

Visual Arts and Math Infused Lesson

Lesson Two: *Translucent Collage: Comparing Fractions*

Author: Meredith Essex Grade Level: Fourth



Enduring Understanding

Fractional parts can be combined to create a balanced whole in composition.

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

*Students make a fraction model showing 1/2, 1/4, and 1/8 on grid paper. Artworks composed of fractions combined to make a balanced whole are analyzed. Students begin a translucent collage by selecting vellum for a background whole, then fold and cut the vellum in different colors to create a 1/2, 1/4, and 1/8 of that whole. Fractional parts are combined and layered in compositions to show understanding of how they combine to make a whole. Students identify smaller, greater, and equal fractions in their collage and write an equation matching their collage using common denominators.*

Learning Targets and Assessment Criteria

**Target:** Compares fractions with different denominators.

**Criteria:** Measures/counts and draws or folds a fraction model showing 1/2, 1/4, and 1/8 of the same whole.

**Target:** Makes a balanced translucent collage.

**Criteria:** Layers and arranges vellum shapes to show 1/2, 1/4, and 1/8 (3/8s optional) of the same whole.

**Target:** Compares fractions in collage.

**Criteria:** Describes each part using <, >, and =; writes an equation representing collage.

**Target:** Uses craftsmanship in translucent collage.

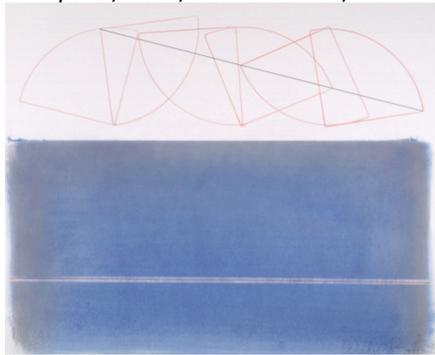
**Criteria:** Cuts fractional shapes smoothly and glues or tapes securely.

Vocabulary	Materials	Learning Standards
<p><u>Arts Infused:</u> Fraction Horizontal Vertical</p> <p><u>Math:</u> Denominator Eighth Half Quarter</p> <p><u>Arts:</u> Background Collage Composition Craftsmanship Crease Depth Nonobjective Proportion Space Translucent Vellum</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> Rulers; Drawing pencils: 2H; 1" grid paper: 9x12"; 1" grid transparency; Transparency film markers; Vellum: 8.5x11", broad range of colors, 2 sheets per student; Scissors; O'glue by Itoya and/or double-sided tape; Recycled magazines; glue mats; Arts Impact <u>sketchbooks</u>; Class Assessment Worksheet</p> <p><b>Connections</b> <i>Everyday Mathematics</i> 7.4 – Pattern Block Fractions 7.5 – Fraction Addition and Subtraction 7.6 – Many Names for Fractions 7.7 – Equivalent 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>1.1.1 Elements: Lines 1.1.2 Elements: 2-D shape 1.1.7 Principles of Design: Proportion, balance 1.2.1 Skills and Techniques: Cutting, taping 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> (Age 4-5) 6. Learning about my world: Math: Use measuring tools in play; Compare size. Describe objects using size words; Order three objects by characteristic. Arts: Show an increasing ability to use art materials safely and with purpose.</i></p> <p><i>continued</i></p>

Seattle Art Museum images:  
*Orange on Red*, 1956, Mark Rothko,  
2002.68



*Counterpoint*, 1990, Weldon Butler, 92.32



### **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/>  
4.NF.2. Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as  $\frac{1}{2}$ . Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols  $>$ ,  $=$ , or  $<$ , and justify the conclusions.

### **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.

### ICON KEY:

 = Indicates note or reminder for teacher

 = Embedded assessment points in the lesson

### Pre-Teach

Sketchbook Activity: Draw objects or elements in the environment that are shapes divided into fractions (buildings, rugs, book covers). Notice and compare the different ways that shapes are divided into parts.

### Lesson Steps

**1.** Warm-Up: Guide students in drawing or folding a 4x8 unit rectangle on grid paper and dividing it into  $\frac{1}{2}$ ,  $\frac{1}{4}$ , and  $\frac{1}{8}$  part of a whole.

 Criteria-based teacher checklist: Measures/counts and draws a fraction model showing  $\frac{1}{2}$ ,  $\frac{1}{4}$ , and  $\frac{1}{8}$  of the same whole.

