Unit Design

Can You Dig It?

Patterns, Predictions, and Discoveries

Grade Level:
7/8

Content Areas:
Math
with connections to Social Studies and Art

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**Standards and Benchmarks**

Math:

**Standard A: Problem Solving**
M-A8: Explains to others in writing the process and rationale used to find a solution

**Standard B: Numbers**
M-B5: Understands basic number theory concepts
   *focus on patterns and sequences

**Standard E: Geometry**
M-E5: Understands geometric transformations of figures

**Based on Standards and Benchmarks for the Howard-Suamico School District**

Horizontal Connections:

**Social Studies:** E.8.13 - Select examples of artistic expressions from several different cultures for the purpose of comparing and contrasting the beliefs expressed.

**Art:** 7/8.4.1 - Knows that the visual arts have a history and a specific relationship to various cultures.

**Based on Standards and Benchmarks of the State of Wisconsin**

Concepts:

- patterns
- sequences
- variable
- prediction
- symmetry
- transformation
- shape
- angle
- number
Benchmark: Art: 7/8.4.1- Knows that the visual arts have a history and a specific relationship to various cultures

<table>
<thead>
<tr>
<th>Benchmark Proficiency Criteria</th>
<th>Learning Target</th>
<th>Method of Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Knows the definition of culture</td>
<td>K</td>
<td>SR</td>
</tr>
<tr>
<td>2. Knows that symbols/motifs in art have different meanings in different cultures</td>
<td>K</td>
<td>SR, CR</td>
</tr>
<tr>
<td>3. Can compare and contrast different cultural images</td>
<td>R</td>
<td>CR(essay)</td>
</tr>
<tr>
<td>4. Understands art communicates cultural ideas and beliefs</td>
<td>K</td>
<td>CR</td>
</tr>
<tr>
<td>5. Can use art as a means to learn the history of a culture</td>
<td>S</td>
<td>PA, PC</td>
</tr>
</tbody>
</table>

K = Knowledge
S = Skill
R = Reasoning
D = Dispositions

P = Product
CR = Constructed Response
SR = Selected Response
P = Product
PA = Performance Assessment
O = Observation
PC = Personal Communication
PF = Portfolio
Benchmark: Social Studies: E.8.13- Select examples of artistic expressions from several different cultures for the purpose of comparing and contrasting the beliefs expressed.

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<tr>
<th>Benchmark Proficiency Criteria</th>
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<th>Method of Assessment</th>
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</thead>
<tbody>
<tr>
<td>1. Knows the definition of culture</td>
<td>K</td>
<td>SR</td>
</tr>
<tr>
<td>2. Knows that art is a form of communication</td>
<td>K</td>
<td>SR</td>
</tr>
<tr>
<td>3. Knows symbols and styles/motifs are unique to specific cultures (Native American, Islam, Latin American, Hmong..)</td>
<td>K</td>
<td>P,CR(essay)</td>
</tr>
<tr>
<td>4. Can compare and contrast art from different cultures</td>
<td>R</td>
<td>CR(essay)</td>
</tr>
<tr>
<td>5. Can find real world examples of art from several different cultures</td>
<td>S</td>
<td>PA,PC</td>
</tr>
</tbody>
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Benchmark: M-A8: Explains to others in writing the process and rationale used to find a solution

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<th>Benchmark Proficiency Criteria</th>
<th>Learning Target</th>
<th>Method of Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Know math vocabulary</td>
<td>K</td>
<td>CR</td>
</tr>
<tr>
<td>2. Write sequentially in complete sentences</td>
<td>S</td>
<td>Product/CR(essay)</td>
</tr>
<tr>
<td>3. Write with clarity</td>
<td>S</td>
<td>Product/CR(essay)</td>
</tr>
<tr>
<td>4. Explain a mathematical process using evidence to support reasoning</td>
<td>S</td>
<td>Product/CR(essay)</td>
</tr>
</tbody>
</table>

K = Knowledge  
P = Product  
CR = Constructed Response  
SR = Selected Response  
P = Product  
PA = Performance Assessment  
O = Observation  
PC = Personal Communication  
PF = Portfolio
**Benchmark: M-B5: Understands basic number theory concepts**  
*focus on patterns and sequences*

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<thead>
<tr>
<th>Benchmark Proficiency Criteria</th>
<th>Learning Target</th>
<th>Method of Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Knows vocabulary</td>
<td>K</td>
<td>SR</td>
</tr>
<tr>
<td>2. Identifies examples of geometric patterns found in nature</td>
<td>S</td>
<td>CR/SR</td>
</tr>
<tr>
<td>3. Recognizes patterns in a sequence</td>
<td>S</td>
<td>O/PA</td>
</tr>
<tr>
<td>4. Create a pattern using a sequence</td>
<td>S</td>
<td>P</td>
</tr>
<tr>
<td>5. Write an equation using a variable to represent a sequence</td>
<td>S</td>
<td>CR</td>
</tr>
</tbody>
</table>

**Abbreviations:**  
K = Knowledge  
S = Skill  
R = Reasoning  
D = Dispositions  
P = Product  
CR = Constructed Response  
SR = Selected Response  
P = Product  
PA = Performance Assessment  
O = Observation  
PC = Personal Communication  
PF = Portfolio
Benchmark: M-E5: Understands geometric transformations of figures

<table>
<thead>
<tr>
<th>Benchmark Proficiency Criteria</th>
<th>Learning Target</th>
<th>Method of Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Know the different kinds of transformations (translation, reflection, rotation, glide reflection)</td>
<td>K</td>
<td>SR</td>
</tr>
<tr>
<td>2. Knows and can identify line and rotational symmetries</td>
<td>K/S</td>
<td>CR,P</td>
</tr>
<tr>
<td>3. Can create patterns using transformations</td>
<td>S</td>
<td>P,PA</td>
</tr>
<tr>
<td>4. Can identify transformations in patterns</td>
<td>S</td>
<td>CR</td>
</tr>
<tr>
<td>5. Knows and understands tessellations and what shapes tessellate (Escher)</td>
<td>S</td>
<td>CR,SR</td>
</tr>
<tr>
<td>6. Can create an original tessellation</td>
<td>S</td>
<td>P,PA</td>
</tr>
</tbody>
</table>

