

ARTS IMPACT LESSON PLAN

Visual Arts and Math Infused Lesson

Lesson Two: *Composing with Fractions*

Author: Meredith Essex Grade Level: Fifth



Enduring Understanding

Dividing space into fractions and combining neutral and pure color can create emphasis in composition.

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

Students plan and calculate the size of areas of color and shape within their own 4x8 inch composition by multiplying fractions and using a fraction model. Art composed of fractional polygon shapes is studied with focus on creating emphasis through use of color in composition. Polygons representing 1/16, 3/16, 1/4, and 1/2 of the total area are identified in composition plans. Using oil pastel techniques, students add a pure color hue to their smallest shape, and then develop subtle neutral colors for all other shapes for emphasis.

Learning Targets and Assessment Criteria

Target: Calculates areas for a composition.

Criteria: Uses a fraction model and multiplication to determine the area for 1/16, 3/16, 1/4, and 1/2 of a 4x8" composition.

Target: Organizes composition into polygons representing fractions.

Criteria: Designates and outlines four straight sided shapes with the correct number of grid squares for 1/16, 3/16, 1/4, and 1/2 of a 4x8" composition. (32 units)

Target: Creates emphasis in composition.

Criteria: Uses pure hues in smallest shape, layers and blends neutral colors in all other shapes.

Target: Uses craftsmanship.

Criteria: Draws perimeter of polygons with ruler, clearly defines shapes with color.

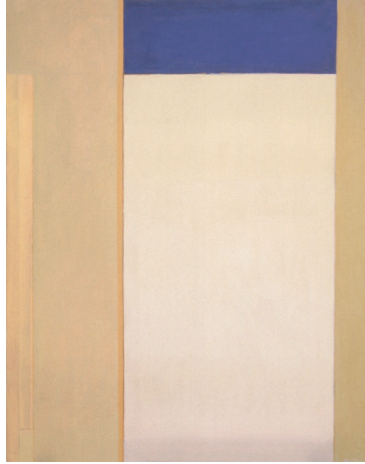
Vocabulary	Materials	Learning Standards
<p>Arts Infused: Grid Shape Fraction</p> <p>Math: Area Multiplication Perimeter Polygon</p> <p>Arts: Blot Color field Color palette Composition Edge Emphasis Neutral Pure Hue Refine Value</p>	<p>Museum Artworks or Performance:</p> <p>Seattle, WA Seattle Art Museum</p> <p>Tacoma, WA Tacoma Art Museum</p> <p>Materials 1" graph paper: 9x12"; White copy paper: print, do not copy, the double-sided Student Practice Worksheet from lesson; White cardstock: 8.5x11", print, do not copy, 8x4 1" grid from lesson; 1/2" graph transparency; Drawing pencils: 2B; Vinyl erasers; Protractors; Rulers; Oil pastels (or watercolor pencils and small brushes); Color pencils; Individual color wheels & color wheel poster; Arts Impact sketchbooks; Class Assessment Worksheet</p> <p align="center"><i>continued</i></p>	<p>WA Arts State Grade Level Expectations <i>For the full description of each WA State Arts Grade Level Expectation, see: http://www.k12.wa.us/Arts/Standards</i></p> <p>1.1.2 Elements: Shape 1.1.6 Elements: Color 1.1.7 Principles of Design: Emphasis 1.2.1 Skills and Techniques: Drawing/painting 2.1.1 Creative Process 2.3.1 Responding Process 4.2.1 Connection between Visual Arts and Math</p> <p>Early Learning Guidelines (Pre-K – Grade 3) <i>For a full description of Washington State Early Learning and Child Development Guidelines see: http://www.del.wa.gov/development/guidelines/ (Age 4-5) 6. Learning about my world: Math: Count and group things by number; compare groups of up to 10 objects. Arts: Show an increasing ability to use art materials safely and with purpose.</i></p> <p align="center"><i>continued</i></p>

Connections

Everyday Mathematics

5.1, 5.2, 5.3, 5.4, 8.1, 8.5, 8.6, 8.7, 8.8

Seattle Art Museum
Harold Street #14, 1975, Louis Bunce,
83.62



Ollytyumbo, 1978, Peter Millet, 78.67



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/>

5.NF.4. Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.

5.NF.6. Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.

