INDIGENOUS WISDOM:
CENTURIES OF PUEBLO IMPACT IN NEW MEXICO

A Pueblo-Based Educational Curriculum • IndianPuebloEducation.org

ELEMENTARY SCHOOL CURRICULUM

2nd Edition

Title of Unit: Mathematics: Our Creator's Gifts

Content Area: Mathematics

Grade Level: 2-3

Author: Nola Miller

Co-Editors:
Azella Humetewa, MBA-Ed. (Kewa/Acoma)
K-8 Head of School, Native American Community Academy

Glenabah Martinez, Ph. D. (Taos/Diné)
Director, UNM Institute for American Indian Education
Associate Professor, Department of Language, Literacy and Sociocultural Studies - UNM

Natalie Martinez, Ph. D. (Laguna)
UNM Institute of American Indian Education, Faculty Member

Christine Sims, Ph. D. (Acoma)
UNM Institute of American Indian Education
Associate Professor, Department of Language, Literacy and Sociocultural Studies – UNM

Section A: Introductory Materials

Name: Nola Romero-Miller
Title of Unit: Mathematics: Our Creator's Gifts
Content Area: Mathematics
Grade Levels: Elementary (Grade 2 - 3)

Rationale:
Our Pueblo families use math in their everyday existence. This practice has enabled our culture, language, and traditions to continue to thrive after 100 years of New Mexico statehood. Pueblo ancestors used the knowledge and wisdom they gained from the natural world. Today, many of our youth are unaware of the everyday applications of math in their daily lives. This unit is designed to help students reconnect with the knowledge that our Pueblo People were mathematicians who adapted to their needs in order to sustain a way of life for generations.

Unit Goals:

1. Students will be able to illustrate the various ways in which their families use math in everyday life.
2. Students will be able to explore the various geometric attributes of a Pueblo fireplace.
3. Students will be able to create a geometrical design on a pair of moccasins using congruency and the line of symmetry.

Standards:

Common Core Standards	Common Core Standards for Mathematical Practice
CCSS 2.G.A.1 CCSS 2.MD.A.1 CCSS 3.G.A.1	CCSS.MATH.PRACTICE.MP4 CCSS.MATH.PRACTICE.MP5 CCSS.MATH.PRACTICE.MP7
CCSS 3.NF.A.1	
CCSS 3.MD.A.1	

Section B: Lesson Plan One
Title: How does My Family Use Math?
Duration: 60 minutes
Grade Level: 2 - 3

Learning Objectives:

1. Students will be able to illustrate the various ways in which their families use math in their everyday lives.

Prerequisite Skills and Knowledge:

1. Reading and Writing
2. Drawing

Materials and Resources:

1. White board
2. Paper
3. Markers/Crayons
4. Attachment #1 Fry bread
5. Attachment # 2Photo of Adobe Bricks
6. Attachment # 3Photo of textile
7. Attachment # 4 Assessment Graphic Organizer: How My Family Uses Math
8. Attachment # 5 Rubric
9. https://www.youtube.com/watch?v=6Hk4TPwq_R0

Guiding Question

1. In what ways does my family use math in everyday life?
2. How is this important to me?

Core Values: Love and Respect; A Way of Life and Family

Procedure:

1. Beginning activity
    a. Ask students how their families use math in everyday life.
        i. Allow enough time for students to think, pair, and share.
        ii. Write the students responses on the board.
        iii. Examples
            1. Making dinner
            2. Building
            3. Art work
2. Introduce the YouTube video listed in the resources. Let your students know that making bread is a common practice in most Pueblo families. This is an example of how families use math on a daily basis. Emphasize the math that students will see as the woman is making fry bread.
        i. Watch the video
        ii. Record responses of math observed in the video
    b. Help students make connections to how math is used in their families and community, every day through building, cooking, sewing, gardening, etc.
    c. Encourage students to describe their experiences,
3. Repeat the same activity using attachments two and three. Ask what kind of math might be used in making adobes, or building with adobes for example, and making a geometric weaving or design.

Assessment

Using Attachment 4

1. Students create an illustration of how their family uses math in everyday life.
2. Students will write how each activity relates to a math skill and explain why it is important.

Modifications:

1. Timing accommodations: Give more time to complete a task as well as extra time to process oral information and directions.
2. Scheduling accommodations: Give more time to complete a project and in small phases.
3. Use sentence:
    a. My family uses math when they_____.
    b. They use_____.
    c. It is important to my family because_____.
4. Provide visual aids: Use pictures or graphics.
5. Show a model of assessment.