Dispositions: Following Instructions
Works Collaboratively

K = Knowledge
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<table>
<thead>
<tr>
<th>Generalizations:</th>
<th>Essential/Guiding Questions:</th>
</tr>
</thead>
</table>
| 1. Sequences can be used to discover geometric patterns in the world we live in. | 1. What is a sequence?  
2. What is a pattern?  
3. How can sequences be used to create geometric patterns?  
4. What are some examples of geometric patterns found in nature? |
| 2. Rotational symmetry can be used to create shapes and patterns. | 1. What is symmetry?  
2. What is rotational symmetry?  
3. How do you know if a shape has rotational symmetry?  
4. What is an example of a figure that does not have rotational symmetry?  
5. How do cultures use rotational symmetry in their designs? |
| 3. Different patterns can be made through a sequence for transformations. | 1. What are the different types of transformations used to create patterns?  
2. How are the different types of transformations used to create patterns?  
3. How many different designs can be created from transformations?  
4. How do cultures use transformations? |
| 4. Numerical values are expressed differently among different cultures. | 1. What is place value?  
2. Why is place value used?  
3. How do other cultures use place values?  
4. How has place value evolved over time? |
| 5. Different cultures use patterns in their art and their environment. | 1. What is culture?  
2. What is a pattern?  
3. How do cultures use patterns to communicate? |
### Instructional/Assessment Planner

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formative Assessment:</td>
<td>1. Review place value of whole numbers</td>
</tr>
<tr>
<td>Place Value/Numeration Systems</td>
<td>2. Introduce other numeration systems (Mayan)</td>
</tr>
<tr>
<td>Constructed Response - Worksheet</td>
<td>3. Compare numeration systems</td>
</tr>
<tr>
<td>Formative Assessment: Sequences and Patterns</td>
<td>1. Check prior knowledge of sequences and patterns</td>
</tr>
<tr>
<td>Constructed Response, Extended Task Product</td>
<td>2. Predict number and shape sequences</td>
</tr>
<tr>
<td>(8th Grade only)</td>
<td>3. Discuss correlation between number and shape sequences</td>
</tr>
<tr>
<td>Formative Assessment: Symmetry</td>
<td>4. Write rules to describe patterns</td>
</tr>
<tr>
<td>Constructed Response, Product,</td>
<td>5. Translate the rules into equations with variables</td>
</tr>
<tr>
<td>Structured Observation (7th Grade only)</td>
<td>6. Identify geometric patterns in several art and nature samples</td>
</tr>
<tr>
<td>Formative Assessment: Transforms</td>
<td>1. Check prior knowledge</td>
</tr>
<tr>
<td>Constructed Response (7th Grade only) Product</td>
<td>2. Identify and model each kind of transformation</td>
</tr>
<tr>
<td></td>
<td>3. Share examples of strip patterns in other cultures</td>
</tr>
<tr>
<td></td>
<td>4. Introduce tessellations</td>
</tr>
<tr>
<td></td>
<td>5. Share examples of tessellations (Escher)</td>
</tr>
<tr>
<td></td>
<td>6. Model creation of tessellations</td>
</tr>
</tbody>
</table>

### Performance Assessment

**Museum Curator Activity**
- 8th grade: reconstruct and research artifact
- 7th grade: identify artifact and research to support findings

*See full write-up
**Baseline Assessment**

Name: 

Class: 

*Benchmark #: M-A8: Explains to others in writing the process and rationale used to find a solution*

1. Explain how to find equivalent fractions and give a reason why you would need to do this. (4 pts) (writes logically, with clarity and accuracy, and gives an example to support process)

*Benchmark #: M-B5: Understands basic number theory concepts
  *focus on patterns and sequences*

1. Give an example of a sequence. (1 pt)
2. Complete this shape and number sequence. (2 pts)
3. What pattern can you use to predict the next term in the shape sequence. (1 pt)
4. Write an equation with a variable to determine the 100th term. (1 pt)

*Benchmark #: M-E5: Understands geometric transformations of figures*

1. Tell whether the following shapes have line symmetry, rotational symmetry, both, or none? (display 5 shapes) (5 pts)
2. Transform this shape in the following ways: translation, reflection, rotation, glide reflection. (4 pts)
3. Draw a tessellation with the following shape. (equilateral triangle) (1 pt)

*Benchmark #: Social Studies: E.8.13- Select examples of artistic expressions from several different cultures for the purpose of comparing and contrasting the beliefs expressed.*

Art: 7/8.4.1- Knows that the visual arts have a history and a specific relationship to various cultures.

1. How do cultures use mathematical patterns? (1 pt)
2. Why do cultures use mathematical patterns? (1 pt)
3. Give an example to support your answers to Questions 1 and 2. (1 pt)

*Benchmark #:*
Baseline Scoring

**Benchmark #M-A8:** Explains to others in writing the process and rationale used to find a solution

4 correct = 3 (proficient)
2-3 correct = 2 (approaching proficiency)
0-1 correct = 1 (not proficient)

**Benchmark #M-B5:** Understands basic number theory concepts
*focus on patterns and sequences

5 correct = 3 (proficient)
3-4 correct = 2 (approaching proficiency)
0-2 correct = 1 (not proficient)

**Benchmark #M-E5:** Understands geometric transformations of figures

9-10 correct = 3 (proficient)
6-8 correct = 2 (approaching proficiency)
0-5 correct = 1 (not proficient)

**Benchmark #Social Studies:** E.8.13- Select examples of artistic expressions from several different cultures for the purpose of comparing and contrasting the beliefs expressed.

Art: 7/8.4.1- Knows that the visual arts have a history and a specific relationship to various cultures.

3 correct = 3 (proficient)
2 correct = 2 (approaching proficiency)
0-1 correct = 1 (not proficient)

**Benchmark #**

correct = 3 (proficient)
correct = 2 (approaching proficiency)
correct = 1 (not proficient)
**Performance Assessment**

**Goal:** The student demonstrates understanding about the critical component of the unit topic (Use generalizations to guide writing the goal)

<table>
<thead>
<tr>
<th>Goal: 7th Grade: Students will evaluate a product demonstrating their knowledge of how cultures use geometric patterns in art to communicate their beliefs and perceptions of the world.</th>
</tr>
</thead>
<tbody>
<tr>
<td>8th Grade: Students will create a product demonstrating their knowledge of how cultures use geometric patterns in art to communicate their beliefs and perceptions to the world.</td>
</tr>
</tbody>
</table>

**Scenario:** The student is placed in a real-world situation in which the student assumes a role with an authentic audience. (Use G.R.A.S.P.S to guide writing the scenario)

