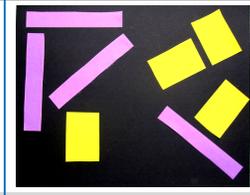


Visual Arts and Math Infused Lesson

Lesson One: *Fractions in Informal Balance*

Author: Meredith Essex Grade Level: Third



Enduring Understanding

Equal number and area of shapes can be arranged asymmetrically on either side of a centerline to create informal balance in composition. Pairing complementary colors can create contrast.

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

Students explore dividing equal area rectangles into equal shares through folding and cutting paper in different ways. Artworks are analyzed with emphasis on arrangement of shapes for informal balance and combination of complementary colors for contrast. Students then select a complementary color pair for collage and divide rectangles into equal but differently shaped quarters. Compositions are arranged to create informal balance with equal area on either side of a center line and glued using craftsmanship.

Learning Targets and Assessment Criteria

**Target:** Divides same shapes into equal parts in different ways.

**Criteria:** Folds vertically, horizontally, and in both directions to make rectangles into fourths.

**Target:** Creates contrast in composition.

**Criteria:** Pairs complementary colors in collage.

**Target:** Creates informal balance in composition.

**Criteria:** Arranges equivalent area of shapes asymmetrically on either side of a center line without overlapping.

**Target:** Uses craftsmanship in collage.

**Criteria:** Folds, smoothly cuts, and glues shapes flat and securely.

Vocabulary	Materials	Learning Standards
<p><b>Arts Infused:</b> Asymmetry Horizontal Shape Symmetry Vertical</p> <p><b>Math:</b> Area Equal Fraction Part Quarter Whole</p> <p><b>Arts:</b> Center line Collage Complementary color Composition Contrast Informal balance</p>	<p><b>Museum Artworks or Performance:</b></p> <p><b>Seattle, WA</b> Seattle Art Museum</p> <p><b>Tacoma, WA</b> Tacoma Art Museum</p> <p><b>Materials</b> Newsprint: 4.5x6", 3 per student; Individual color wheels; Fadeless art paper: 4.5x3" in primary and secondary colors, 2 per student; Scissors; White chalk; Black card stock: 8.5x11"; Glue sticks; Recycled magazines; glue mats; Arts Impact sketchbooks; Class Assessment Worksheet</p> <p><b>Connections</b> <i>Everyday Mathematics</i> 8.1 – Naming Parts with Fractions 8.3 – Exploring Fractions, Re-Forming Squares and Combinations 8.5 – Equivalent Fractions 8.6 – Comparing Fractions</p> <p><i>continued</i></p>	<p><b>WA Arts State Grade Level Expectations</b> <i>For the full description of each WA State Arts Grade Level Expectation, see: <a href="http://www.k12.wa.us/Arts/Standards">http://www.k12.wa.us/Arts/Standards</a></i></p> <p>1.1.2 Elements: Shape 1.1.6 Elements: Complementary color 1.1.7 Principles of Design: Contrast, balance 1.2.1 Skills and Techniques: Collage 2.1.1 Creative Process 2.3.1 Responding Process 4.2.1 Connection between Visual Arts and Math</p> <p><b>Early Learning Guidelines (Pre-K – Grade 3)</b> <i>For a full description of Washington State Early Learning and Child Development Guidelines see: <a href="http://www.del.wa.gov/development/guidelines/">http://www.del.wa.gov/development/guidelines/</a> (3<sup>rd</sup> grade) 6. Learning about my world: Math: Develop an understanding of fractions (e.g. 1/2, 1/4, etc); determine the perimeter and area of rectangles. Arts: Explain own artwork to others.</i></p> <p><i>continued</i></p>

Seattle Art Museum images:

*Thermometer*, 1959, Jasper Johns, 91.97



*Abstract Forms*, ca. 1937, Ruth Penington, 69.335



### **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.NF.1. Understand a fraction  $1/b$  as the quantity formed by 1 part when a whole is partitioned into  $b$  equal parts; understand a fraction  $a/b$  as the quantity formed by  $a$  parts of size  $1/b$ .

3.G.2. Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole.

3.NF.3. Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size.

### **CCSS Mathematical Practices**

MP 2. Reason abstractly and quantitatively.

MP 4. Model with mathematics.

MP 5. Use appropriate tools strategically.

MP 6. Attend to precision.

MP 7. Look for and make use of structure.

### ICON KEY:

 = Indicates note or reminder for teacher

 = Embedded assessment points in the lesson

### Pre-Teach

Sketchbook Activity: Draw two objects that are different shapes but approximately the same size. Trace around a rectangular object (box...) three times. Try dividing it up into equal rectangles in different ways.

### Lesson Steps

**1. Warm-Up:** Demonstrate and guide folding, cutting, and comparing three same-size/shape newsprint papers cut into equal fourths in three different ways. Emphasize craftsmanship.

 Criteria-based teacher checklist: Folds vertically, horizontally, and in both directions to cut rectangles into fourths.

