LESSON PLAN Visual Arts and Math Infusion

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CLASS ASSESSMENT WORKSHEET

Disciplines MATH VISUAL ARTS MATH Total

6

(or 7)

Concept Multiplication Balance Craftsmanship Multiplication/Division

Criteria

Student Name

Organizes correct

number of identical

groups mosaic

gems/buttons to

express a repeated

addition problem

Organizes

rows in

symmetry

Sponges

paint to

create an

evenly

textured

ground

Glues

glass

mosaic

gems/

buttons

securely

Writes

multiplication

equation for

own art

Writes

Multiplication equation for

another’s art

Extension

Writes

division

equations

for own and

another’s art

1.

2.

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29.

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 visual arts and math?

Teacher: Date:

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ARTS IMPACT FAMILY LETTER

VISUAL ARTS AND MATH LESSON: Multiplication in Symmetrical Assemblages

Dear Family:

Today your child participated in a two-part Arts and Math lesson. We looked at three very different

artworks: a painting, a hanging, and an example of antique furniture. We found examples of repetition

of shapes in rows or arrays and symmetry in all of these artworks. We also found examples of

multiplication in this art. We made assemblages that show our understanding of multiplication.

• We practiced figuring out multiplication problems by drawing rows or arrays of dots to

represent numbers.

• We made art in response to a multiplication problem by organizing rows of dots that represent

numbers into a plan for a symmetrical composition.

• We prepared a textured sponge painted ground (surface to adhere things to) for an assemblage

(artwork that is made of real 3-dimensional objects).

• We used glass mosaic gems or buttons for our assemblages and mapped out where we would

place them.

• We showed multiplication by using groups of beads or buttons to represent numbers.

• We selected, counted, arranged, and glued our glass mosaic gems or buttons.

• We looked at our work together and recorded multiplication equations matching our own and

other’s assemblages.

• Some of us identified and recorded division equations matching our assemblages.

At home, you could encourage your child to group and count objects as a way to practice

multiplication. Together, you could look for examples of rows or arrays in the world around us, and use

multiplication to determine total numbers. You could also experiment with making symmetrical

mathematical collages out of dot stickers or small objects found in nature.

Enduring Understanding

Multiplication can be represented by equal rows of repeated shapes.

Symmetry can create order and balance in a composition.