

ARTS IMPACT LESSON PLAN

Visual Arts and Math Infused Lesson

Lesson Two: Visualizing Operations: Number Line Collages

Author: Meredith Essex Grade Level: Seventh



Enduring Understanding

Shapes representing the addition or subtraction of numbers in a linear format can be combined to create variety and unity in composition.

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

Students interpret art as numerical representations in linear formats. Students practice showing addition or subtraction of positive and/or negative numbers on a number line then arrange shapes in diverse papers to represent a specific equation in a collage number line format. Creating unity through repetition and variety through using a range of different textures, colors, and patterns of paper is emphasized in composition. Students reflect by "reading" each other's equations visually.

Learning Targets and Assessment Criteria

Target: Represents an equation on a line diagram.

Criteria: Practices using lines, shapes and/or arrows to show numbers and operations on a number line.

Target: Creates variety and unity in composition.

Criteria: Uses a range of colors, patterns, and textures. Repeats elements.

Target: Creates composition representing equation.

Criteria: Measures, cuts and organizes shapes to show number line, addition/subtraction, and sum/difference.

Target: Uses craftsmanship in collage.

Criteria: Measures and cuts accurately and attaches shapes smoothly and securely.

Vocabulary

Arts Infused:

Direction
Measurement
Vertical
Horizontal

Math:

Addition
Difference
Equation
Integer
Negative number
Number Line
Parts
Positive number
Subtraction
Sum

Materials

Museum Artworks or Performance

Seattle, WA

Seattle Art Museum

Tacoma, WA

Tacoma Art Museum

Materials

Arts Impact sketchbook; Copy paper: 8.5x11": copy Number Line Worksheet from lesson, one per student; Paper: variety of colored and textured papers, cut into 1 inch strips; Cardstock: 8.5x11", variety of colors; Scissors; Glue stick; Recycled magazines: to use as glue mats; Rulers; Class Assessment Worksheet

Learning Standards

WA Arts Learning Standards in Visual Arts

For the full description of each standard, see:

<http://www.k12.wa.us/Arts/Standards>

Creating (Concepts: Shape, Repetition, Variety, Unity, Color, Texture, Pattern. Technique: Collage

1. Generate and conceptualize artistic ideas and work.
2. Organize and develop artistic ideas and work.
3. Refine and complete artistic work.

Responding

7. Perceive and analyze artistic work.
8. Interpret intent and meaning in artistic work.
9. Apply criteria to evaluate artistic work.

Connecting

11. Relate artistic ideas and works with societal, cultural, and historical context to deepen understanding.

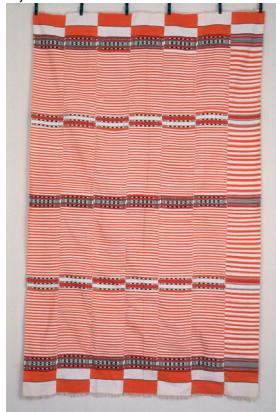
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Arts:
Collage
Craftsmanship
Layer
Repetition
Unity
Variety
Visual Interest

Seattle Art Museum images:
Blanket, African, 81.17.1350



Untitled, 1967, Donald Judd, 2000.190



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/>

7.NS. Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

7.NS.1. Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.

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

Guide students in practicing using a number line to add and subtract rational numbers in a sketchbook. Facilitate process of identifying and drawing examples of vertical and/or horizontal lines seen in buildings, maps, computer programs, tools, or other objects in the real world. Help students analyze how these examples are related to numerical quantities and/or types of number lines.

Lesson Steps Outline

1. Introduce and guide art analysis of *Blanket* from Africa from the Seattle Art Museum collection. Emphasize idea of repetition and unity in art. Ask students to visualize these works as a number line and interpret their shapes and patterns mathematically.

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

2. Introduce *Untitled* by Donald Judd from the Seattle Art Museum collection and analyze how shapes can suggest numbers. Review and demonstrate representing equations in a number line format.

Distribute or assign equations to students and guide practice mapping them out on number line worksheet.

