

ARTS IMPACT LESSON PLAN

Visual Arts and Math Infused Lesson

Lesson Two: *Fractions of Fractions: Translucent Circle Collages*

Author: Meredith Essex Grade Level: Sixth



Enduring Understanding

Shapes can represent the relationship of fractional amounts and can be combined to create variety and unity in composition.

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

Students solve an equation dividing a fraction by a fraction, then create an artistic fraction model that represents that equation. Shapes representing the whole, dividend, and divisor are cut out of translucent color vellum using craftsmanship. These shapes are then layered and glued to show fractional relationships. Last, students position and glue their fraction model to a color vellum background and note the equation that is represented.

Learning Targets and Assessment Criteria

Target: Solves fraction division problem.

Criteria: Divides a fraction by another fraction and records equation in notes and on final collage.

Target: Represents fraction equation in collage.

Criteria: Shows a whole, fraction divided (dividend), what fraction is divided by (divisor), and quotient through layering translucent color paper shapes.

Target: Uses craftsmanship in translucent collage.

Criteria: Cuts fraction shapes smoothly and accurately and attaches layers precisely and securely using minimal glue.

Vocabulary

Arts Infused:

Angle
Circle
Fraction

Math:

Dividend
Division
Divisor
Equation
Fraction model
Parts
Quotient
Whole

Arts:

Collage
Craftsmanship
Layer
Repetition
Translucent
Unity
Variety
Vellum
Visual interest

Materials

Museum Artworks or Performance

Seattle, WA

Seattle Art Museum

Tacoma, WA

Tacoma Art Museum

Materials

Arts Impact sketchbook; Permanent markers (Sharpies): ultra fine tip, various colors; Vellum: 4.25x5.5", various colors, 3 per student; Vellum: 5.5x8.5", various colors, one per student; Copy paper: 8.5x11", copy
Fraction Circle Template from the lesson, 2 per student, and copy the fraction division problems from the lesson, cut into individual cards, 1 per student; Blue painter's tape: 2-4 rolls; Scissors; O'glue by O'toya and/or double-sided tape; Recycled magazines (glue mats); Transparent tape (ex: Scotch® tape); Classroom Assessment Worksheet

continued

Learning Standards

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
- 1.1.7 Principles of Design: Repetition/Unity
- 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

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/>

- 6.NS. Apply and extend previous understanding of multiplication and division to divide fractions by fractions.
- 6.NS.1. Interpret and compute quotients of fractions, and solve word problems involving division of fractions, e.g., by using visual fraction models and equations to represent the problem.

CCSS Mathematical Practices

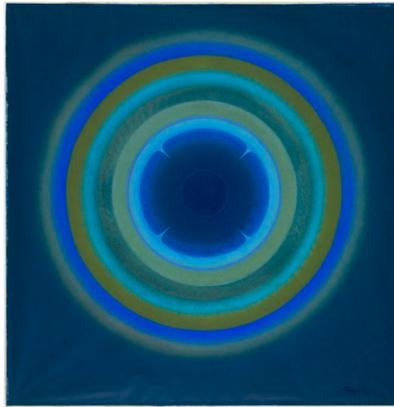
- MP.4. Model with mathematics.
- MP.5. Use appropriate tools strategically.
- MP.6. Attend to precision.

Seattle Art Museum images:

Double-gourd moonflask with paired handles, 1426 – 35, Chiu Yen, 48.167

Dream of the Cardinal Points, 1971, Leo Kenney, 2009.52.56

Amaranth, 1966, Leo Kenney, 2009.52.55



ICON KEY:

 = Indicates note or reminder for teacher

 = Embedded assessment points in the lesson

Pre-Teach

Introduce/review using a circle divided into equal parts as a tool for visualizing and dividing fractions by fractions. Ask students to identify what parts/area represents a whole, what represents $\frac{1}{2}$, $\frac{1}{4}$, and other fractions. Invite students to identify ways that dividing fractions by fractions can be represented in a circle format.