**2.** Introduce and guide art and math analysis of *Orange on Red* by Mark Rothko and/or *Counterpoint* by Weldon Butler from the Seattle Art Museum collection. Introduce idea of fractions or parts arranged to create balance in compositions.

**3.** Demonstrate and guide folding and cutting papers into  $\frac{1}{2}$ ,  $\frac{1}{4}$ , and  $\frac{1}{8}$  fractions that extend edge to edge across the composition to make a translucent collage.

 Criteria-based teacher checklist: Cuts fractional shapes smoothly.

**4.** Demonstrate and guide arranging and comparing fractions in composition. Focus on layering shapes to show  $\frac{1}{8}$ ,  $\frac{1}{4}$ ,  $\frac{3}{8}$ , and  $\frac{1}{2}$ .

 Criteria-based teacher checklist and peer assessment: Layers and arranges vellum shapes to show  $\frac{1}{2}$ s,  $\frac{1}{4}$ s, and  $\frac{1}{8}$ s ( $\frac{3}{8}$ s optional) of the same whole. Describes each part using  $<$ ,  $>$ , and  $=$ ; writes an equation representing collage.

**5.** Demonstrate and guide gluing or taping using craftsmanship.

 Criteria-based teacher checklist: Glues/tapes securely.

**6.** Guide criteria-based self assessment for craftsmanship and math understandings.

 Criteria-based self-assessment: Glues/tapes securely and writes an equation representing collage.

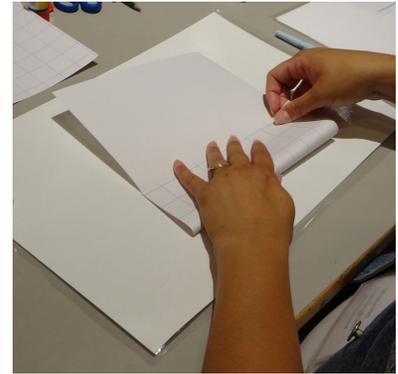
**7.** Guide criteria-based group reflection. Display by taping on windows so that light can come through compositions.

Criteria-based group reflection: Interprets compositions mathematically and artistically.

## LESSON STEPS

### 1. Warm-Up: Guide students in drawing or folding a 4x8 unit rectangle on grid paper and dividing into $\frac{1}{2}$ , $\frac{1}{4}$ , and $\frac{1}{8}$ s parts of a whole.

- Count and dot the corners (vertices) of a horizontal 4x8 unit rectangle. Draw lines using a ruler to connect the corners.
- Count squares and then use a ruler to draw a vertical line to divide the rectangle in half.
- Draw another vertical line dividing  $\frac{1}{2}$  in half again, making  $\frac{1}{4}$ s of the whole.
- Draw another vertical line dividing  $\frac{1}{4}$  into  $\frac{1}{8}$ s.
- Which is the smallest fraction?



Criteria-based teacher checklist: Measures/counts and draws a fraction model showing  $\frac{1}{2}$ ,  $\frac{1}{4}$ , and  $\frac{1}{8}$  of the same whole.

### 2. Introduce and guide art and math analysis of *Orange on Red* by Mark Rothko and/or *Counterpoint* by Weldon Butler from the Seattle Art Museum collection. Introduce idea of fractions or parts arranged to create balance in compositions.



