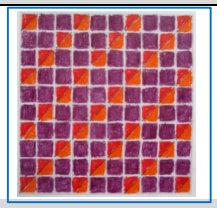
ARTS IMPACT LESSON PLAN

Visual Arts and Math Infused Lesson



Lesson One: *Discovering Number Patterns*

Author: Meredith Essex Grade Level: Fourth

Enduring Understanding

Numerical rules can generate regular artistic patterns.

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

Students study examples of beaded and woven art and generate a pattern by applying a rule to numbers. The first ten numbers in a number pattern are calculated and features of those numbers are identified. Pattern numbers are marked on a 100s grid, and students predict additional pattern numbers based on visual characteristics of that pattern. A single line or shape and color are consistently added to each pattern square, and one background color is added to all other grid squares to further define the pattern.

Learning Targets and Assessment Criteria

Target: Identifies a number pattern.
Criteria: Applies assigned rule to calculate numbers to 100 and describes features of the pattern.

Target: Identifies number pattern on grid.
Criteria: Designates pattern numbers/grid squares on a 100s grid.

Target: Repeats design to show pattern.
Criteria: Consistently adds same line/shape/color pattern squares and same color to background area.

Target: Uses craftsmanship.
Criteria: Uses math tools and leaves grid lines visible.

Vocabulary

Arts/Math Infused:
Grid
Pattern

Math:
Addition
Prediction
Rule
Subtraction
Symbol

Arts:
Background
Color Palette
Contrast
Line
Repetition
Shape
Template

Materials

Museum Artworks or Performance:

Seattle, WA
Seattle Art Museum

Tacoma, WA
Tacoma Art Museum

Materials
White copy paper: 8.5x11", print, do not copy, Student Practice Worksheet from lesson; White cardstock: 8.5x11", print, to not copy, custom 100's grid from lesson; White cardstock: 8.5x11", copy the number rules from the lesson, cut into individual cards; Math manipulatives: counters or small objects (optional); Drawing pencils: 2H; Vinyl erasers; Protractors; Drawing/architectural shape templates (optional); Ultra fine tip black markers; Lyra® large diameter color pencils; Math manipulatives: small objects or counters; Arts Impact sketchbooks; 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
1.1.1 Elements: Line
1.1.2 Elements: Shape
1.1.7 Principles of Design: Repetition/pattern
1.2.1 Skills and Techniques: Drawing
2.1.1 Creative Process
2.3.1 Responding Process
4.2.1 Connection between Visual Arts and Math

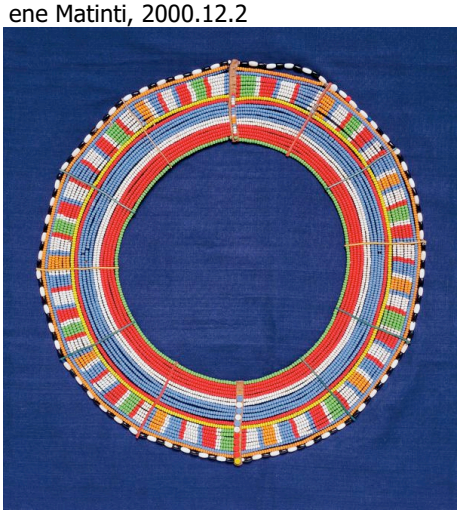
Early Learning Guidelines (Pre-K – Grade 3)
For a full description of Washington State Early Learning and Child Development Guidelines see: http://www.del.wa.gov/development/guidelines/
(Age 4-5) 6. Learning about my world: Math: Create own pattern with a variety of materials. Describes what the pattern is. Arts: Show an increasing ability to use art materials safely and with purpose.

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. OA.5: Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself.

continued

Connections
Everyday Mathematics
3.1 – What's My Rule?
3.9 – True or False Number Sentences

Seattle Art Museum images:
Bull Necklace (Norkiteng), 1999, Nalepo ene Matinti, 2000.12.2



yius (basket), ca. 1890s, Cowlitz, 93.74

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.

ICON KEY:

= Indicates note or reminder for teacher

☑ = Embedded assessment points in the lesson

Pre-Teach

Sketchbook Activity: Search for and draw examples of patterns inside and outside. Notice fabrics, rugs, surfaces on buildings, animals, and plants. What elements are repeated—lines, shapes, colors?

Lesson Steps

1. Warm-Up: Guide students in generating number patterns with simple rules. Emphasize pattern as a repeating sequence of shapes, colors, lines, or numbers.

2. Introduce and guide art and math analysis of *Bull Necklace (Norkiteng)* and *yius (basket)* from the Seattle Art Museum collection.

3. Demonstrate using a rule to identify a number pattern and lightly marking those numbers/squares on the 100s grid.

4. Distribute number rule cards. Guide recording rule, calculating and recording pattern numbers, designating numbers/grid squares that show the pattern, and describing features of the pattern on practice worksheet.

☑ Criteria-based teacher checklist and peer assessment: Applies assigned rule to calculate numbers to 100 and describes features of the pattern. Designates pattern numbers/grid squares on a 100s grid.