 Criteria-based teacher checklist: Practices using lines, shapes, and/or arrows to show numbers and operations on a number line.

3. Introduce number line collage example and discuss creating a collage that represents an equation in a horizontal number line format.

4. Demonstrate and guide selecting 4-5 one-inch wide strips of paper and a background color cardstock paper. Demonstrate folding (or measuring and marking) and cutting into 8-9 multiple squares and arranging on color background to represent a number line in collage form.

 Criteria-based teacher process assessment: Selects a range of colors, patterns, and textures.

5. Demonstrate and guide cutting and arranging three additional paper shapes to represent numbers equation. Ask students to check math with a partner.

Criteria-based peer assessment and teacher checklist: Uses a range of colors, patterns, and textures. Repeats elements. Measures, cuts, and organizes shapes to show number line, addition/subtraction, and sum/difference.

6. Demonstrate and guide craftsmanship in gluing collage shapes.

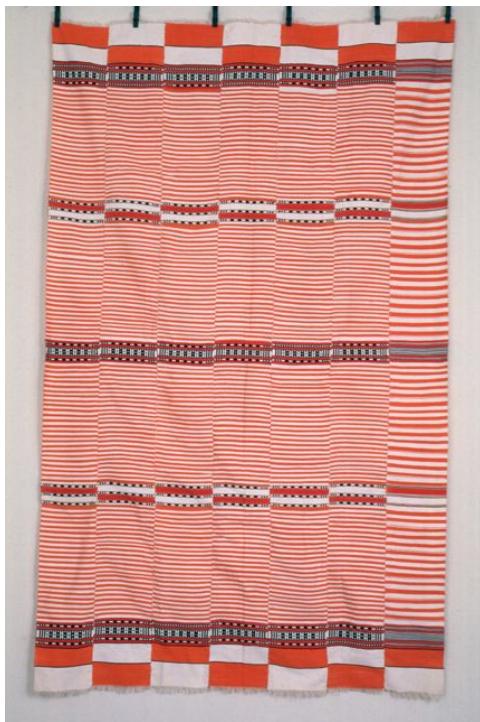
Criteria-based teacher checklist: Attaches shapes smoothly and securely.

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

Criteria-based peer assessment and reflection: Interprets a peer's collage by identifying the equation it represents and checks for accuracy. Identifies and reflects on craftsmanship and artistic choices that create visual interest or unity in compositions.

LESSON STEPS

- 1. Introduce and guide art analysis *Blanket* from Africa from the Seattle Art Museum collection. Emphasize idea of repetition and unity in art. Ask students to visualize these works as a number line and interpret their shapes and patterns mathematically.**



□ 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.

- *Artists often use a variety of different patterns, textures, or colors in art to create visual interest in the art. Where do you see examples of that in Sarong and Blanket?*
- *Artists also repeat elements (shape, color, pattern, texture) in art to create visual relationships that unify the work. Where do you see examples of repetition?*
- *What characteristics do these two textile (fabric) artworks share with a number line? (a line of symmetry similar to the point of zero; patterns or shapes organized in a way that could suggest different numerical values)*
- *If we interpreted the vertical stripes of color or pattern on these artworks as numbers or expressions, what might they be?*

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

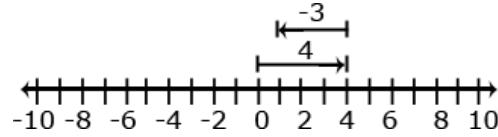
2. Introduce *Untitled* by Donald Judd from the Seattle Art Museum collection and analyze how shapes can suggest numbers. Review and demonstrate representing equations in a number line format.



Teachers can differentiate by providing equations matched with student ability.

- *How might this sculpture by Donald Judd be interpreted as a number line? What might the rectangles and open spaces suggest?*
- *What are opposites on a number line and where are they placed? (positive and negative numbers) How do we show a negative or a positive number on a number line?*
- *How do we show the addition and subtraction using direction on a number line? (Negative to the left and positive to the right).*
- *If my equation is $4 + (-3) = 1$, how do I show that? Where do I start? (0)*
- *Which directions am I moving in to show the operation?*

Distribute or assign equations to students and guide practice mapping them out on number line worksheet.



