

## ARTS IMPACT LESSON PLAN

### Visual Arts and Math Infused Lesson

#### Lesson One: *Mythical Math Characters: Proportion Portraits*

Author: Meredith Essex      Grade Level: Sixth



#### Enduring Understanding

Proportional relationships can guide accurate portrayal of human faces of any size.

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

*Students apply understandings of fractions, scale, and ratio to creating a human facial portrait in proportion. Students calculate placement of and map out facial features using a set of established proportional guidelines and record their measurements. Last, students embellish upon their proportional portraits using math tools and colorful pens to transform their portrait into a "Mythical Math" character.*

### Learning Targets and Assessment Criteria

**Target:** Uses understanding of proportion to map out the features of a human face.

**Criteria:** Draws vertical line of symmetry. Measures and marks top and bottom of head, horizontal line for eyes  $\frac{1}{2}$ -way between the top of the head and bottom of chin, and horizontal line for bottom of the nose  $\frac{1}{2}$ -way between the eyes and bottom of chin.

**Target:** Uses understanding of proportion to define human features.

**Criteria:** Defines head shape, draws eyes on horizontal eye line using 5 eye widths across as a guide, adds nose, places mouth midway between bottom of nose and bottom of chin, and aligns sides of mouth with position of pupils.

**Target:** Documents proportional calculations.

**Criteria:** Notes measurements guiding placement of facial features on margin of drawing.

**Target:** Creates a mythical math character portrait using craftsmanship.

**Criteria:** Defines features and adds invented geometric elements using pen, grid squares, and straight edge to suggest human and machine-like characteristics.

#### Vocabulary

Arts Infused:

Grid  
Horizontal  
Proportion  
Ratio  
Scale  
Symmetry  
Vertical

Math:

Fraction

Arts:

Character  
Craftsmanship  
Contour  
Portrait

#### Materials

##### Museum Artworks or Performance

###### Seattle, WA

Seattle Art Museum

###### Tacoma, WA

Tacoma Art Museum

##### Materials

Drawing pencil: 4H; Vinyl erasers; Arts Impact sketchbook; Gel pens: variety of colors;  $\frac{1}{4}$ " grid paper: 5.5x8.5", one per student; Facial proportion diagram: one per student; Protractors; Rulers; Class 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: Proportion  
1.2.1 Skills and Techniques: Drawing  
2.3.1 Responding Process  
2.1.1 Creative 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.RP. Understand ratio concepts and use ratio reasoning to solve problems.  
6.RP.3.d. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.

*continued*

Seattle Art Museum images:  
*Self Portrait*, 1941, Fay Chong,  
2009.52.4

**CCSS Mathematical Practices**

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

*Gelede Mask: Male with Skull Cap*, early  
20th century, Southwestern Yoruba,  
81.17.585





*Funerary Portrait*, 1st - 2nd century,  
Egyptian, 50.62



Proportion Diagram Drawing excerpted  
from:  
<http://www.animatedbuzz.com/tutorials/proportion.html>

### ICON KEY:

 = Indicates note or reminder for teacher


 = Embedded assessment points in the lesson

### Pre-Teach


Ask students to search for and share examples of objects or images that represent scale or ratio relationships: toy models, instructional diagrams. Compare the proportion in the same photograph or image of a face seen on different electronic devices: phone, tablet, smart board, movie screen.

### Lesson Steps Outline


**1.** Introduce and guide art analysis of images of faces from *Self Portrait* by Fay Chong, *Gelede Mask: Male with Skull Cap*, Southwestern Yoruba, and *Funerary Portrait*, Egyptian, from the Seattle Art Museum collection. Introduce proportions of the human head.

 Criteria-based teacher process assessment: Participates in analyzing art and diagram.


**2.** Analyze using ratio and fraction concepts to accurately scale up or down human facial proportion. Connect concepts of ratio, proportion, and fractions.

 Criteria-based teacher process assessment: Analyzes how scale, ratio, and fractions relate to representing human proportion.

**3.** Demonstrate and guide the process of using ratio, fraction, and symmetry concepts to accurately map out the proportions of the human face in pencil on  $\frac{1}{4}$ " grid paper.

 Criteria-based teacher checklist: Draws vertical line of symmetry. Measures and marks top and bottom of head, horizontal line for eyes  $\frac{1}{2}$ -way between the top of the head and bottom of chin, and horizontal line for bottom of the nose  $\frac{1}{2}$ -way between the eyes and bottom of chin. Notes measurements guiding placement of facial features on margin of drawing.

**4.** Demonstrate and guide drawing eyes in proportion, creating a symmetrical shape for the contour of head, and adding other features in symmetry using pencil.