Lesson Steps Outline

1. Introduce and guide art analysis of Chinese ceramic vessel *Double-gourd moonflask with paired handles* and works of art by Leo Kenney: *Dream of the Cardinal Points* and *Amaranth* from the Seattle Art Museum collection. Facilitate discussion of ways that the artists divided a circular shape into repeating parts and how that can create variety or visual interest and unity.

 Criteria-based teacher process assessment: Participates in art analysis.

2. Introduce the idea of creating an artistic fraction model collage representing a fraction division problem. Demonstrate and guide drawing a circle divided into 8 equal parts in sketchbook to help visualize dividing fractions.

 Criteria-based teacher process assessment: Sketches and shares ideas with a peer for representing fraction equations using a circular format.

3. Distribute fraction division problems from the lesson that students will represent in their vellum fraction model collage.

Guide students in selecting three colors of vellum (4.25" x 5.5"): one for the circle that will represent the whole, one that will be used to show the fraction that will be divided (dividend), and one to show the fraction that is dividing that fraction (the divisor).

 Criteria-based teacher checklist: Divides a fraction by another fraction and records equation in notes.

4. Distribute the Fraction Circle Template from the lesson, 2 per student, and demonstrate using it as a guide for cutting one circle shape in vellum to represent the whole and one circle shape (in the second color) to represent the dividend fraction. Emphasize craftsmanship.

Demonstrate positioning and gluing or taping the fraction dividend to the whole circle. Emphasize craftsmanship.

Criteria-based teacher checklist: Cuts fraction shapes smoothly and accurately and attaches layers precisely and securely using minimal glue/tape.

5. Demonstrate and guide using the template to cut shapes out of a third color of vellum to represent multiples of the divisor fraction and any remainder fraction.

Criteria-based teacher checklist: Cuts fraction shapes smoothly and accurately and attaches layers precisely and securely using minimal glue/tape. Shows a whole, fraction divided (dividend), what fraction is divided by (divisor), and quotient through layering translucent color paper shapes.

6. Demonstrate and guide selection of a background vellum color (5.5" x 8.5") for circle fraction models. Encourage students to consider color choice, placement, and orientation of fraction model on background as artistic choices. Guide gluing or taping and labeling with equation using craftsmanship and precision.

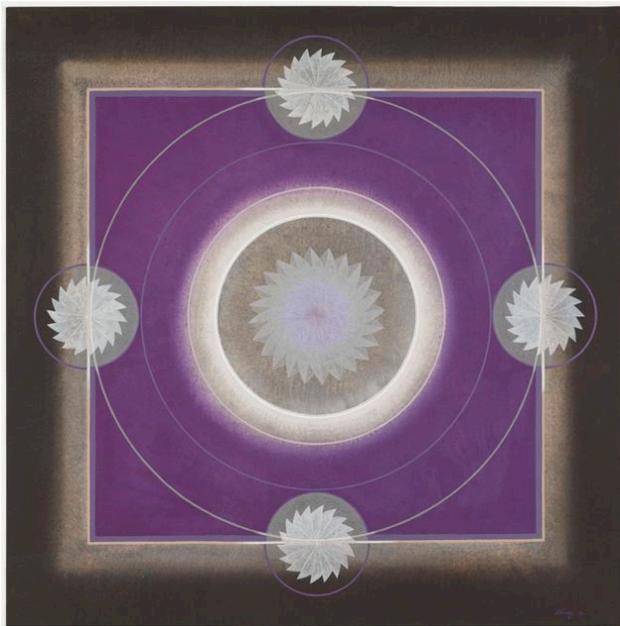
Criteria-based teacher checklist: Attaches securely using minimal glue/tape. Records equation on final collage.

7. Facilitate peer assessment and reflection on the math and art of the learning process.

Criteria-based self and peer assessment: Identifies and verifies equations in peer's collages. Describes examples of effective craftsmanship, visual interest, and unity seen in art.