Responding to Art in the Classroom

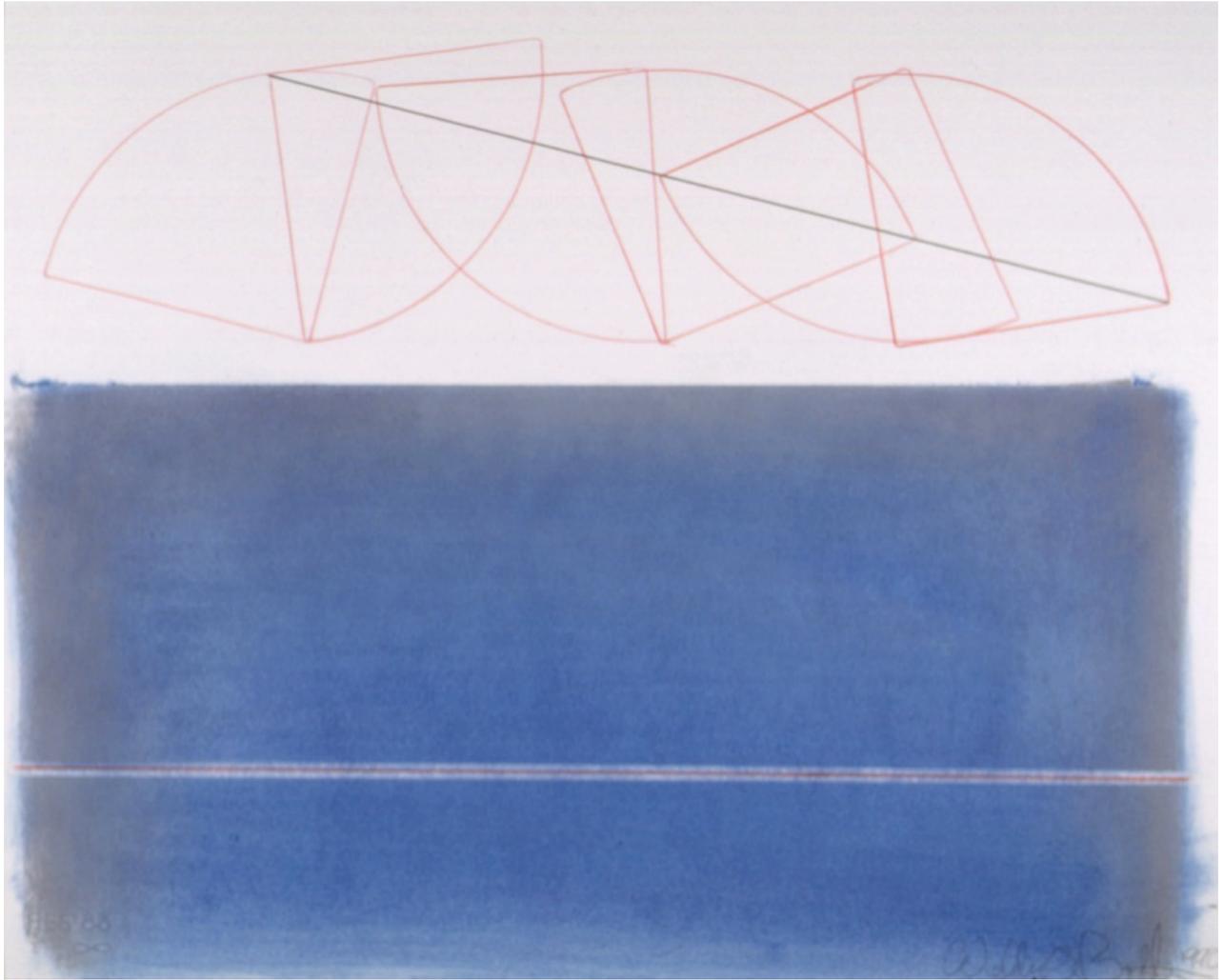
▣ The Seattle Art Museum's collection is available on-line at:

<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 in the beginning of the lesson.

- *Where do you see fractions or parts in these works of art? Many artists create nonobjective (no object) compositions that focus on dividing space into parts in ways that feel balanced and pleasing to our eyes. Let's see what happens when I cover up part of one. What changes?*
- *Do you think the artists used math tools (ruler, grids) to make this art? Why?*
- *Without actually measuring, just looking, how many parts or fractions do you see in Counterpoint by Weldon Butler?*
- *Think about the relationship of each part. Do any sections look equal? What is the smallest part? Let's layer a clear transparency over this artwork and see what we can figure out.*
- *How many times do you think we repeat the smallest fraction/rectangle horizontally within the whole painting? (5 times approximately) Now we have a common denominator. Let's call that  $\frac{1}{5}$ . Using 5 as that common denominator and looking closely at the other two parts, what fractions might they represent? ( $\frac{2}{5}$  and  $\frac{2}{5}$ ). What does  $\frac{1}{5} + \frac{2}{5} + \frac{2}{5}$  equal? ( $\frac{5}{5}$  as one whole)*

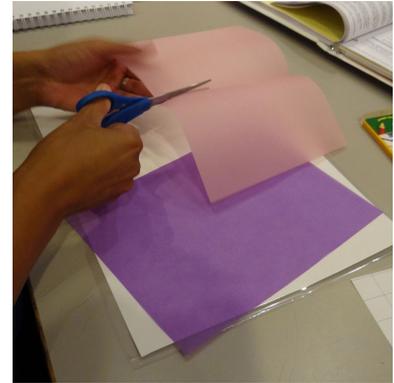
▣ A piece of transparency film can be laid over the artwork projected with a document camera and lines drawn in pen to show fractions.