<table>
<thead>
<tr>
<th>Scenario: 7th Grade: You are a museum curator-in-training. As part of your final exam at the local university, you need to go to the local museum to look at some unlabeled artifacts. While at the museum take notes on the details of the artifacts. Following your visit to the museum, you will be assigned to do research on one of the artifacts. You will present your findings to your colleagues.</th>
</tr>
</thead>
<tbody>
<tr>
<td>8th Grade: You are a museum curator. A person from your town brings you a piece of ________________. They want to know what culture it is from and if it has any significance. Your job is to reconstruct the artifact to its original state and research where it is from. The artifact, along with a description of its history, will be on display at the museum.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Role: 7th Grade: Museum curator-in-training</th>
</tr>
</thead>
<tbody>
<tr>
<td>8th Grade: Museum curator</td>
</tr>
</tbody>
</table>

**Audience:** Community, public

**Evaluation Criteria:** The student meets the criteria for benchmark proficiency by producing evidence of learning.

<table>
<thead>
<tr>
<th>Product: 7th Grade: Explanation of findings on the artifact</th>
</tr>
</thead>
<tbody>
<tr>
<td>8th Grade: Reconstruction of artifact and explanation of findings on the artifacts</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Criteria:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Finished product</td>
</tr>
<tr>
<td>2. Written explanation</td>
</tr>
<tr>
<td>3. Evidence by comparison to similar examples</td>
</tr>
<tr>
<td>4. Use of appropriate mathematical terms</td>
</tr>
<tr>
<td>5. Identify pattern/origin of artifact</td>
</tr>
</tbody>
</table>
Can You Dig It?

Goal: 7th Grade:

Students will evaluate an artifact demonstrating their knowledge of how cultures use geometric patterns in art to communicate their beliefs and perceptions of the world.

8th Grade:

Students will create a replica of an artifact demonstrating their knowledge of how cultures use geometric patterns in art to communicate their beliefs and perceptions of the world.

Scenario: 7th Grade Students

You are a museum curator-in-training. As a part of your final exam, you need to go to the local museum to look at unlabeled artifacts. While there, take notes on the details of these items. Following your visit to the museum, you will be assigned to do research on one of the artifacts. You should identify what it is, what culture it may have come from, its use, and what significance it has with that culture. Make sure to support your claims with evidence found in your research.

8th Grade Students

You are a museum curator. A local resident has come to you with a fragment of an unusual object found in her yard while gardening. She wonders what it might be and if perhaps it has any value to the museum. Your job is to reconstruct the artifact to what you believe to be its original state. You must also research where it came from, when it was created, what it was used for, and any other significant attributes it may have that would help others to understand the culture it came from.

Evaluation Criteria:

- Accurate reconstruction of artifact (8th Grade)
- Clear written explanation used to identify artifact
• Sufficient evidence given to support identification/origin of artifact
• Correct usage of mathematical terms (symmetry, translation, sequence, etc.) when describing pattern
### Performance Assessment Rubric

<table>
<thead>
<tr>
<th>Benchmark # M-A8:</th>
<th>Benchmark # M-B5:</th>
<th>Benchmark # M-E5: E.8.13; Art: 7/8.4.1</th>
<th>Benchmark # S.S:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>4</strong> The student writes a detailed explanation of how the problem was solved and why the chosen mathematical process was utilized.</td>
<td>The student clearly explains and applies their knowledge of mathematical patterns and sequences to identify geometric patterns found throughout the world. (art, nature, cultures) Detailed evidence is provided to support their reasoning.</td>
<td>The student identifies and demonstrates symmetry, congruency, and motion geometry (translation, reflection, rotation, and transformations). The student compares and contrasts the use of these concepts in at least three or more examples from artwork and cultures.</td>
<td>The student demonstrates a complete and detailed understanding of the history and relationship of art to various cultures and provides new insights into some aspect of this information through comparing and contrasting select examples.</td>
</tr>
<tr>
<td><strong>3</strong> The student writes a clear explanation of process used to solve the problem and the rationale for using that mathematical process.</td>
<td>The student clearly explains and applies their knowledge of mathematical patterns and sequences to identify geometric patterns found throughout the world. (art, nature, cultures) Evidence is provided to support their reasoning.</td>
<td>The student identifies and demonstrates symmetry, congruency, and motion geometry (translation, reflection, rotation, and transformations). The student compares and contrasts the use of these concepts in at least two examples from artwork and cultures.</td>
<td>The student displays a complete and accurate understanding of the history and relationship of art to various cultures.</td>
</tr>
<tr>
<td>Level</td>
<td>Description</td>
<td></td>
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</tr>
</tbody>
</table>
| 2     | The student has difficulty writing a clear explanation of the process used to solve the problem and/or rationale for using that mathematical process.  
The student explains their knowledge of mathematical patterns and sequences to identify geometric patterns found throughout the world, but uses little or no evidence to support their reasoning.  
The student makes errors when identifying and/or demonstrating symmetry, congruency, and motion geometry (translation, reflection, rotation, and transformations). These errors limit their ability to effectively compare and contrast the use of these concepts in a multicultural setting.  
The student displays an incomplete understanding of the history and relationship of art to various cultures or has some misconceptions about the information. However, the student maintains a basic understanding. |
| 1     | The student can only write an explanation of the process used to solve the problem and/or rationale for process when given assistance.  
The student attempts to explain and apply their knowledge of mathematical patterns and sequences, but makes critical errors.  
The student needs teacher assistance identifying and/or demonstrating symmetry, congruency, and motion geometry (translation, reflection, rotation, and transformations).  
The student demonstrates a very limited understanding of the history and relationship of art to various cultures or has numerous misconceptions about the information. |
**Unit Title:** Can You Dig It?  
**Lesson #:** 1-Mayan Bingo

**Key concept/understanding/skill:** Compare our place value system to the Mayan place value system

**Materials/Resources:** See instructional plan section

**Neville Public Museum Artifact:** Mayan Stela and Glyphs

**Classroom Setup:** Divide the classroom into 2 or 3 person teams to try Mayan math. Bingo game is played individually.

**Instructional Plan:** Can be use for 7th, 8th, and Special Education

**Materials/Resources:**
1. Bingo sheet (blank)
2. Popsicle sticks
3. dry beans
4. macaroni shells
5. Worksheet for assessment
7. Book: Native American Arts & Culture
8. Overhead projector

**Instructional Plan:**
**Day 1**
1. Review place value of whole numbers.
2. Identify our numerical system as being Hindu/Arabic
3. Use the overhead to introduce the students to the Mayan numerical system
4. Distribute beans, macaroni, and Popsicle sticks to each group. Have them practice writing Mayan numerals. One person (the farmer/merchant) quotes the price. The second person (customer) pays using the correct combination of sticks, beans, and shells. The third person records the Mayan numeral on the chart. The group switches roles every six minutes in order to complete the chart. Complete the 0-19 chart only.