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.

MP 8. Look for and express regularity in repeated reasoning

ICON KEY:


-  = Indicates note or reminder for teacher
-  = Embedded assessment points in the lesson

Pre-Teach

Sketchbook Activity: Notice the division of area in rooms, in outdoor spaces like parks and playgrounds, and in street maps or site plans. Find and sketch a place or object where space is divided into fractions.


Lesson Steps

1. Warm-Up: Guide students in using a fraction model to calculate fractions that will be used in a painting composition.


 Criteria-based teacher checklist: Uses a fraction model and multiplies fractions to determine the area for $1/16$, $3/16$, $1/4$, and $1/2$ of a 4x8" composition.

2. Introduce and guide art and math analysis of *Harold Street Number 14* by Louis Bunce and *Ollityumbo* by Peter Millet from the Seattle Art Museum collection. Introduce creating emphasis in composition using color.


3. Demonstrate and guide recording painting total area and fraction areas on practice worksheet paper. Show ideas for and guide arranging compositions on practice worksheet using the area/fractions calculated. Demonstrate using ruler to draw polygon composition on heavy cardstock printed with gray grid (template for composition provided in lesson).

 Criteria-based teacher checklist: Designates and outlines four straight sided shapes with the correct number of grid squares for $1/16$, $3/16$, $1/4$, and $1/2$ of a 4x8" composition. Draws perimeter of polygons using a ruler.

4. Demonstrate adding a pure hue to the smallest shape/fraction to create emphasis and layering grays, whites, blacks, and browns to create subtle neutral colors in other shapes using oil pastels (or water color pencils).

 Criteria-based teacher checklist: Uses pure hues in smallest shape, then layers and blends neutral colors in all other shapes. Clearly defines shapes using color.

5. Guide criteria-based self and group reflection.

 Criteria-based student self and group assessment: Analyzes compositions artistically and mathematically.

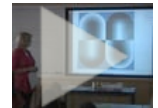
LESSON STEPS

1. Warm-Up: Guide students in using a fraction model to calculate fractions that will be used in an artistic composition.

- *We are going to be making a 4x8" composition. Just like in the art we are about to talk about, we will be dividing our composition into different polygon shapes calculated by multiplying the total area (a whole number) by fractions.*
- *What would be the first step in figuring out what the area of each of these parts, $1/16$, $3/16$, $1/4$, and $1/2$, of our art would be?*
- *Using the 9x12" 1" graph paper, count or multiply grid squares to figure out how large the area (number of square inches) a 4x8" composition area would be. Dot the corners and use a ruler to draw the lines for edges of this rectangle.*
- *What is the total area of this rectangle in square inches? (32) Multiply $32 \times 1/2$. What is one half the total area of the rectangle? (16) Show $1/2$ or 16 square inches by dividing the 4x8" rectangle on your grid paper. Now multiply $32 \times 1/16$, $32 \times 3/16$, and $32 \times 1/4$. Show these fractions (with correct number of squares/area) on your grid paper rectangle, also.*

Criteria-based teacher checklist: Uses a fraction model and multiplies fractions to determine the area for $1/16$, $3/16$, $1/4$, and $1/2$ of a 4x8" composition.