LESSON STEPS

1. Introduce and guide art analysis of Chinese ceramic vessel *Double-gourd moonflask with paired handles* and works of art by Leo Kenney: *Dream of the Cardinal Points* and *Amaranth* from the Seattle Art Museum collection. Facilitate discussion of ways that the artists divided a circular shape into repeating parts and how that can create variety or visual interest and unity.



▣ 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.

- *Why did these artists divide a circle shape into parts? In the case of the porcelain vessel, how is a circle divided? How do the parts of the design suggest equal fractions?*
- *In the Leo Kenney artworks, how is the space divided? (concentric circles) Is there any part of these compositions that suggest dividing the circle? (reference four parts in images)*
- *Where do we see repetition in all of these works? Repeating similar shapes can create a sense of unity in an artistic composition.*

Criteria-based teacher process assessment: Participates in art analysis.

2. Introduce the idea of creating an artistic fraction model collage representing a fraction division problem. Demonstrate and guide drawing a circle divided into 8 equal parts in sketchbook to help visualize dividing fractions.

- *We are creating artistic fraction model collages out of layered translucent paper. Our goal is to use our excellent artistic choices and precise craftsmanship in cutting and gluing to create a work of art that is unified, interesting to look at, and shows fractions divided by fractions.*
- *Warm up by sketching a circle and divide it into 8 equal parts like a pie.*
- *In dividing fractions, how might we show the number/fraction we are dividing (dividend) using a circle/pie format? How might we show the dividing fraction (divisor) on that same circle?*
- *Share your ideas with a peer.*

Criteria-based teacher process assessment: Sketches and shares ideas with a peer for representing fraction equations using a circular format.

3. Distribute fraction division problems from the lesson that students will represent in their vellum fraction model collage.

Guide students in selecting three colors of vellum (4.25" x 5.5"): one for the circle that will represent the whole, one that will be used to show the fraction that will be divided (dividend), and one to show the fraction that is dividing that fraction (the divisor).

▣ Teachers can differentiate by selecting fraction problems appropriate to student ability levels.

- *Solve the fraction problem you have been assigned using operations, notes, and/or drawings.*
- *Choose three colors of translucent vellum pre-cut to 5.5" x 4.25" that you think would look good together to begin your fraction model collage that shows our equation.*

Criteria-based teacher checklist: Divides a fraction by another fraction and records equation in notes.

4. Distribute the Fraction Circle Template from the lesson, 2 per student, and demonstrate using it as a guide for cutting one circle shape in vellum to represent the whole and one circle shape (in the second color) to represent the dividend fraction. Emphasize craftsmanship.

▣ For the purposes of demonstration, the equation $7/8 \div 3/8 = 2 \frac{1}{3}$ is used.

WHOLE

- *Tape the circle template face down on the vellum in a few places using small pieces of blue low-tack tape to keep it in place.*
- *Craftsmanship: Use care and accuracy when you cut along the edge of the circle. Cut carefully and slowly through both vellum and template paper along the outside edge of black circle line. This is your "whole." Remove the tape.*

DIVIDEND

- *If for instance my fraction problem is $7/8 \div 3/8$, how can I show $7/8$ of the whole? Tape the (now cut out) circle template face down on the second color of vellum. Identify and cut out a fraction shape representing the dividend fraction.*

Demonstrate positioning and gluing or taping the fraction dividend to the whole circle. Emphasize craftsmanship.

- *This glue is called "O" glue: it has a sponge tip. Carefully, add just a dab of glue or double-sided tape in 4-5 places around the edges of your fraction shape. Use a glue mat or scrap paper underneath the shapes when you apply glue or tape to protect your desk.*
- *Line up the fraction shape (dividend) with the whole circle shape and rub vigorously to securely attach.*

Criteria-based teacher checklist: Cuts fraction shapes smoothly and accurately and attaches layers precisely and securely using minimal glue/tape.