**Day 2**
5. Discuss the Mayan numeral system, focusing on the numbers 20-30.
6. Distribute charts (20-30) for small groups to finish.
7. Once the group is done, they can create their own bingo cards. Students write, in Mayan numerals, any numbers between 0-30.
8. Once all groups are done, play bingo. Use beans as markers.
9. Teacher says a number between 0-30. Students need to know Mayan equivalence to it.
10. First person with a completed row wins.

**Note:** Special Education Suggestion- Only do numbers 0-19. Reference page in “Native American Arts and Culture”. Bingo card can be made for the students prior to lessons. They will then have to find the numeral and place a bean on it.
**Constructivist Principles:** Principle #2: Structure learning around primary concepts.

**Assessment Connection:** Constructed Response-Worksheet

**Teacher notes/reflections:**
**Unit Title:** Patterns, Predictions, and Discoveries  
**Lesson #:** 2-Mayan Birthday  

**Key concept/understanding/skill:** Comparing how different cultures record historical events (social studies emphasis)

**Materials/Resources:** See instructional plan section

**Neville Public Museum Artifact:** Mayan Stela and Glyphs

**Classroom Setup:** Students work individually

**Instructional Plan:** For use with 7th Grade and Special Education

**Materials/resources:**
2. Book: Secrets in Stone: All About Maya Hieroglyphs
3. Glyph worksheet
4. White construction paper
5. Colored pencils or crayons
6. Black marker or pen (for outlining)
7. Video "Lost Kingdom of the Mayas"

**Instructional Plan:**
1. Show video "Lost Kingdom of the Mayas"
2. Give student worksheet "The Mayan Numeration System"
3. Show students examples of Mayan glyph messages (reference- "Secrets in Stone")
4. Have students create glyph picture of an important date (ex. date of birth) in their lifetime. Use "Mayan Numeration System" worksheet as a model for the glyph picture.
5. Color with 2 colored pencils or crayons and outline in black pen or marker.
6. Colors chosen should reflect the student's personality:
   - Blue-water/sky/peaceful
   - Yellow-corn/purity/friendship
   - Red-blood/life
   - Green-earth/energy/nature

**Constructivist Principles:** Principle #3- Seeking and valuing student's point of view.

**Assessment Connection:** Personal communication
Teacher notes/reflections:
**Unit Title:** Patterns, Predictions, and Discoveries  
**Lesson #:** 3-Sequences and Patterns  
**Time:** 2-3 Days

**Key concept/understanding/skill:** Use sequences to describe geometric patterns. Learn how to write rules for sequences. Translate rules into algebraic equations.

<table>
<thead>
<tr>
<th><strong>Materials/Resources:</strong></th>
<th>See Instructional Plan Section</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Neville Public Museum Artifact:</strong></td>
<td>Hmong Flower Cloth, Quilt, Rug</td>
</tr>
</tbody>
</table>

**Classroom Setup:** Small groups of 3-4 students; 6 work stations

<table>
<thead>
<tr>
<th><strong>Instructional Plan:</strong></th>
<th>For use with 7th grade and Special Education</th>
</tr>
</thead>
</table>

**Materials/Resources:**
1. "MathThematics: Book 2" textbook
2. graph paper
3. 2 colored pencils
4. ruler
5. notebook

**Instructional Plan:**
1. Setting the stage..read and discuss the information on pages 14-16 in textbook, "Modeling Sequences"
2. Students will complete Exploration 1 problems pages 21-21, numbers 1-11.
   a. Predict number sequence and shape sequence patterns.
   b. Write rules to describe patterns
   c. Write equations to represent those patterns
3. Show students examples of art from various cultures that have geometric patterns. A resource can be found at [http://www.sarakuehn.com/](http://www.sarakuehn.com/)
4. Divide students into small groups (3-4)
5. Students will rotate to the 6 stations that each display a particular culture's art. (Hmong, Native American, Islamic, Quilts (USA-Amish, etc), Japan, Africa,..)
6. At each station, the students take notes describing the artwork.
7. Each group will share their findings with the class.

**Note:** For Special Education- depending on the level of your students, you may want to exclude the written part from the textbook and replace it with a class discussion talking about what they see and notice about different patterns. Ask them to see if they can come up with a rule for what they see. You can write the rules on the board. They would not necessarily need to write an equation. They will still be able to complete the station activity.
**Constructivist Principles:**
Principle #2- Structure learning around primary concepts.
Principle #3- Seeking and valuing students' point of view.

**Assessment Connection:** Constructed response

**Teacher notes/ reflections:**
Unit Title: Patterns, Predictions, and Discoveries  
Lesson #: 4- The Fibonacci Sequence  
Time: 1 Day

Key concept/understanding/skill: The Fibonacci sequence and how it relates to nature

Materials/Resources: See instructional plan section.

Neville Public Museum Artifact: Nautilus Shell

Classroom Setup: Individual or groups

Instructional Plan: For 7th, 8th, and Special Education

Materials/Resources:
1. "MathThematics: Book 3" textbook
2. "Mathematics: Teaching in the Middle School". Jan/97. pg. 161

Instructional Plan:
1. Setting the stage..Introduce Leonardo Fibonacci. Who was he? What did he do?
2. Use "At Home with Fibonacci" pg. 161. Individuals or partners work to read and discuss questions 1-3 on pg. 161.
3. Students answer the questions and share the results with the class to check for accuracy.
4. Share with students how Fibonacci's sequence can be found in nature (plants, seashells, pinecones, etc.). As an extension or homework, have the students bring an example to class.
5. Create a Fibonacci sequence poem using syllables that correlate with the sequence.
6. Share/collect poetry the next day.

Note: For Special Education- You may want to do the pg.161 activity as a class, especially the reading and interpreting the questions. Depending on your student levels, you may need to omit a few of the items and cover as a class. It may help to discuss the sequence to see what they notice about it. Have them design a sequence and explain how they came up with it.