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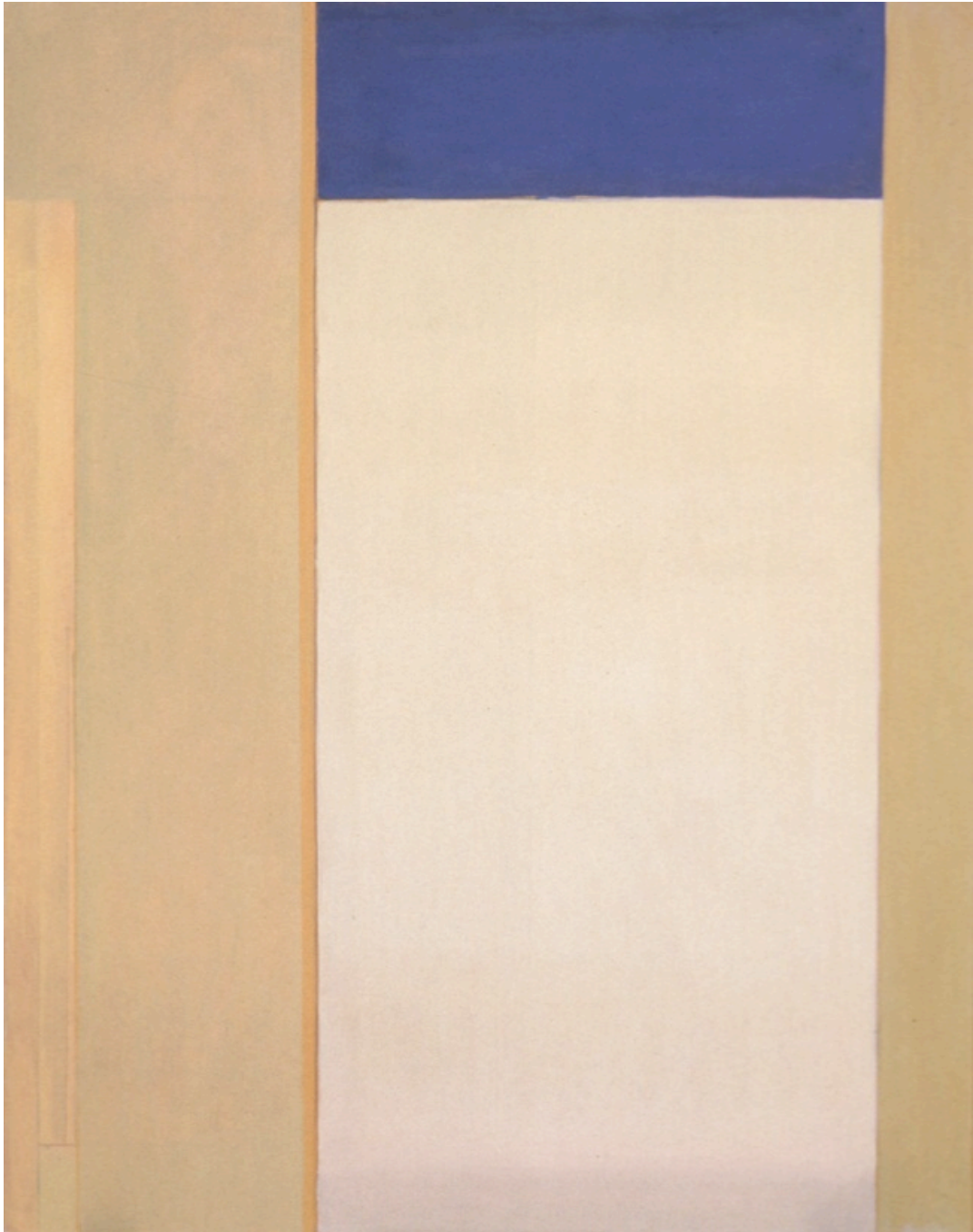
Responding to Art in the Classroom