**2.** Distribute color wheels. Introduce and guide discussion of balance and contrast through combining complementary colors in *Thermometer* by Jasper Johns from the Seattle Art Museum collection.

**3.** Introduce and guide discussion and analysis of symmetry vs. informal balance in *Abstract Forms* by Ruth Penington from the Seattle Art Museum collection.

**4.** Introduce concept of “collage”. Demonstrate and guide selecting a pair of complementary color same-size rectangles for collage.

 Criteria-based teacher checklist: Pairs complementary colors in collage.

**5.** Demonstrate arranging, without overlapping, eight equal quarters in informal balance using equal number of quarters on each side of the center line.

 Criteria-based teacher checklist: Arranges equivalent shapes asymmetrically on either side of a center line.

**6.** Demonstrate and guide gluing using glue mat or book and glue sticks.

 Criteria-based teacher checklist: Folds, smoothly cuts, and glues shapes flat and securely.

**7.** Lead criteria-based self-assessment and display collages together for group reflection.

 Criteria-based student self-assessment and group reflection: Checks for equal areas and craftsmanship. Analyzes balance mathematically and artistically.

## LESSON STEPS

### 1. Warm-Up: Demonstrate and guide folding, cutting, and comparing three same-size/shape newsprint papers cut into equal fourths in three different ways. Emphasize craftsmanship.

- *First, compare the three newsprint rectangles you have. Are they exactly the same? Do they occupy the same amount of space or area? Check to make sure.*
- *Is it possible to create fourths, or equal parts/fractions, of the same size rectangle in different ways?*
- *Fold one rectangle into fourths using just vertical folding to make four (skinny) equal fourths/quarters. Use craftsmanship for math precision: line up edges completely before creasing.*
- *Fold another same size rectangle horizontally to make equal fourths/quarters.*
- *Fold the last rectangle vertically and horizontally to make equal fourths/quarters.*
- *Practice craftsmanship in cutting by smoothing folded paper open, opening scissors wide, keeping your thumb facing up, and making long, smooth cuts along the folds.*
- *Compare and notice that each fourth/quarter is a different shape. Think about what we know about the rectangles we folded. How do you know that each of the fourths from the three rectangles we cut up are equal in area (amount of space they take up)?*



Criteria-based teacher checklist: Folds vertically, horizontally, and in both directions to cut rectangles into fourths.

### 2. Distribute color wheels. Introduce and guide discussion of balance and contrast through combining complementary colors in *Thermometer* by Jasper Johns from the Seattle Art Museum collection.



Responding to Art in the Classroom

▣ 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.

- *This art conveniently has a line down the center. Is it symmetrical (the same lines, shapes and colors mirrored on the other side of the centerline) or is it balanced in another way?*
- *What makes the areas or shapes of the composition stand out? The artist chose colors with the intent of making the art dynamic or exciting to look at.*
- *Notice colors that jump out in this art. Artists combine colors that are directly opposite on the color wheel to create contrast, or pop out. These are called complementary colors.*
- *What complementary color pair is jumping out most in this painting?*
- *Look at your color wheel: let's find two more combinations of complementary colors. Red/green and yellow/violet...*

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### **3. Introduce and guide discussion and analysis of symmetry vs. informal balance in *Abstract Forms* by Ruth Penington from the Seattle Art Museum collection.**



- *If you were to draw a line down the center of these artworks, are the artworks symmetrical? Are the same exact shapes in the same place on either side of that line? Do you think the art or shapes seem equal or balanced? Why or why not?*
- *This is informal balance, where artists arrange shapes so that they are balanced and equal, but not symmetrical in a composition. Sometimes artists think about balancing color and equal area of shapes, also.*
- *Let's experiment with covering up shapes on either side of a center line on this composition. What happens? How does that make the composition seem incomplete or lopsided?*

▣ A piece of paper can be used to cover up areas on the artwork while it is projected to illustrate this idea.

#### 4. Introduce concept of “collage”. Demonstrate and guide selecting a pair of complementary color same-size rectangles for collage.



Folding and Cutting Congruent Shapes/Fractions, Cutting through Multiple Layers

- Collage means “to paste” in French. We will be folding and cutting two same-size rectangles into equal quarters and arranging them in informal balance.
- Choose one pair of complementary colors for your collage. That means you will have two same-size rectangles in colors directly opposite on the color wheel.
- Using the techniques we have practiced, divide each rectangle differently but into four equal parts.



Criteria-based teacher checklist: Pairs complementary colors in collage.

#### 5. Demonstrate arranging, without overlapping, eight equal quarters in informal balance using equal number of quarters on each side of the centerline.

▮ Students can lightly drawing a center line of symmetry in white chalk (that can be sponged off later.)

- Think about balance. We are being mathematicians and artists as we arrange our quarters of rectangles. Your black background paper can be vertical or horizontal. Draw a light line of symmetry on your black paper (can be wiped or sponged off later)
- How can different shaped quarters be combined to equal the same area on either side of the centerline? (Shapes should not be overlapping, so that we can easily see equal area in balance.) How many on each side?
- The beauty of collage is that we can arrange our compositions many times before we decide on our final composition.
- As for color, think about the art we looked at. What would you need to do to make the color seem balanced on either side? You probably want some of each color on each side of the center line.
- Do you have equal area/number of quarters of the same size rectangle on either side?
- Raise your hand when you have arranged your final composition in informal balance.