Constructivist Principles: Principle #1- Posing problems of emerging relevance to students

Assessment Connection: Constructed response, Extended task

Teacher notes/ reflections:
Unit Title: Patterns, Predictions, and Discoveries  
Time: 2 Days

Lesson #: 5 - Reflections & Symmetry

Key concept/understanding/skill: To identify a reflection and lines of symmetry

Materials/Resources: See Instructional Plan section

Neville Public Museum Artifact:

Classroom Setup: Small groups of 3-4 students

Instructional Plan: For 7th grade & Special Education

Materials/Resources:
1. "MathThematics: Book 2" text
2. Yes/No/Maybe chart
3. Scissors
4. Colored pencils
5. Green, yellow, red construction paper squares
6. Envelops with pictures, letters or numbers inside

Instructional Plan:
Day 1:
1. Setting the stage..Introduce the concepts of line symmetry and reflection (textbook reference pgs. 266-271)
2. Distribute Yes/No? maybe charts and divided students into groups of 3-4 students.
3. Give the students 5-8 minutes with each of the following envelops: numbers, letters, basic shapes, artwork/pictures, words (palindromes).
4. Students classify cards in envelops as yes (symmetry), no (not symmetrical), maybe (not sure). Yes = green square, No = red square, Maybe = yellow square
5. Students record at least 2-3 samples of each kind on their yes/no/maybe chart

Day 2:
7. Discuss yesterday's findings.
8. Find pictures in magazines that have line symmetry or reflection.
9. Chooses one picture and cut it in half.
10. By hand, sketch, and color the "missing half", following the rules of symmetry.

Note: For Special Ed- While introducing the concepts, use examples similar to those they will see in the envelops. Possibly introducing the concept of mirrors to help illustrate the idea of reflection. If the students struggle with the idea of line symmetry, use shapes or pieces of paper that they can fold or manipulate.
**Constructivist Principles:** Principle #2- Structure learning around primary concepts

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<thead>
<tr>
<th>Assessment Connection:</th>
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<tbody>
<tr>
<td>Constructed response</td>
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<tr>
<td>Product (magazine activity)</td>
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<tr>
<td>Structured observation (checklist)</td>
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</tbody>
</table>

**Teacher notes/reflections:**
Unit Title: Patterns, Predictions, and discoveries          Time: 2 Days
Lesson #: 6-Rotational Symmetry

Key concept/understanding/skill: Describe rotational symmetry and identify the minimum rotational symmetry of a shape.

Materials/Resources: See Instructional Plan section

Neville Public Museum Artifact:

Classroom Setup: Day 1: Individual or partner
Day 2: Small groups of 3 or 4

Instructional Plan: For 7th grade & Special Education

Materials/Resources:
1. "MathThematics: Book 2" textbook
2. Tracing paper
3. Green, Yellow, Red construction paper squares (can be same as from lesson 5)
4. Yes/No/Maybe charts
5. Envelops with pictures, numbers, letters, etc. (can be same as from lesson 5)
6. Overhead projector and blank overheads

Instructional Plan:
Day 1:
1. Setting the stage..Introduce the concept of rotational symmetry (textbook reference pgs. 262-265).
2. Use the overhead to model rotational symmetry (by tracing shapes on a blank overhead and rotating them).
3. Students use tracing paper to determine rotational symmetry of a variety of shapes and letters (on overhead)

Day 2:
4. Discuss the findings from yesterday
5. Distribute Yes/No/Maybe charts and divided students into groups of 3-4 students.
6. Give the students 5-8 minutes with each of the following envelops: numbers, letters, basic shapes, artwork/pictures, words (palindromes).
7. Students classify cards in envelops as yes (symmetry), no (not symmetrical), maybe (not sure). Yes = green square, No = red square, Maybe = yellow square
8. Students record at least 2-3 samples of each kind on their yes/no/maybe chart
**Constructivist Principles:** Principle #2- Structure learning around primary concepts

**Assessment Connection:**
- Constructed response
- Structured observation (checklist)

**Teacher notes/ reflections:**
Unit Title: Patterns, Predictions, and Discoveries
Lesson #: 7-Transformations

Key concept/understanding/skill: Understand the attributes of transformations (translation, reflection, rotation, glide reflection)

Materials/Resources: See Instructional Plan section

Neville Public Museum Artifact:

Classroom Setup: Individuals or partners

Instructional Plan: For 7th, 8th, & Special Education

Materials/Resources:
1. Activity #1 sheet (1 per student)
2. Tag board squares for stencils
3. Stencil of an asymmetrical shape (example-sailboat)
4. Scissors
5. Overhead projector

Instructional Plan:
1. Students will cut out the stencil design (tag board squares)
2. Model (on the overhead) each kind of transformation, one at a time.
3. Provide students adequate time to practice each transformation (on activity #1 sheet) before moving on.
4. Activity is completed when there are 4-5 stencils drawn in each row.
5. Share examples of strip patterns found in Islamic and Native American art.
6. Have students create their own strip pattern design using colored construction paper or magazine cut outs.

Note: Special Ed. Suggestions- Have stencils pre-cut, especially for those with motor deficits. Use stampers and ink instead of stencils for activity #1 sheet and for their strip pattern. Also as you are demonstrating on the overhead, students can be manipulating shapes, letters, etc. at their desks.

Constructivist Principles: Principle #2-Structure learning around primary concepts

Assessment Connection:
Constructed response
Product
**Unit Title:** Patterns, Predictions, and Discoveries

**Lesson #:** 8-Tessellations

**Time:** 2 Days

**Key concept/understanding/skill:** Understanding what a tessellation is and how to create one.

**Materials/Resources:** See Instructional Plan section

**Neville Public Museum Artifact:** Rug

**Classroom Setup:** Individual

**Instructional Plan:** For 7th, 8th, & Special Education

**Materials/Resources:**
1. Tape
2. Scissors
3. Markers
4. Tag board
5. Index Cards
6. "MathThematics: Books 2 and 3" textbook
7. "Multicultural Mathematics Ideas" pgs. 121-122
8. Computer lab/internet

**Instructional Lesson:**

**Day 1:**
1. Setting the stage..Introduction of concept of tessellation.
2. Share examples of M.C. Escher's (Dutch artist) artwork.
3. Go to the computer lab to investigate Tessellate! website.

**Day 2:**
4. Discuss yesterday's website activity.
5. Model how to alter a regular polygon into an interesting shape that will tessellate.
6. Students create their own shape to design a tessellation.
7. Finish tessellation by adding detail and color.

Note: Special Education Suggestion: Have examples of the various stages of creating a tessellation and altering one shape to become another. Also have examples of finished products. Maybe only use the rectangular shape of an index card.