Criteria-based teacher checklist: Practices using lines, shapes, and/or arrows to show numbers and operations on a number line.

3. Introduce number line collage example and discuss creating a collage that represents an equation in a horizontal number line format.

- *How can I create a number line using cut pieces of paper? What would make sense visually and mathematically?*
- *We will use a line of congruent squares with space in-between to mark each number. What if I wanted to use different colors of paper to show my number line? What makes sense mathematically and artistically? All different colors? A pattern of color squares?*
- *Using a practice number line worksheet as a guide, think about how you will show each number in your equation as well as the sum or difference.*
- *In showing $4 + -3 = 1$, how can I show 4 and how can I show -3? Also, if I wanted to emphasize the sum in the equation, how might I represent that so that it is clear visually?*

4. Demonstrate and guide selecting 4-5 one-inch wide strips of paper and a background color cardstock paper. Demonstrate folding (or measuring and marking) and cutting into 8-9 multiple squares and arranging on color background to represent a number line in collage form.

- Now select 4-5 different one-inch strips of paper to show your number line and your equation plus a color background paper.
- Think about variety of color, pattern, and texture for visual interest and repetition for unity as you make your choices. Too little variation might be boring, while too much variation might be chaotic.
- First measure and mark or fold strips of paper to make an artistic number line using cut squares. Use craftsmanship: care and attention to mathematical precision in measuring and cutting. You will only be able to fit about 9-10 number line squares horizontally on your color cardstock background paper.
- Because of the size of your paper, you will need to strategically place the zero on your number line so that the equation can fit on your paper. Depending on your equation, the zero might be close to the left or right side of your paper or close to the middle of the paper.
- Arrange your squares horizontally across the bottom of your color background. Cut out a circle or zero shape and place it with your equation and composition in mind.

Criteria-based teacher process assessment: Selects a range of colors, patterns, and textures.

5. Demonstrate and guide cutting and arranging three additional paper shapes to represent numbers equation. Ask students to check math with a partner.

- Measure and cut strips to show the numbers in your equation including the sum or difference. They need to align with the number line size-wise.
- Arrange your shapes representing numbers in your equation above the squares for your number line. Make sure your number line has consistent spaces between each square (to clearly and consistently show units/numbers.)
- Before you glue, have a partner check your equation collage. Have you measured and cut accurately? Can your partner "read the equation"? Does it illustrate the equation effectively?
- Talk with your partner about unity and variety you see in their composition.

Criteria-based peer assessment and teacher checklist: Uses a range of colors, patterns, and textures. Repeats elements. Measures, cuts, and organizes shapes to show number line, addition/subtraction, and sum/difference.

6. Demonstrate and guide craftsmanship in gluing collage shapes.

- *Now that your collage shapes are arranged artistically and mathematically, glue them down using craftsmanship.*
- *Without disturbing the careful arrangement of your shapes illustrating your equation, turn each shape over on a glue mat or scrap paper, and apply glue stick around the edges of the shape.*
- *Rub paper shapes down with care to make sure that each shape is flat and secure with no corners or edges sticking up.*

Criteria-based teacher checklist: Attaches shapes smoothly and securely.

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

- *"Read" the equation expressed by a classmate's number line collage. Check interpretations against equations for accuracy.*
- *Describe a collage that captures your attention and describe what artistic choices created unity and/or variety or use of craftsmanship makes that artwork especially effective.*
- *Describe where the relationship of color, texture, or pattern creates visual interest or unity.*

Criteria-based peer assessment and reflection: Interprets a peer's collage by identifying the equation it represents and checks for accuracy. Identifies and reflects on craftsmanship and artistic choices that create visual interest or unity in compositions.