Prompting for Creativity

▮ Withhold glue sticks until students have arranged compositions that demonstrate understanding.

Criteria-based teacher checklist: Arranges equivalent shapes asymmetrically on either side of a center line.

## 6. Demonstrate and guide gluing using glue mat or book and glue sticks.

- *Once your composition arranged in informal balance has been checked, remove each shape one by one, turn over on glue mat or book (recycled magazines), and run glue over the edge of shape, and then glue exactly where it was.*
- *Using craftsmanship, rub shapes down well so that they are flat and stay put.*
- *Sign your name in the lower right corner.*



Craft of Gluing with  
Glue Stick/O'Glue

Criteria-based teacher checklist: Folds, smoothly cuts, and glues shapes flat and securely.

## 7. Lead criteria-based self-assessment and display collages together for group reflection.

- *Check to make sure that you have equal areas/numbers of fourths of rectangles on either side of a center line.*
- *Check your craftsmanship: do your shapes clearly look like equal quarters of the original rectangle? Did you glue them down so that they are flat and not coming off the paper?*
- *Compare the different combinations of quarters of rectangles. Describe the artistic choices you see that create balance.*



Guiding Reflecting on  
Student Art

Criteria-based student self-assessment and group reflection: Checks for equal areas and craftsmanship. Analyzes balance mathematically and artistically.

### **Everyday Mathematics Extensions:**

8.7 – Fractions Greater Than ONE

8.8 – Fractions in Number Stories

**ARTS IMPACT LESSON PLAN Visual Arts and Math Infusion**

Third Grade Lesson One: *Fractions in Informal Balance*

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

**STUDENT SELF-ASSESSMENT WORKSHEET**

Disciplines	VISUAL ARTS AND MATH				VISUAL ARTS		Total 6
Concept	Shape/Fractions			Informal Balance	Contrast	Craftsmanship	
Criteria	Folds vertically, to make rectangles into fourths.	Folds horizontally, to make rectangles into fourths.	Folds in both directions to make rectangles into fourths.	Arranges equal area of shapes asymmetrically on either side of a center line (without overlapping).	Pairs complementary colors in collage (red/green, violet/yellow, orange/blue).	Folds, smoothly, cuts, and glues shapes flat and securely.	
Student Name							

**ARTS IMPACT LESSON PLAN Visual Arts and Math Infusion**

Third Grade Lesson One: *Fractions in Informal Balance*

**CLASS ASSESSMENT WORKSHEET**

Disciplines	VISUAL ARTS AND MATH			VISUAL ARTS		Total 6
	Concept	Shape/Fractions		Informal Balance	Contrast	
Criteria	Folds vertically, to make rectangles into fourths.	Folds horizontally, to make rectangles into fourths.	Folds in both directions to make rectangles into fourths.	Arranges equal area of shapes asymmetrically on either side of a center line (without overlapping).	Pairs complementary colors in collage (red/green, violet/yellow, orange/blue).	Folds, smoothly, cuts, and glues shapes flat and securely.
Student Name						
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27.						
28.						
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: \_\_\_\_\_

VISUAL ARTS AND MATH LESSON: **Fractions in Informal Balance**

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Dear Family:

Today your child participated in an **Arts and Math** lesson. We looked at ways that artists used shapes to create balanced artistic compositions. We also noticed how combining certain colors can create contrast and make art exciting to look at. Then we created artistic collages through applying our knowledge of fractions and math.

- We first explored dividing three rectangles that were the same size and shape into four equal shares through folding and cutting paper in different ways: vertically, horizontally, and both ways. We talked about how each quarter of a rectangle represented the same area or size, but was a different shape.
- We looked at art and noticed how artists create a sense of balance without placing shapes symmetrically or in mirror image. We also noticed how equal area of shapes on either side of a centerline helped create balance.
- We learned about complementary colors—colors opposite on the color wheel (red/green, yellow/violet, orange/blue) that can be combined to create contrast. We noticed how an artist combined those colors to make their shapes jump out.
- We selected a complementary color pair for our collage and divided two complementary color paper rectangles into equal but different shaped quarters.
- We arranged (and rearranged) our quarter rectangle shapes to create informal balance with equal area on either side of a center line within our composition.
- We glued down our collage shapes using craftsmanship.

At home, you could notice how the same a measurement can have a different shape or form yet represent the same quantity (think of different shaped measuring cups that hold the same amount). Together, you could divide interesting found papers (cards, wrapping paper, pages from catalogs) into quarters in different ways and combine them into compositions. You could also notice how complementary colors create contrast in signs, sports jerseys, and logos.

### **Enduring Understanding**

Equal number and area of shapes can be arranged asymmetrically on either side of a center line to create informal balance in composition. Pairing complementary colors can create contrast.