### 3. Demonstrate and guide folding and cutting papers into $\frac{1}{2}$ , $\frac{1}{4}$ , and $\frac{1}{8}$ fractions that extend edge to edge across the composition to make a translucent collage.

- We are creating a collage, which is a work of art composed of layered papers. The paper we are using is a translucent (that lets some light through it) paper called vellum. Our papers will orient vertically with our fractions in horizontal bands (like Butler and Rothko's work).
- Select one vellum color—(preferably the darkest or brightest one) for the background. The background represents the whole; we will not be cutting it up into fractions.
- Choose another color that you feel will work well with your background color. Orient it horizontally and fold it in half. Line up the edges carefully and crease. Vellum is a stiff paper, so crease very thoroughly. Just like the artists we studied, we want to show mathematical precision and craftsmanship in our art.
- Open and flatten vellum on both sides of the fold. Top of thumb pointing up, open the scissors all the way and slowly cut exactly on the crease. Both these papers should be exactly the same size when cut since they are halves. Keep one half and share the other.
- Choose a third color (half sheet) and repeat the process: Orient it vertically and fold into half to make quarters of the whole. Both these papers should be exactly the same size when cut. Keep one quarter and share the other.
- Choose a fourth color (quarter sheet) and repeat the process. Orient it vertically and fold in half to make long skinny strips that are eighths of the whole.



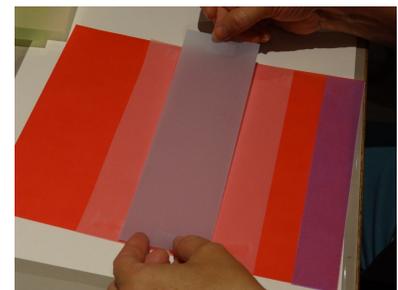
Folding and Cutting Congruent Shapes / Fractions, Cutting through Multiple Layers

▣ As soon as students fold and cut vellum into halves and quarters, the extra papers go into a communal pile for other students to use so that paper is used economically.

☑ Criteria-based teacher checklist: Cuts fractional shapes smoothly.

### 4. Demonstrate and guide arranging and comparing fractions in composition. Focus on layering shapes to show $\frac{1}{8}$ s, $\frac{1}{4}$ s, $\frac{3}{8}$ s, and $\frac{1}{2}$ s.

- Arrange all of your shapes (half, quarter, and eighth) so that they reach across (in stripes) the width of your paper when your paper is vertical. Think about what feels balanced to your eyes. All fraction strips touch the edges of the paper.
- We are showing how fractions create a whole in our artistic compositions. Make sure when you overlap and arrange your shapes that each stripe of color represents a very specific fraction with a denominator of 2, 4, or 8 that you can name.



Prompting for Creativity

- You might be covering up part of a half with an eighth—what is that part of the half that would still be showing? ( $\frac{3}{8}$ ) Once we display this art on a window and let the light through, we can also see how smaller fractions add up to larger ones. Make sure all of your edges align with your background paper.
- Once you have arranged your composition, write the fractions expressing each color as you "read" your composition from top to bottom ( $\frac{1}{8}$ ,  $\frac{1}{4}$ ,  $\frac{1}{4}$ ,  $\frac{3}{8}$ ). Now using the common denominator of 8, read and write your composition as an equation:  $\frac{1}{8} + \frac{2}{8} + \frac{2}{8} + \frac{3}{8} = 1$ .
- Share your composition and the equation that goes with it with a partner. Describe which fraction is the largest and smallest and which, if any, are equal. Check for accuracy.



Criteria-based teacher checklist and peer assessment: Layers and arranges vellum shapes to show  $\frac{1}{2}$ ,  $\frac{1}{4}$ , and  $\frac{1}{8}$  ( $\frac{3}{8}$  optional) of the same whole. Describes each part using  $<$ ,  $>$ , and  $=$ ; writes an equation representing collage.