5. Demonstrate mapping out pattern on heavy white paper with gray grid for final composition. Guide using the same mathematical lines or shapes to emphasize each grid square/numbers in the pattern.

6. Guide enhancing pattern by using craftsmanship with color pencils. Emphasize using the same combination of colors and shapes in each pattern square.

☑ Criteria-based teacher checklist: Consistently adds same line, shape, and/or color pattern to squares and same color to background area. Uses math tools and leaves grid lines visible.

7. Guide criteria-based self and group reflection. Display by placing pattern grids adjacent to one another.

☑ Criteria-based student self and group assessment: Checks for craftsmanship, compares patterns and rules seen in art.

LESSON STEPS

1. Warm-Up: Guide students in generating number patterns with simple rules. Emphasize pattern as a repeating sequence of shapes, colors, lines, or numbers.

- *Think about the simplest pattern of numbers: even and odd. Visually, what does that pattern look like? (Checkerboard) What would the rule be for that pattern? (Start at one and add two)*
- *Lets try this rule: Start with 5 and add 5. What are the numbers in that pattern up to 100? What do you notice about this pattern?*
- *Lets try another rule: start with 5 and add 3.*

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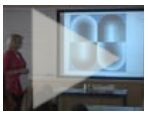
2. Introduce and guide art and math analysis of *Bull Necklace (Norkiteng)* by Nalepo ene Matinti (artist) and *yius (basket)* from the Seattle Art Museum collection.



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 objects or parts of these objects, what tells us that shapes or colors are organized on a grid or in rows?*
- *Describe a pattern that you see. What number rule might result in that pattern?*
- *How might number patterns have been used to create this necklace and basket?*
- *After we create some number patterns on a grid, we will look more closely at parts of these artworks and compare them to our work.*

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3. Demonstrate using a rule to identify a number pattern and lightly mark those numbers/squares on the 100s grid.

Project or draw a 100's grid on chart paper or white board so that you can demonstrate how a number pattern develops visually (columns, rows, stair steps, etc.)

- *My rule is start with 2 and add 5. My number pattern will run up to 100 since I am using a 100's grid to show it.*
- *2+5=7, 7+5=12, 12+5=17, 17+5=22, 22+5=27 (Lets stop here and notice what the features of the pattern are. What numbers do we see repeated: 1, 2, 5, and 7). Based on what we see so far, what do you predict for the rest of the numbers? Do some quick calculating. If I color in each number in the sequence on the grid, what pattern will I see (two vertical lines in the 2s and 7s columns…)?*
- *How about another: 1+4=5, 5+4=9, 9+4=13, 13+4=17, 17+4=21. What do we notice about every number? Odd or even? When we mark the grid do we see an alternating pattern? Can we predict or determine what the next numbers in the pattern will be by just looking at the grid?*

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4. Distribute number rule cards. Guide recording rule, calculating and recording pattern numbers, designating numbers/grid squares that show the pattern, and describing features of the pattern on practice worksheet.

Small objects or tiny squares of paper can be provided to place on the 100's grid to help concrete learners identify number patterns (think bingo).

- *Write your rule below your 100s grid practice worksheet.*
- *Calculate the first ten numbers using your rule and write them below your rule, then mark them on your grid very lightly. Predict your pattern by marking it on your grid very lightly. Now check the math to make sure it is accurate.*
- *Write down the features of your pattern below your grid. Recurring numbers? Sequence of odd and even? Relationship between numbers on the grid?*
- *Share your pattern grid and calculations with a partner. Check for accuracy.*

☑ Criteria-based teacher checklist and peer assessment: Applies assigned rule to calculate numbers to 100 and describes features of the pattern. Designates pattern numbers/grid squares on a 100s grid.

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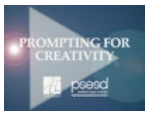
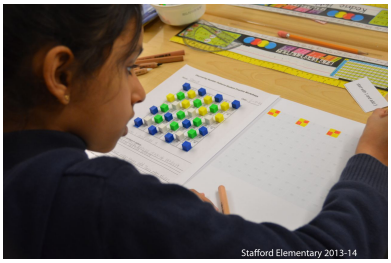
5. Demonstrate mapping out pattern on heavy white paper with gray grid for final composition. Guide using repeating lines or shapes to emphasize each grid square/numbers in the pattern.

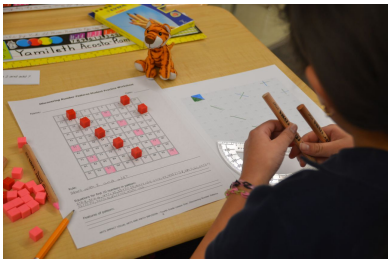
- *Transfer your pattern to our final heavy paper with a gray grid. This will become your final pattern composition.*
- *Dividing each grid square/number in your pattern with a single line or adding a single shape is a way to artistically show each number pattern grid square.*
- *What artistic choices will you make?*



Prompting for Creativity

- *This is a mathematical pattern, so we want be precise using drawing tools. Using a protractor for a straight edge or a template for small geometric shapes, emphasize each square in your number pattern the same way so that your mathematical and artistic accuracy is clearly seen.*





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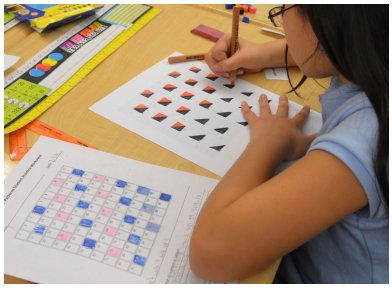
6. Guide enhancing pattern by using craftsmanship with color pencils. Emphasize using the same combination of colors and shapes in each pattern square.