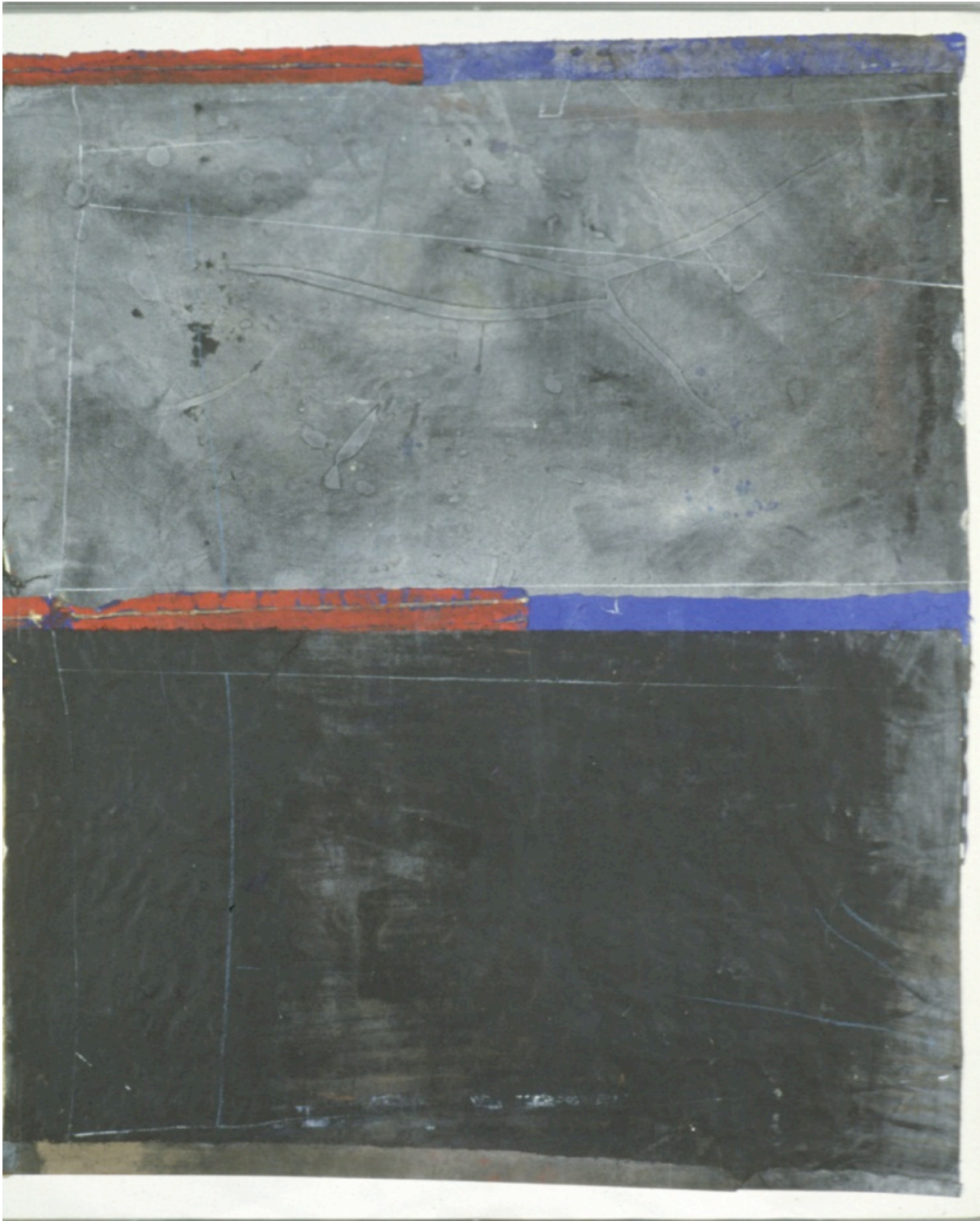
▣ The Seattle Art Museum's collection is available on-line at:

<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.

- *When we look at these paintings, what tells us that shapes or colors are organized on a grid? How might these artists have used math or math tools?*
- *Where do you see fractions? If you were to estimate which shape/color is which fraction or percentage, what would you guess? How is it different in the second painting? Why might an artist just focus on shapes and fractions in their work?*
- *Watch the overlay of a transparent grid and notice what fraction of a whole these shapes might represent, and what the area of those fractions might be.*
- *When we look at these paintings, which colors jump out most? Why? This is called creating emphasis. How does the division of shapes also create emphasis?*
- *The primary colors are pure hues directly from the color wheel. The grays, tans, and brown colors are called neutral colors.*
- *Do you think those areas with the primary pure colors would stand out as much if the colors around them were not neutral? Why? What if they were really bright?*

▣ A transparent grid can be laid over projected images of art to help see fractions and area in compositions.





3. Demonstrate and guide recording painting total area and fraction areas on the double-sided Student Practice Worksheet. Show ideas for and guide arranging compositions on practice worksheet using the area/fractions calculated.