5. Demonstrate and guide using the template to cut shapes out of a third color of vellum to represent multiples of the divisor fraction and any remainder fraction.

DIVISOR

- *Layering the divisor fraction shapes (and remainder fraction) on top of the dividend fraction can help us clearly see the relationship of fractions in this equation.*
- *Using the techniques of taping circle template (whole or parts) to the back of the vellum, I am cutting out shapes that represent $3/8$ (divisor). How many will I need to fit into $7/8$ (2)? What is the remainder ($1/8$)? So, I need three shapes: two $3/8$ and one $1/8$ ($1/3$ of $3/8$) to represent my quotient.*
- *Carefully, shape by shape, add glue or double-sided tape to the corners and edges of divisor fraction shapes and line up on top of the dividend fraction. Leave a tiny bit of space between each fraction shape so that the math is visible in your art. Glue/tape down securely.*

Criteria-based teacher checklist: Cuts fraction shapes smoothly and accurately and attaches layers precisely and securely using minimal glue/tape. Shows a whole, fraction divided (dividend), what fraction is divided by (divisor), and quotient through layering translucent color paper shapes.

6. Demonstrate and guide selection of a background vellum color (5.5" x 8.5") for circle fraction models. Encourage students to consider color choice, placement, and orientation of fraction model on background as artistic choices. Guide gluing or taping and labeling with equation using craftsmanship and precision.

- *Select a background color that makes your fraction model stand out even more.*
- *Orient and place your circle on the background paper in a way that highlights your shapes and feels balanced to you.*
- *Glue or tape your fraction model circle securely to your background as planned using four glue dabs or pieces of double-sided tape equally spaced (at approximately 90° intervals).*
- *Somewhere on your background paper, write the equation that your artwork represents very neatly in decorative pen or pencil.*

Criteria-based teacher checklist: Attaches securely using minimal glue/tape. Records equation on final collage.

7. Facilitate peer assessment and reflection on the math and art of the learning process.

Display translucent collages by taping to a window with transparent tape. This shows collages to their best advantage.

- *"Read" the equation expressed by a classmate's collage without looking at what they have written. Check against equations noted for accuracy.*
- *Describe a collage that captures your eye and describe what artistic choices or use of craftsmanship makes that artwork especially effective.*
- *Describe where the relationship of fraction parts creates visual interest and/or unity.*

Criteria-based self and peer assessment: Identifies and verifies equations in peer's collages. Describes examples of effective craftsmanship, visual interest, and unity seen in art.