## 5. Demonstrate and guide gluing or taping using craftsmanship.

- Now that your composition is arranged and the fractions you are showing have been clearly identified and checked, layer and glue or tape (with double sided tape) all of your parts together using craftsmanship.
- This glue is called "O" glue: it has a sponge tip. With a glue book or paper underneath, run it along just the perimeter of your first layer. Position edges to edges and rub along the perimeter so that the bond is smooth and secure. You can also use small pieces of double sided tape carefully slipped under each corner of each shape.
- Run the glue right along the edge of the next pieces of vellum as you layer. Make sure that a glue paper or mat is underneath.
- Check to see that every shape is secure.



Craft of Gluing with Glue Stick / O'Glue

Criteria-based teacher checklist: Glues/tapes securely.

## 6. Guide criteria-based self assessment for craftsmanship and math understandings.

- Check for craftsmanship. Are all of your edges securely glued and rubbed down? Are all of your edges lined up so that fractions are easy to see?
- Check to make sure your math matches your composition!

Criteria-based self-assessment: Glues/tapes securely and writes an equation representing collage.

**7. Guide criteria-based group reflection. Display by taping on windows so that light can come through compositions.**

- *Look at all of our work as a group. Let's play a little game: choose a composition and name the fractions you see, then check to see whether your math matches the artist's math.*
- *Notice a composition that feels especially balanced or effective and share what artistic choices you feel the artist made that created that effect.*
- *Notice the new colors that are created through layering translucent colors.*
- *How does the translucency (with light coming through) change how we see the fractions? What does the translucency tell us about parts of our composition forming a whole?*



Guiding Reflecting on Student Art

Criteria-based group reflection: Interprets composition mathematically and artistically.

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**Everyday Mathematics Extensions:**

7.11–Probability, Fractions and Spinners

7.12–A Cube Drop Experiment

Unit 9–Fractions, Decimals and Percents

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

Fourth Grade Lesson Two: *Translucent Collage: Comparing Fractions*

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

**STUDENT SELF-ASSESSMENT WORKSHEET**

Disciplines	VISUAL ARTS AND MATH			VISUAL ARTS		Total 5
Concept	Fractions/Space			Craftsmanship		
Criteria	Measures/counts and draws or folds a fraction model showing 1/2, 1/4s, and 1/8s of the same whole	Layers and arranges vellum shapes to show 1/2, 1/4s, and 1/8s (3/8s optional) of the same whole	Describes each part using <, >, and =; writes an equation representing collage	Cuts fractional shapes smoothly.	Glues or tapes securely	
Student Name						

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

Fourth Grade Lesson Two: *Translucent Collage: Comparing Fractions*

**CLASS ASSESSMENT WORKSHEET**

Disciplines	VISUAL ARTS AND MATH			VISUAL ARTS		Total 5
	Concept	Fractions/Space		Craftsmanship		
Criteria	Measures/counts and draws or folds a fraction model showing 1/2, 1/4s, and 1/8s of the same whole	Layers and arranges vellum shapes to show 1/2, 1/4s, and 1/8s (3/8s optional) of the same whole	Describes each part using <, >, and =; writes an equation representing collage	Cuts fractional shapes smoothly.	Glues or tapes securely	
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*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: *Translucent Collage: Comparing Fractions*

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Dear Family:

Today your child participated in an **Arts and Math lesson**. We looked at art composed of fractions or parts that fit together in balanced compositions. We analyzed the art mathematically to determine what fraction of the whole different sections of each painting represented. We created our own translucent collages composed of fractions.

- We practiced dividing a rectangle to show  $\frac{1}{2}$ ,  $\frac{1}{4}$ , and  $\frac{1}{8}$  on grid paper.
- We analyzed art and talked about the kinds of math tools those artists might have used to make their paintings.
- We began making a translucent collage using vellum, which is a paper that lets light show through it.
- We selected one color of vellum paper to be the background or whole.
- We folded and cut vellum in different colors to create fractions of the whole:  $\frac{1}{2}$ ,  $\frac{1}{4}$ , and  $\frac{1}{8}$ .
- We combined and layered fractional parts in compositions to show understanding of how they can make a whole.
- We identified smaller, greater, and equal fractions in our collages and wrote an equation matching our collage.

At home, you could fold found papers (including translucent tissue or wax papers) into different or even smaller fractions, cut them apart, and combine them to create collage wholes. You could also experiment with relating measurement to fractions through measuring small objects to the  $\frac{1}{8}$  inch.

### **Enduring Understanding**

Fractional parts can be combined to create a balanced whole in composition.