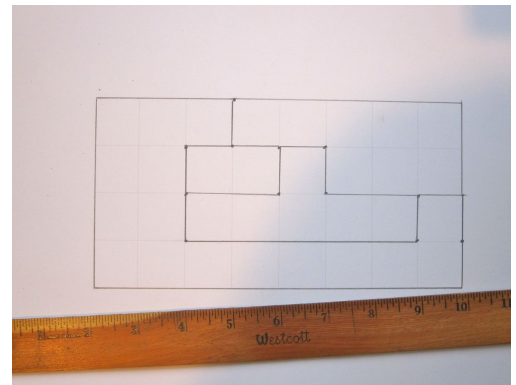
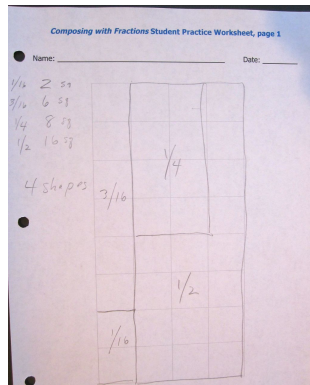
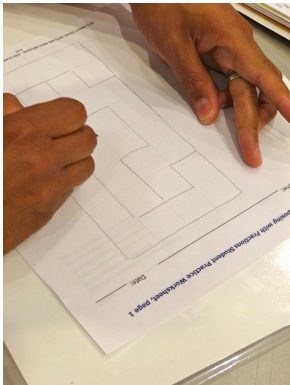
- *Mathematical artists, please record the area for $1/16$, $3/16$, $1/4$, and $1/2$ on your practice worksheet paper, page #2.*
- *Experiment with arranging each fraction/part of your composition by lightly outlining polygon perimeters or marking their corners (vertices) on the worksheet grid. You must have shapes representing $1/16$, $3/16$, $1/4$, and $1/2$; label each shape with the fraction it represents.*
- *Shapes do not have to be regular polygons such as rectangles or squares, but they need to have straight sides that follow grid lines with 90 (or 270) degree angles so that fraction/area calculations can be easily figured out and seen.*



Drawing with a Ruler

Demonstrate using ruler to draw polygon composition on heavy cardstock printed with gray grid (template for composition provided in lesson).

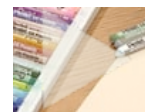
- *When you have decided on your fraction composition, draw it on the paper for your final composition. Notice this paper is heavier and has the 4x8 grid already printed on it. Outline your fraction shapes using a ruler and pencil.*
- **STOP AND LOOK:** *Switch papers with a partner and have them check your composition plan to make sure each of your polygons correctly correlates with an area and fraction.*



Criteria-based teacher checklist: Designates and outlines four straight sided shapes with the correct number of grid squares for $1/16$, $3/16$, $1/4$, and $1/2$ of a 4x8" composition. Draws perimeter of polygons using a ruler.

4. Demonstrate adding a pure hue to the smallest shape/fraction to create emphasis and layering grays, whites, blacks, and browns to create subtle neutral colors in other shapes using oil pastels (or watercolor pencils).

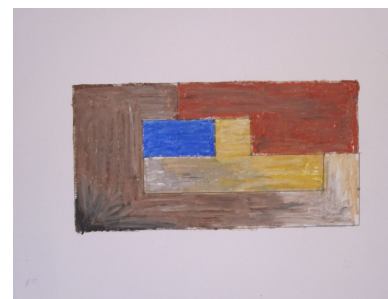
- *We are using oil pastels (watercolor pencils may be substituted here): They blend and layer well, but are challenging to fit into small, precise areas. Fill inside your polygons carefully with oil pastel leaving grid lines visible.*
- *We are creating emphasis through using a pure primary color in our smallest fraction area. Which shape is that on your composition?*
- *In that pure hue (1/16) area add a primary color. We know that if we put equally as bright colors around it, it would not be emphasized, so now we move on to using neutral colors.*
- *Develop some very quiet neutral colors around a bright pure hue to emphasize it. Grays and browns might seem boring, but by layering oil pastel color, you can create a huge range of different quiet, neutral colors.*
- *You can also create very subtle changes in those neutrals by adding a tiny bit of gray or white around the perimeter of polygons and by layering browns and blacks (or combining complementary color pairs in slightly different ways). Each neutral shape needs to stand out, so develop a neutral color that is distinct for each polygon. Make sure your edges and shapes are clearly seen; your math is part of what makes your composition effective!*
- *To refine and complete your composition, especially if some of the precision of shapes is lost through blending, you can draw or layer on top of areas with color pencils: Lines can be re-drawn with a ruler to define polygons as needed.*



Oil Pastels



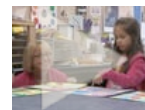
Prompting for Creativity



Criteria-based teacher checklist: Uses pure hues in smallest shape, layers and blends neutral colors in all other shapes. Clearly defines shapes using color.