**Constructivist Principles:** Principle #2-Structure learning around primary concepts

**Assessment Connection:** Product
**Unit Title:** Can I Dig It?  
(8th Gr.)  

**Time:** 1-2 Days  
**Lesson #:** 1  

**Key concept/understanding/skill:** Compare the Hindu-Arabic numeration system with ancient number systems of the Egyptians, Romans, and Mayans.

**Materials/Resources:** See Instructional Plan

**Neville Public Museum Artifact:** Mayan Stelas.

**Classroom Setup:** Desks will be set up in pairs.

### Instructional Plan:

**Materials:** Overhead transparencies/markers; Ancient Numeration System worksheet packets  
**Resources:** Mathematics for Elementary Teachers, pg 40-42  
Multicultural Mathematical Ideas (Berken), pg. 3-7  
Hands-On Math Projects with Real-Life Applications, pg. 116-120  
Secrets in Stone (Book about Mayan culture)

Begin by explaining that many ancient civilizations have contributed to the development of mathematics and the number system we use today.

1. Review place value of whole numbers.  
2. Identify our numeration system as Hindu-Arabic.  
3. Use the overhead to introduce ancient number systems of the Egyptians, Romans and Mayans.  
4. Discuss advantages/disadvantages of each system.  
5. Distribute worksheets that include samples of these number systems. Students will complete the chart expressing the given numbers in the other number systems.  
6. Students will compare their chart with a classmate.  
7. Partner Activity - Perform an arithmetic operation using each of the number systems.  
8. Share session: compare solutions with rest of class; discuss level of difficulty among the systems. Reflect on the wisdom of ancient cultures. Write thoughts into math journal.

**Constructivist Principles:** Structured learning around primary concepts.

**Assessment Connection:** Constructed Response

**Teacher notes/ reflections:**
Ancient Number Systems

Throughout history different cultures have devised and used unique methods of numeration and arithmetic relationships. In fact, many ancient civilizations have contributed to the development of mathematics and the number system we use today.

Numeration Systems

The tally numeration system is very simple. It is composed of single strokes, one for each object being counted.

An advantage of this system is how simple it is, however it has some disadvantages too. For example, what number is represented by these tally marks?

Can you think of two disadvantages the tally numeration has?

1. 
2. 

The tally system was improved by the introduction of grouping. The fifth tally mark was placed across every four to make a group of five. Thus, the numeral above can be written as follows:

Grouping clearly makes it easier to recognize the number being represented.

The Egyptian numeration system (3000 B.C.) grouped by ten. In addition, it introduced new symbols for powers of ten using hieroglyphics.
Examples of some Egyptian numerals are shown below. Notice how this system required far fewer symbols than the tally system once numbers greater than 10 were represented. This system is also an additive system since the values for the various individual numerals are added together.

\[ \underline{\text{Egyptian Numerals}} \]

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Value</th>
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<tbody>
<tr>
<td>𓏪</td>
<td>1000</td>
</tr>
<tr>
<td>𓏫</td>
<td>500</td>
</tr>
<tr>
<td>𓏬</td>
<td>100</td>
</tr>
<tr>
<td>𓏭</td>
<td>50</td>
</tr>
<tr>
<td>𓏮</td>
<td>10</td>
</tr>
<tr>
<td>𓏯</td>
<td>1</td>
</tr>
</tbody>
</table>

Notice that the order in which the symbols are written is immaterial. A major disadvantage of this system is that computation is very cumbersome. The following addition problem uses 51 individual Egyptian numerals, whereas our system requires only 10 numerals.

321 + 1,120,013

The Roman numeration system also uses additive grouping and has many symbols. The basic Roman numerals are the following:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>1</td>
</tr>
<tr>
<td>V</td>
<td>5</td>
</tr>
<tr>
<td>X</td>
<td>10</td>
</tr>
<tr>
<td>L</td>
<td>50</td>
</tr>
<tr>
<td>C</td>
<td>100</td>
</tr>
<tr>
<td>D</td>
<td>500</td>
</tr>
<tr>
<td>M</td>
<td>1000</td>
</tr>
</tbody>
</table>

Roman numerals are made up of combination of these basic numerals, as illustrated:

\[ CCLXXXI = 281 \quad MCVIII = 1,108 \]

Notice that the values of these Roman numerals are found by adding the values of the basic numerals. For example, MCVIII means 1000 + 100 + 5 + 1 + 1 + 1, or 1,108.

Two new attributes that were introduced by the Roman system were a **subtractive principle** and a **multiplicative principle**. Both of these principles allow the system to use fewer symbols to represent a number.

The subtractive principle permits the following simplifications using combinations of basic Roman numerals:

- \[ IV \] (I to the left of V means five minus one) for 4 rather than using \[ IIII \]
- \[ IX \] (ten minus one) for 9 instead of \[ VIII \]
- \[ XL \] for 40, \[ XC \] for 90, \[ CD \] for 400, and \[ CM \] for 900
To evaluate a complex Roman numeral, look to see if any of these subtractive pairs are present, group them together mentally, and then add values from left to right. For example,

\[ \text{MCMXLIV} \]

think \( \text{M CM XL IV} \) - which is one thousand nine hundred forty-four

*Without the subtractive principle, 14 individual Roman numerals would be required to represent 1,944 instead of the seven used in \( \text{MCMXLIV} \).

Also, because of the subtractive principle, the Roman system is a positional system since the position of a numeral can affect the value of the number being represented. For example, \( \text{VI} \) is six, whereas \( \text{IV} \) is four.

**Practice.** Express the following Roman numerals in our numeration system.

\[
\begin{align*}
\text{MCCCXLIV} &= \\
\text{MMCMXCIII} &= \\
\text{CCXLIX} &=
\end{align*}
\]

The **multiplicative principle** permitted the use of a horizontal bar above a numeral to represent 1000 times the number. For example \( \text{V} \) meant 5 times 1000 or 5,000; \( \text{XI} \) meant 11,000; and so on.

The **Mayan numeration system** introduced two new attributes that were not present in the systems above, namely **place value** and a symbol for **zero**.

The Mayan system used only three symbols:

a dot to represent **one**; a horizontal bar to represent **five**; and a conch shell to represent **zero**.