Filling in Grid Squares

- *Choose a combination of two to three colors for your number pattern squares.*
- *Add color consistently to each grid square so the math and artistic pattern are easy to see.*
- *Last, choose one contrasting color (think of light/dark, warm/cool, or complementary colors) to add to all of the other squares so that there is a consistent background that enhances your pattern artistically.*
- *Use craftsmanship to color each grid square individually. Adding color to the grid is a lot like weaving or knitting or beading: it takes patience and consistency to show good craftsmanship.*



☑ Criteria-based teacher checklist: Consistently adds same line, shape, and/or color pattern to squares and same color to background area. Uses math tools and leaves grid lines visible

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7. Guide criteria-based self and group reflection. Display by placing pattern grids adjacent to one another.


Guiding Reflecting on Student Art

- *Check your craftsmanship. Is your pattern precise and easy to read?*
- *Compare number patterns. Which look similar? What are the rules governing those patterns? Are they the same or different? Compare their pattern features.*
- *Look again at some of the parts of the necklace and basket we looked at earlier. Where do we see the same number patterns? Can you identify a rule for them?*

☑ Criteria-based student self and group assessment: Checks for craftsmanship, compares patterns and rules seen in art.

***Everyday Mathematics* Extensions:**
Unit 10–Reflections and Symmetry

Discovering Number Patterns Number Rules

Make copies and cut into cards for students

start with 1 and add 3	*start with 3 and add 4*
start with 4 and add 4	*start with 2 and add 7*
start with 1 and add 3	*start with 3 and add 4*
start with 4 and add 4	*start with 2 and add 7*
start with 1 and add 3	*start with 3 and add 4*
start with 4 and add 4	*start with 2 and add 7*

Discovering Number Patterns Student Practice Worksheet

Name: _____ Date: _____

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
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Rule:

_____

Equations for first 10 numbers in pattern:

_____

_____

_____

Features of pattern:

_____

_____

_____

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
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

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

STUDENT SELF-ASSESSMENT WORKSHEET

Disciplines	**VISUAL ARTS AND MATH**				Total 4
Concept	**PATTERN**			**CRAFTSMANSHIP**	
Criteria Student Name	Applies assigned rule to calculate numbers to 100 and describes features of the pattern	Designates pattern numbers/grid squares on a 100s grid	Consistently adds same line/shape/color to pattern squares, and same color to background area	Uses math tools, leaves grid lines visible	

ARTS IMPACT LESSON PLAN Visual Arts and Math Infusion

Fourth Grade Lesson One: *Discovering Number Patterns*

CLASS ASSESSMENT WORKSHEET

Disciplines	VISUAL ARTS AND MATH				Total 4
Concept	PATTERN			CRAFTSMANSHIP	
Criteria Student Name	Applies assigned rule to calculate numbers to 100 and describes features of the pattern	Designates pattern numbers/grid squares on a 100s grid	Consistently adds same line/shape/color to pattern squares, and same color to background area	Uses math tools, leaves grid lines visible	
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
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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: _____

ARTS IMPACT FAMILY LETTER

VISUAL ARTS AND MATH LESSON: ***Discovering Number Patterns***

Dear Family:

Today your child participated in an **Arts and Math lesson**. We looked at examples of art objects made using mathematical patterns: A beaded Masai necklace from Kenya and a woven Northwest Native American basket. We combined math and art by creating patterns using numbers.

- We learned how make an artistic pattern through applying a rule to numbers. A rule might be starting at 1 and adding 4, or starting at 100 and subtracting 7.
- We calculated the first ten numbers in a number pattern. We talked about features of those numbers: whether they are composed of repeating digits, whether they were a pattern of odd and even numbers, or whether they had other similarities.
- We marked our pattern numbers on a 100s grid (ten by ten square graph with squares numbered to 100) and then predicted additional pattern numbers that would continue the sequence based on the visual pattern we saw.
- We added a single line or shape and color consistently to each number pattern grid square using a straightedge or math template.
- We selected a background color that helped our pattern stand out even more and added it to all other grid squares to further define the pattern.
- We compared patterns as a group and noticed which rules produced similar patterns. We looked again at the necklace and basket and thought about number rules that might apply to those artworks.

At home, you could identify patterns in fabrics and buildings. You could experiment with coloring complex patterns on grids that have number rules and other repeating elements. You also could create number patterns using simple paper weaving techniques.

Enduring Understanding

Numerical rules can generate regular artistic patterns.