 Criteria-based teacher checklist: Defines head shape, draws eyes on horizontal eye line using 5 eye widths across as a guide, adds nose, places mouth midway

between bottom of nose and bottom of chin, and aligns sides of mouth with position of pupils. Notes measurements guiding placement of eyes on margin of drawing.

**5.** Demonstrate and guide creative embellishment merging portrait elements both human and mathematical using gel pens. Emphasize highlighting grid squares and horizontal and vertical guidelines to invent a character portrait that is part human and part machine.

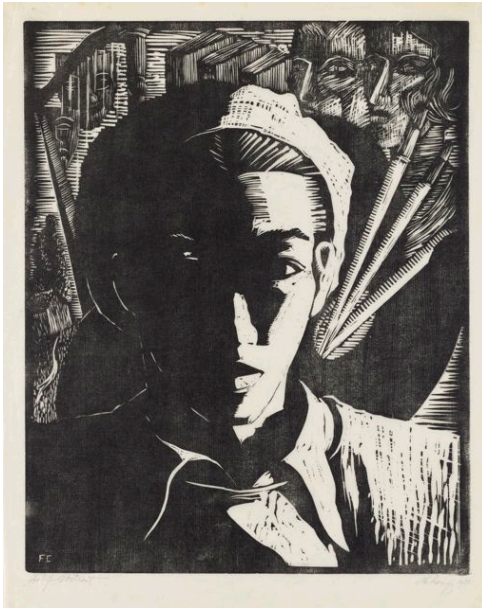
Criteria-based teacher checklist: Defines features and adds invented geometric elements using pen, grid squares, and straight edge to suggest human and machine-like characteristics.

**6.** Facilitate criteria-based peer and group math and art reflection.

Criteria-based peer assessment and group reflection: Checks for mathematical and artistic proportional accuracy with a peer. Reflects on impact of combining human and math/machine elements in characters.

## LESSON STEPS

1. Introduce and guide art analysis of images of faces from *Self Portrait* by Fay Chong, *Gelede Mask: Male with Skull Cap*, Southwestern Yoruba, and *Funerary Portrait*, Egyptian, from the Seattle Art Museum collection. Introduce proportions of the human head.



▣ 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.

▣ Refer to facial proportion diagram included in lesson.

- *Humans have been portrayed in art for thousands of years. A basic formula of proportional relationships has been developed over time to help artists represent faces realistically. Every face is different, but these basic proportions can form a guide.*

- *Compare the human proportion diagram with the Seattle Art Museum artworks. Using a yardstick, let's find the line of symmetry first. What is the halfway point on the face in the art? Does it approximately align with the placement of the eyes? What about the 5 eye widths across?*
- *We are going to draw portraits of Mythical Math beings that have human proportions combined with machine-like qualities. Our knowledge of ratio and fractions will help us map out and draw a face then we transform it into an invented character.*

Criteria-based teacher process assessment: Participates in analyzing art and diagram.

## **2. Analyze using ratio and fraction concepts to accurately scale up or down human facial proportion. Connect concepts of ratio, proportion, and fractions.**

- *Using our proportion diagram as a guide, think about ratio, scale and proportion. If you are the sculptor of the face of a 62-foot high Buddha sculpture, or if you were making a tiny face on a coin, you would be using the same proportions.*
- *Regardless of size, what ratio is represented by the fractional division of the face? Distance from top of head to eyes and eyes to bottom of chin represents what ratio compared to the entire length of the head? (2:1)*
- *If your human face is 4 centimeters tall, where would the halfway point (horizontal line) for the eyes be (2 centimeters)? What about the bottom of the nose that is halfway between the eyes and the chin (1 centimeter)?*
- *What is the ratio of eyes to bottom of nose and bottom of nose to bottom of chin compared to the length between of nose to bottom of chin? (2:1)*
- *If you are making a human face that is 7 feet tall, where would the halfway point (horizontal line) for the eyes be (3.5 feet or 3 feet, 6 inches)? What about the bottom of the nose that is halfway between the eyes and the chin (1.75 feet or 1 foot, 8 inches)?*

Criteria-based teacher process assessment: Analyzes how scale, ratio, and fractions relate to representing human proportion.

## **3. Demonstrate and guide the process of using ratio, fraction, and symmetry concepts to accurately map out the proportions of the human face in pencil on ¼" grid paper.**

- *Orient the grid paper vertically then identify a vertical grid line in the center of paper: this is your line of symmetry. Lightly draw over it using straightedge and pencil.*

Lesson can be differentiated by assigning a certain number of units (12 for instance) for height of faces that will yield the same calculations or students can choose different heights of faces and generate a range of calculations for parts of the whole.