Sample number line equations: Can be copied and cut into cards for students.

$$-3 + 4 =$$

$$-5 - 3 =$$

$$5 + -7 =$$

$$-3 - 4 =$$

$$4 + -5 =$$

$$4 - 7 =$$

$$-2 + 3 =$$

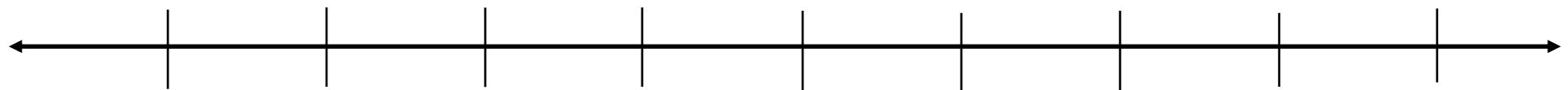
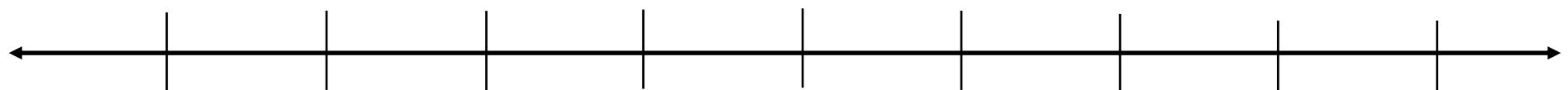
$$-2 - 5 =$$

$$1 + -6 =$$

$$-3 - 4 =$$

$$2 + -4 =$$

$$-1 - 5 =$$



ARTS IMPACT LESSON PLAN Visual Arts and Math Infusion**Seventh Grade Lesson Two: *Visualizing Operations: Number Line Collages***

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

STUDENT SELF-ASSESSMENT WORKSHEET

Disciplines	MATH	VISUAL ARTS	VISUAL ARTS AND MATH	VISUAL ARTS		Total 5
Concept	Operations	Unity and Variety	Number Line Operations in Collage	Craftsmanship		
Criteria Student Name	Practices using lines, shapes and/or arrows to show numbers and operations on a number line.	Uses a range of colors, patterns, and textures. Repeats elements.	Measures, cuts and organizes shapes to show number line, addition/subtraction, and sum/difference.	Measures and cuts accurately.	Attaches shapes smoothly and securely.	

ARTS IMPACT LESSON PLAN Visual Arts and Math InfusionSeventh Grade Lesson Two: *Visualizing Operations: Number Line Collages***CLASS ASSESSMENT WORKSHEET**

Disciplines	MATH	VISUAL ARTS	VISUAL ARTS AND MATH	VISUAL ARTS		Total 5
Concept	Operations	Unity and Variety	Number Line Operations in Collage	Craftsmanship		
Criteria						
Student Name	Practices using lines, shapes and/or arrows to show numbers and operations on a number line.	Uses a range of colors, patterns, and textures. Repeats elements.	Measures, cuts and organizes shapes to show number line, addition/subtraction, and sum/difference.	Measures and cuts accurately.	Attaches shapes smoothly and securely.	
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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: _____

ARTS IMPACT FAMILY LETTER

VISUAL ARTS AND MATH LESSON: *Visualizing Operations: Number Line Collages*

Dear Family:

Today your child participated in an **Arts and Math** lesson. We analyzed works of art from different times in history and cultures and identified shapes that suggested numbers on a linear format or number line.

- We discovered that we can show addition/subtraction of positive and/or negative numbers on a number line using shapes.
- We practiced solving equations with positive and negative numbers using a number line.
- We measured and cut shapes in diverse papers to represent a specific equation in a collage number line format.
- We organized our paper shapes to represent our equation and checked in with a partner to make sure that our mathematical thinking could be seen visually.
- We emphasized creating unity through repetition and variety through using a range of different textures, colors and patterns of paper in our compositions.
- We focused on craftsmanship by cutting mathematically accurate shapes and gluing them down smoothly and securely.

At home, you could reuse decorative papers such as cards and gift wrap to create collages representing positive and negative numbers and equations vertically or horizontally. You could also create decorative linear measuring tools through careful cutting and gluing of diverse papers.

Enduring Understanding

Shapes representing the addition or subtraction of numbers in a linear format can be combined to create variety and unity in composition.