They used these three symbols, in combination, to represent the numbers 0 to 19 as illustrated.
For numbers greater than 19, they used a base 20 system. That is, they grouped in twenties and displayed their numerals vertically. Sample Mayan numbers are shown.

\[ \begin{array}{c}
\cdot \\
\cdot \cdot \\
20^3 \text{ or } 8000 \\
\cdot \\
\cdot \cdot \\
20^2 \text{ or } 400 \\
\cdot \\
\cdot \\
20 \\
\cdot \\
\cdot \\
1
\end{array} \]

Notice in the Mayan numeration system, you must take great care in the way the numbers are spaced.

**Practice.** Express the following numbers in Mayan numerals.

17 = \rule{1cm}{0.2pt} \\
51 = \rule{1cm}{0.2pt} \\
401 = \rule{1cm}{0.2pt}

The Hindu-Arabic numeration system that we use today was developed about A.D. 800. Our system has the following attributes:

**Digits:** 0, 1, 2, 3, 4, 5, 6, 7, 8, 9. These ten symbols or digits can be used in combination to represent all possible numbers.

**Decimal System:** Grouping into sets of ten is a basic principle of this system. Ten ones are replaced by one ten, ten tens are replaced by one hundred, ten hundreds are replaced by one thousand, and so on.

**Place Value:** Each of the various places in a numeral has its own value. For example:

In the number 6,523 - the 6 represents 6 thousands, 
the 5 represents 5 hundreds, 
the 2 represents 2 tens, and 
the 3 represents 3 ones.

**Additive and Multiplicative:** The value of a Hindu-Arabic numeral is found by multiplying each place value by its corresponding digit and then adding all the resulting products.

Ex. \( 6 \times 1000 + 5 \times 100 + 2 \times 10 + 3 \times 1 = 6,523 \)

Notice that our numeration system requires fewer symbols to represent numbers than earlier systems. Also, the Hindu-Arabic system is far superior when performing computations.
Complete the following chart expressing the given numbers in other numeration systems.

<table>
<thead>
<tr>
<th>Hindu-Arabic</th>
<th>Egyptian</th>
<th>Roman</th>
<th>Mayan</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>CXLIV</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>726</td>
<td></td>
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</tbody>
</table>

Perform arithmetic operations using the Egyptian, Roman, and Mayan numeration systems.
**Unit Title:** Can You Dig It?  
*(8th Gr.)*

**Time:** 3-4 Days  
**Lesson #:** 2

**Key concept/understanding/skill:** Use Sequences to describe geometric patterns; write rules for sequences and translate rules to algebraic expressions.

**Materials/Resources:** See Instructional Plan

**Neville Public Museum Artifact:** Patterns displayed among several cultures

**Classroom Setup:** Groups of three; work stations

**Instructional Plan:**
Materials: Math Thematics, Book 3 - pg. 238-46; Labsheets 1A and 1B; ruler; 4 different colored pencils; protractor; compass; scissors; plain white paper; black paper
Resources: Math Thematics Book 3; Video: Being Hmong Means Being Free

Students will explore fractal patterns and other patterns in the world.

1. Setting the stage..read and discuss pg. 238. Define term - fractal.
2. Students will complete Exploration 1 - pg. 239-40.
   *Draw a fractal tree - (Labsheet 1A)*
   *Describe sequences/Write rules using a variable*
3. Students will complete Exploration 2 - pg. 241-44.
   *Construct triangles using compass/Apply the triangle inequality principle*
4. Students will complete Exploration 3 - pg. 244-46.
   *Construct perpendicular bisectors*
   *Make a Sierpinski triangle - (Labsheet 1B)*
5. Show "Being Hmong Means Being Free" video/ Discussion
6. Share geometric patterns found in art among various cultures in workstations around room.
7. Students will note distinctive patterns found in art pieces. Share findings with class.

**Constructivist Principles:** Structure learning around primary concepts  
Seeking and valuing students point-of-view

**Assessment Connection:** Constructed Response; Product

**Teacher notes/Reflections:**
Unit Title: Can You Dig It?  
(8th Gr.)

Time: 1-2 Days  
Lesson #: 3

Key concept/understanding/skill: Fibonacci sequence and how it relates to nature and art.

Materials/Resources: See Instructional Plan

Neville Public Museum Artifact: Nautilus Shell, plant display

Classroom Setup: Desks will be set up in pairs.

Instructional Plan:
Materials: Math Thematics, Book 3 - pg. 256-57; Worksheets - The Chambered Nautilus, The Fibonacci Rabbit Problem, Golden Explorations

Resources: Math Thematics, Book 3 text; Mathematics Teaching in the Middle School Journal, January, 1999 - pg. 256-262

1. Setting the stage. Have a display of several items with patterns containing Fibonacci sequence. Introduce Leonardo Fibonacci. Give brief biography.
2. Partners solve the Fibonacci rabbit problem. Identify the Fibonacci sequence.
3. Students will then complete The Chambered Nautilus worksheet to discover the golden rectangle.
4. Each student will complete the activities from the workpage, Golden Explorations, found in the Jan. 1999 issue of Mathematics Teaching in the Middle School - pg. 259-60. (golden ratio)
5. Partners will author a Fibonacci poem, using syllables to correlate with the sequence.
7. Extension activity: Draw a basket, vase, or other object using the principle of the golden ratio in its design and dimension. (Could also do a paper weaving)
8. Provide a written explanation of how design agrees with the definition of golden ratio.

Constructivist Principles: Posing problems of emerging relevance to students

Assessment Connection: Constructed Response; Product and Extended Task

Teacher notes/reflections:
Unit Title: Time: 2 Days Lesson #: 4 (8th Gr.)

Key concept/understanding/skill: Describe/identify rotational symmetry and give the minimum rotational symmetry of a shape.

Materials/Resources: See Instructional Plan

Neville Public Museum Artifact: Flower Cloth - Paj ntaub (Pon dow)

Classroom Setup: Group the desks in pairs.

Instructional Plan:
Materials: Math Thematics, Book 3 - pg. 258-267; Labsheet 2A; Protractor, Worksheets - Flag emblems, Exploring Lines of Symmetry, and Hmong Design Motifs; colored paper; plain white paper; scissors

Resources: Math Thematics, Book 3; Multicultural Mathematical Ideas (Berken)
Go to: www.laofamily.org
Go to: www.askasia.org/AsianArt

1. Setting the stage. Review line symmetry and reflection. Worksheet 1: Exploring Lines of Symmetry (Multicultural Mathematical Ideas -pg. 145)
2. Complete Exploration 1 - pg. 258-59.
   *Learn concept of rotational symmetry (Labsheet 2A)
3. Identify types of symmetry and give the minimum rotation of given flag emblems.
4. Share examples of rotational symmetry used in the art work of various cultures.
5. Display samples of Hmong Paj ntaub (Pon dow) Discuss how rotational symmetry is prevalent in Hmong design motifs. Share meanings of symbols used in their designs.
6. Distribute worksheet of design motifs found in Hmong art.
7. Model how to create a paper Paj ntaub.
8. Students will create original paper Paj ntaub squares using authentic Hmong design motifs and rotational symmetry.