- *Identify a number of ½" units (squares) from the top of head to bottom of chin that can be divided easily by ½ and ¼.*
- *Make a mark horizontally on that line to indicate the top of the head and the bottom of the chin. Record the number of units/squares that represent the head from top to bottom of chin on the edge of your paper.*

- *Identify where the placement of the eyes should be halfway down. Record the number of units/squares that represent the head from top to eyes and from eyes to bottom of chin on the far right of your paper. Draw a horizontal line using grid and straightedge to show where the eyes will be placed.*
- *Now identify where the placement of bottom of the nose should be: halfway between the eyes and chin. Record the number of units/squares that represent the distance between eyes and nose and the nose and chin on the far right of your paper.*
- *Draw a short horizontal line using grid and straightedge to show where the bottom of the nose will be placed.*

Criteria-based teacher checklist: Draws vertical line of symmetry. Measures and marks top and bottom of head, horizontal line for eyes  $\frac{1}{2}$ -way between the top of the head and bottom of chin, and horizontal line for bottom of the nose  $\frac{1}{2}$ -way between the eyes and bottom of chin. Notes measurements guiding placement of facial features on margin of drawing.

#### **4. Demonstrate and guide drawing eyes in proportion, creating a symmetrical shape for the contour of head, and adding other features in symmetry using pencil.**

- *On the horizontal line marking placement of the eyes, the ratio of eye width to total width of face is 1:5. Measure and place eyes. Record the number of units/squares that represent the eye width and the total width of the face.*
- *Use grid squares to help you draw the curve of the head shape symmetrically. Add the nose using the horizontal guideline you drew in the previous step.*
- *Place the mouth halfway between bottom of nose and bottom of chin.*
- *Use the facial proportion diagram to map placement of side edges of mouth aligned with the pupils of the eyes and then note and place ears and hairline.*

Criteria-based teacher checklist: Defines head shape, draws eyes on horizontal eye line using 5 eye widths across as a guide, adds nose, places mouth midway between bottom of nose and bottom of chin, and aligns sides of mouth with position of pupils. Notes measurements guiding placement of eyes on margin of drawing.

#### **5. Demonstrate and guide creative embellishment merging portrait elements both human and mathematical using gel pens. Emphasize highlighting grid squares and horizontal and vertical guidelines to invent a character portrait that is part human and part machine.**

- *Sometimes mythical or imaginary beings from literature or movies (think science fiction or superheroes) have human and machine qualities. This can make characters especially interesting, creepy, or seemingly powerful.*
- *We have established proportions using guidelines for drawing human faces, but we also have the mathematical elements of grid lines and squares, fractions, and a line of symmetry.*
- *By strategically filling in grid squares or highlighting lines, create mathematical machine-like characteristics for your Mythical Math portrait/character.*

- *Use a straightedge and grid lines to guide drawing all lines in pen for craftsmanship: mathematical precision and care in drawing.*
- *Trace over pencil lines that define features in color gel pen. Keep the symmetry of your portrait/character in color, line, and shape. Make sure the mathematical and human qualities of your character are clearly shown.*
- *Give your character a great name.*

Criteria-based teacher checklist: Defines features and adds invented geometric elements using pen, grid squares, and straight edge to suggest human and machine-like characteristics.

---

## **6. Facilitate criteria-based peer and group math and art reflection.**

- *Switch portraits with a partner and check portraits for proportional accuracy.*
- *Describe the effect of portraits in human proportion embellished with mathematical machine-like shapes or lines. Share the name of your character.*

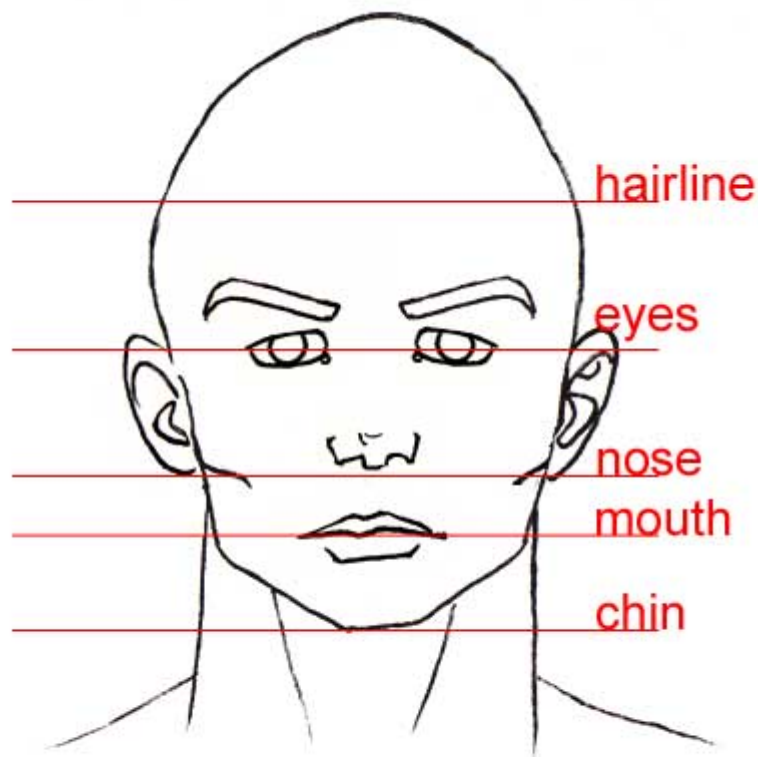
Criteria-based peer assessment and group reflection: Checks for mathematical and artistic proportional accuracy with a peer. Reflects on impact of combining human and math/machine elements in characters.