5. Guide criteria-based self and group reflection. Display art so that it's visible to everyone.

- *Check your craftsmanship: are your polygon areas precise?*
- *Notice and compare all of the different compositions that can be generated using the same criteria. What does that say to you about using math in art?*
- *Where do you see emphasis and how did the artist's choices create that? Think about composition of shapes and color.*
- *Notice and ask another student how they created an interesting color effect with neutral color.*



Guiding Reflecting on Student Art

Criteria-based student self and group assessment: Analyzes compositions artistically and mathematically.

Everyday Mathematics Extensions:

5.5, 5.6, 5.7, 5.8, 8.9, 8.11

Composing with Fractions Student Practice Worksheet, page 1

Name: _____

Date: _____

Composing with Fractions Student Worksheet, page 2

Name: _____

Date: _____

Total area of composition (in square inches): _____

Area of fractions in square inches:

$$1/16 \times 4 \times 8 \text{ inches} = \underline{\hspace{2cm}}$$

$$3/16 \times 4 \times 8 \text{ inches} = \underline{\hspace{2cm}}$$

$$1/4 \times 4 \times 8 \text{ inches} = \underline{\hspace{2cm}}$$

$$1/2 \times 4 \times 8 \text{ inches} = \underline{\hspace{2cm}}$$

ARTS IMPACT LESSON PLAN Visual Arts and Math Infusion

Fifth Grade Lesson Two: *Composing with 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 4
Concept	Shape/Fractions		Emphasis	Craftsmanship	
Criteria	Uses a fraction model and multiplication to determine the area for $1/16$, $3/16$, $1/4$, $1/2$ of a 4x8 inch composition	Designates and outlines four straight sided shapes with the correct number of grid squares/area for $1/16$, $3/16$, $1/4$, $1/2$ of a 4x8 inch composition (32 units)	Uses pure hues in smallest shape, layers and blends neutral colors in all other shapes	Draws perimeter of polygons with ruler, clearly defines shapes with color	
Student Name					

ARTS IMPACT LESSON PLAN Visual Arts and Math Infusion

Fifth Grade Lesson Two: *Composing with Fractions*

CLASS ASSESSMENT WORKSHEET

Disciplines Concept	VISUAL ARTS AND MATH		VISUAL ARTS		Total 4
	Shape/Fractions		Emphasis	Craftsmanship	
Criteria	Uses a fraction model and multiplication to determine the area for $\frac{1}{16}$, $\frac{3}{16}$, $\frac{1}{4}$, $\frac{1}{2}$ of a 4x8 inch composition	Designates and outlines four straight sided shapes with the correct number of grid squares/area for $\frac{1}{16}$, $\frac{3}{16}$, $\frac{1}{4}$, $\frac{1}{2}$ of a 4x8 inch composition (32 units)	Uses pure hues in smallest shape, layers and blends neutral colors in all other shapes	Draws perimeter of polygons with ruler, clearly defines shapes with color	
Student Name					
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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 visual arts and math?

Teacher: _____ Date: _____

VISUAL MATH AND ARTS LESSON: *Composing with Fractions*

Dear Family:

Today your child participated in an **Arts and Math** lesson. We looked at examples of paintings that were divided into shapes. We analyzed those shapes and talked about the idea of multiplying or dividing a whole space or number by a fraction. We also noticed how the artists created areas of emphasis through using bright pure colors in the smallest areas and neutral colors in all the other shapes to attract the eye of the viewer. We multiplied fractions and used color for emphasis in developing our own paintings.

- We calculated the size or area of shapes for our own small 4x8 inch composition. We did this by multiplying the total area of our painting by four different fractions.
- We also drew a fraction model that illustrated the relative size of each fraction.
- We studied how artists create emphasis in works of art through use of color and shape.
- We arranged polygons that equaled $1/16$, $3/16$, $1/4$, and $1/2$ of our total composition.
- We used oil pastel techniques to add a pure color hue to our smallest shape then developed quiet neutral colors for all of the other shapes. This bright color created an area of emphasis.

At home, you could experiment with multiplying fractions in drawings or collages. You could search for and find spaces that are divided into fractions in creative ways like stained glass windows, or tiled surfaces. You could also note areas of emphasis created with color in these spaces.

Enduring Understanding

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