Constructivist Principles: Structured learning around primary concepts.

Assessment Connection: Constructed Response; Product
Teacher notes/reflections:
**Unit Title:** Can You Dig It?  
**Time:** 1 Day  
**Lesson #:** 5 (8th Gr.)

**Key concept/understanding/skill:** Understand the attributes of transformations - translation, reflection, rotation, and glide reflection

**Materials/Resources:** See Instructional Plan

**Neville Public Museum Artifact:** Rug, Islamic Art

**Classroom Setup:** Desks will be set up in pairs.

**Instructional Plan:**
Materials: Activity 1 Worksheet (translations); tag board squares - 2"x2"; scissors; Worksheets - Exploring Rotational and Reflectional Symmetry and Exploring Symmetry of Rigid Motion that Create Strip Patterns

Resources: Multicultural Mathematical Ideas (Berken) - pg. 148-150; Go to: [www.sarakuehn.com](http://www.sarakuehn.com) (Islamic Art)

1. Students will be instructed to cut out an asymmetrical stencil design from tag board square.
2. Using stencil, model each kind of transformation on the overhead or dry-erase board. (translation, vertical reflection, horizontal reflection, rotation, combinations)
3. Provide students adequate time to practice each type modeled using the Activity 1 worksheet.
4. Students will complete 4-5 stencils of each in a row to begin a strip pattern.
5. Students will then label each of their strips with the type of rigid motion illustrate.
6. Volunteers may show their patterns.
7. Show examples of strip patterns found in Islamic and Native American art.
8. Encourage students to look for strip patterns in their own environment..at school, at home, in the community, etc. Share with class in up-coming days.

**Constructivist Principles:** Structured learning around primary concepts.

**Assessment Connection:** Constructed Response; Product

**Teacher notes/reflections:**
**Unit Title:** Can You Dig It?  
**Time:** 2 Days  
**Lesson #:** 6 (8th Gr.)

*Key concept/understanding/skill:* Apply the attributes of transformations - translations, reflection, rotation, and glide reflections.

**Materials/Resources:** See Instructional Plan

**Neville Public Museum Artifact:** Rug

**Classroom Setup:** Desks will be set up in pairs.

**Instructional Plan:**

Materials: Graph paper; colored pencils; ruler; scissors; beads (#10); sewing needle (#10); sewing thread - medium weight; nylon beading thread; bead looms or instructions and supplies to make a cardboard loom;

Resources: Multicultural Mathematical Ideas (Berken) - pg. 151-162; Native American Arts and Culture Activity Book; [http://nativetech.org/beadwork/beadgraph/](http://nativetech.org/beadwork/beadgraph/)

1. Students will create a design for beading on graph paper. They will apply a rigid motion to the design in order to create one that illustrates one of the 7 distinct strip patterns.  
   *Follow directions on handout taken from Multicultural Mathematical Ideas book - pg. 159*
2. After students have completed their designs, model how to bead a bracelet on a loom.
3. After watching this demonstration, students will be given handouts with detailed instructions to make their own bracelet (or belt) on a loom, using their strip pattern.
4. Students will be provided time (1-2 days) to complete their beaded bracelet or belt.
5. Display finished items.

**Constructivist Principles:** Structured learning around primary concepts.

**Assessment Connection:** Product; Unstructured Observation (video)

**Teacher notes/ reflections:**
### Individual Record Keeping

<table>
<thead>
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<th>Name:</th>
<th>Class:</th>
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<th>Benchmark # M-E5:</th>
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### Benchmark M-A8: Explains to others in writing the process and rationale used to find a solution

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<tbody>
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<td># of students at 1</td>
<td>X1=</td>
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<tr>
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<td>X2=</td>
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<table>
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% growth (total score of final/total score of baseline-100%) = % growth

### Benchmark M-B5: Understands basic number theory concepts

*focus on patterns and sequences*

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### Benchmark M-E5: Understands geometric transformations of figures

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Page 1 of 2
### Can You Dig It?

**Teacher:**       
**Class:**

**Benchmark**  
S.S : E.8.13  
Art : 7/8.4.

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**Benchmark**  
S.S : E.8.13  
Art : 7/8.4.

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**Teacher Comments:**
### Class Recording for Unit Benchmarks

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<th>Benchmark 2: M-B5: Understands basic number theory concepts *focus on patterns and sequences</th>
<th>Benchmark 3: M-E5: Understands geometric transformations of figures</th>
<th>Benchmark 4: S.S : E.8.13 Art : 7/8.4.</th>
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Resources
Can You Dig It? Patterns, Predictions, and Discoveries

Textbooks:


Other Approved Sources:

“*Mathematics: Teaching in the Middle School*”. Jan’97. pg. 161

“*Mathematics: Teaching in the Middle School*”. Jan’99. Pgs. 256-262


*Native American Arts and Culture: Grade 4-8.* Teacher Created Materials, Inc.

Neville Museum Artifact:

**Beaded Belt, ca. 1925**

**Bamboo Rug, ca. 1908**
Beaded Sash, ca. ?
Flower Cloth, Paj Ntaub (Pon Dow), from the collection of Bernadette A. Berken
Mayan Stela, Mark Dix, ca. 2002
Nautilus Shell, from the collection of the Neville Public Museum
Quilt, ca. 1890
Quilt, ca. 1935

Library Resources:

*Secrets in Stone: All About Maya Hieroglyphs.* Coulter, Laurie

Video & Other AV Materials:

*Being Hmong Means Being Free*

*Lost Kingdom of the Mayas*
Websites:

www.shodor.org
Tessellate! Website. Explore tessellations and create your own.

www.halfmoon.org
Mayan Hieroglyph page

www.historylink101.com
History link about various cultures

www.askasia.org/AsianArt
Samples of Hmong Textiles

www.sarakuehn.com
Samples of Central Asian and Islamic Textiles and works of art.

www.nativetech.org/beadwork/beadgraph
Interactive beadwork designer

www.laofamily.org
Interactive Hmong design game