---

## ***Mythical Math Character: Proportion Portraits***

### **The Proportions of the Human Head**

- The eyes are halfway between the top of the head and the chin.
- The bottom of the nose is halfway between the eyes and the chin.
- The bottom edge of the mouth is halfway between the nose and the chin.
- There is about one eye's width between each of the eyes, and one eye's width to either side of each eye—room for five eyes across the face.
- The corners of the mouth line up with the centers/pupils of the eyes.
- The top of the ears line up above the eyes, on the eyebrows.
- The bottom of the ears line up with the bottom of the nose.



Drawing excerpted from: <http://www.animatedbuzz.com/tutorials/proportion.html>

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

Sixth Grade Lesson One: *Mythical Math Characters: Proportion Portraits*

**STUDENT SELF-ASSESSMENT WORKSHEET**

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

Disciplines	VISUAL ARTS AND MATH					VISUAL ARTS	Total 6
Concept	Ratio and Proportion					Craftsmanship/ Characterization	
Criteria	Draws vertical line of symmetry. Measures and marks top and bottom of head.	Draws horizontal line for eyes 1/2-way between the top of the head and bottom of chin, and horizontal line for bottom of the nose 1/2-way between the eyes and bottom of chin.	Defines head shape, draws eyes on horizontal eye line using 5 eye widths across as a guide.	Adds nose, places mouth midway between bottom of nose and bottom of chin, aligns sides of mouth with position of pupils.	Notes measurements guiding placement of facial features on margin of drawing.	Defines features and adds invented geometric elements using pen, grid squares, and straight edge to suggest human and machine-like characteristics.	
Student Name							

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

Sixth Grade Lesson One: *Mythical Math Characters: Proportion Portraits*

**CLASS ASSESSMENT WORKSHEET**

Disciplines	VISUAL ARTS AND MATH					VISUAL ARTS	Total 6
Concept	Ratio and Proportion					Craftsmanship/ Characterization	
Criteria	Draws vertical line of symmetry. Measures and marks top and bottom of head.	Draws horizontal line for eyes 1/2-way between the top of the head and bottom of chin, and horizontal line for bottom of the nose 1/2-way between the eyes and bottom of chin.	Defines head shape, draws eyes on horizontal eye line using 5 eye widths across as a guide.	Adds nose, places mouth midway between bottom of nose and bottom of chin, aligns sides of mouth with position of pupils.	Notes measurements guiding placement of facial features on margin of drawing.	Defines features and adds invented geometric elements using pen, grid squares, and straight edge to suggest human and machine-like characteristics.	
Student Name							
1.							
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							
11.							
12.							
13.							
14.							
15.							
16.							
17.							
18.							
19.							
20.							
21.							
22.							
23.							
24.							
25.							
26.							
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: *Mythical Math Characters: Proportion Portraits*

---

Dear Family:

Today your child participated in an **Arts and Math** lesson. We looked at human facial portraits by artists that were created at different times in history within the context of different cultures.

- We discovered that all of the facial portraits we looked at show similar proportional relationships of parts or features relative to the whole size of the face. We talked about the role of fractions, ratio, and proportion in making an image bigger or smaller.
- We talked about how a set of guidelines based on dividing the human face, using math, has been developed to help artists portray faces more accurately.
- We measured and calculated placement of facial features using a set of established proportional guidelines, and recorded measurements associated with that placement.
- We drew the features of the face, again using proportion guidelines to help us.
- We embellished upon our portraits using math tools, grid lines, and colorful pens to transform our portrait into a "Mythical Math Character" with human proportion and machine or robotic-like characteristics. We gave our character a great name.

At home, you could draw proportional portraits of your family and friends small enough to put on a coin or large enough to fill up a wall. You could experiment with enlarging or shrinking parts of faces using knowledge of facial proportion.

### Enduring Understanding

Proportional relationships can guide accurate portrayal of human faces of any size.