Fractions of Fractions: Translucent Circle Collages

Sample fraction problems: Copy and cut into cards for students

$$3/4 \div 1/2 =$$

$$7/8 \div 1/2 =$$

$$7/8 \div 1/4 =$$

$$5/8 \div 1/4 =$$

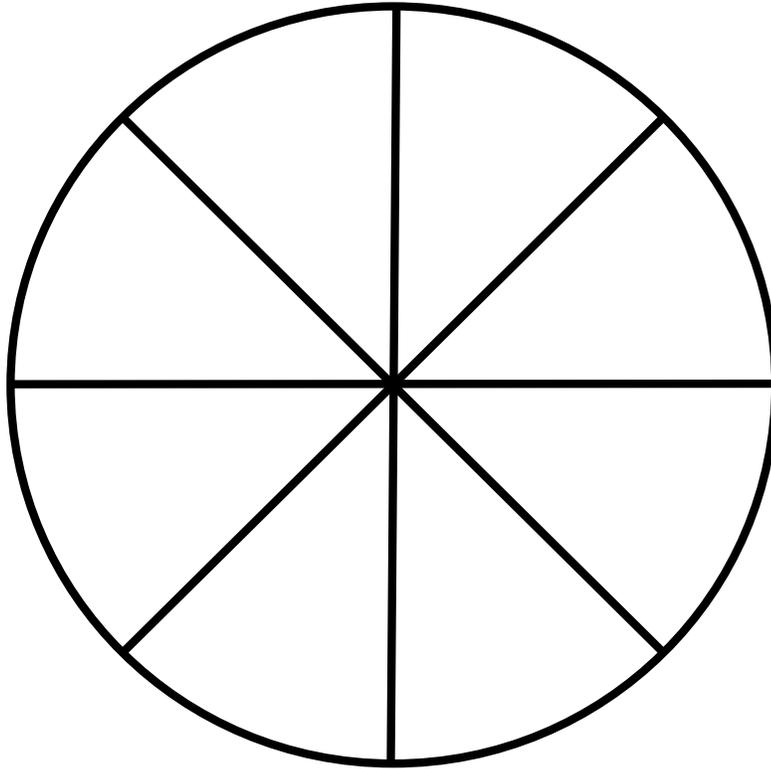
$$7/8 \div 5/8 =$$

$$7/8 \div 1/4 =$$

$$3/4 \div 1/8 =$$

$$1/2 \div 1/8 =$$

Fractions of Fractions: Translucent Circle Collages
Fraction Circle Template



ARTS IMPACT LESSON PLAN Visual Arts and Math Infusion

Sixth Grade Lesson Two: *Fractions of Fractions: Translucent Circle Collages*

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

STUDENT SELF-ASSESSMENT WORKSHEET

Disciplines	MATH		VISUAL ARTS AND MATH	VISUAL ARTS		Total 5
Concept	Fractions Of Fractions			Craftsmanship		
Criteria	Divides a fraction by another fraction and records equation in notes.	Divides a fraction by another fraction and records equation on final collage.	Shows a whole, fraction divided (dividend), what fraction is divided by (divisor) and quotient through layering translucent color paper shapes.	Cuts fraction shapes smoothly and accurately.	Attaches layers precisely and securely using minimal glue/tape.	
Student Name						

ARTS IMPACT LESSON PLAN Visual Arts and Math Infusion

Sixth Grade Lesson Two: *Fractions of Fractions: Translucent Circle Collages*

CLASS ASSESSMENT WORKSHEET

Disciplines	MATH		VISUAL ARTS AND MATH	VISUAL ARTS		Total 5
Concept	Fractions Of Fractions			Craftsmanship		
Criteria	Divides a fraction by another fraction and records equation in notes.	Divides a fraction by another fraction and records equation on final collage.	Shows a whole, fraction divided (dividend), what fraction is divided by (divisor) and quotient through layering translucent color paper shapes.	Cuts fraction shapes smoothly and accurately.	Attaches layers precisely and securely using minimal glue/tape.	
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 ARTS AND MATH LESSON: *Fractions of Fractions: Translucent Circle Collages*

Dear Family:

Today your child participated in an **Arts and Math** lesson. We looked at art using divided circles as a design element and noticed how repetition of shapes can create unity and visual interest in artistic compositions. We talked about how dividing fractions can be represented visually.

- We discovered that we can visually represent dividing fractions using an artistic fraction model.
- We solved an equation where a fraction was divided by another fraction.
- We created a translucent collage using special color paper called vellum that shows our equation.
- We started by cutting out a vellum circle for the whole then layered a fraction shape that we cut out using the help of a divided circle template. We positioned those shapes to show the fraction we are dividing in our equation.
- We then cut and layered shapes on top of the dividend fraction to show the divisor fraction. This helped us see the quotient or answer to the equation. We used mathematical precision and good craftsmanship to show our math and art knowledge.
- Last we glued our circular collage to a color background vellum paper and added the equation that our collage represents.

At home, you could use your knowledge of dividing fractions by fractions by creating translucent fraction model collages organized in square or rectangle formats.

Enduring Understanding

Shapes can represent the relationship of fractional amounts and can be combined to create variety and unity in composition.