Notes to Teacher:

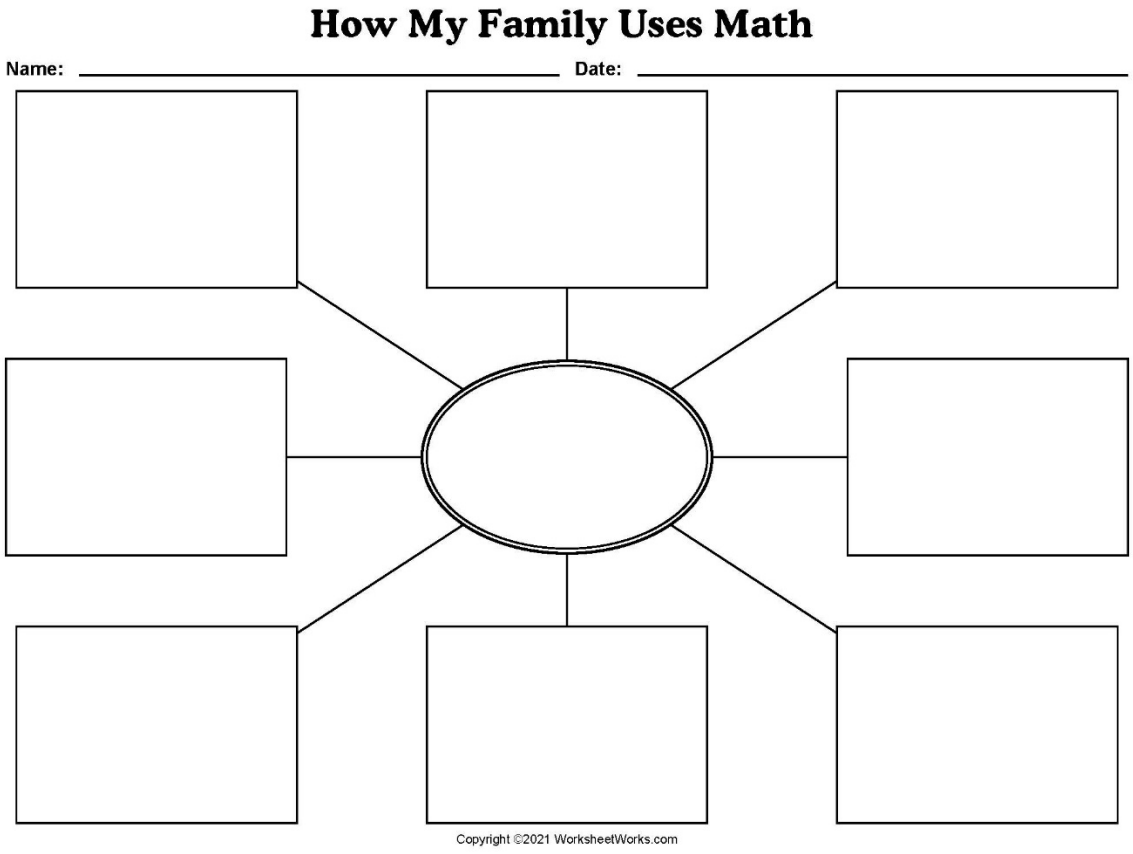
1. This lesson plan supports students in making connections to mathematics through everyday activities such as sewing, cooking, building, painting designs on piece of pottery.
2. Suggested that this lesson be done in two-30 minute sessions.

Attachment 1: Indian Fry Bread

Attachment 2: Adobe Bricks

Attachment 3: Indian Textile

Attachment 4: How My Family Uses Math Everyday (Assessment)



Attachment 5: Math Rubric
Teachers will determine how many activities students will illustrate and writes about.

CATEGORY	3	2	1	Total
Identifies important information	Student lists all the main points of the lesson. • Family Activity • Math skills • Importance to self	Student lists two main points of the lesson. • Family Activity • Math skills • Importance to self	Student lists one main point of the lesson. • Family Activity • Math skills • Importance to self	
Relates activity to text	Student accurately explains how each activity is related to the text that is written or illustration	Student vaguely explains each activity relating to the text that is written or illustration	Student has difficulty relating the activity to the text or illustration	
Presentation	Student completes the lesson in an age and developmentally appropriate to each child	Student attempts to complete the lesson in an age and developmental appropriate it each child	Student is unable to complete the lesson	

Lesson Plan Two
Title: Geometric Designs in Pueblo Fireplaces
Duration: 45 minutes
Grade Level: 2 - 3

Learning Objectives:

1. Students will be able to explore and identify the various geometric attributes of a Pueblo fireplace.

Prerequisite Skills and Knowledge:

1. Familiarity with basic 2-D closed shapes and solids and their properties
2. Geometric figures: Recognize and draw shapes having specified attributes as defined by shapes.
3. Reading and writing
4. Cooperative skills

Materials and Resources:

1. Attribute blocks (solid shapes)
2. Attribute blocks (2-D)
3. Paper & Pencil
4. Attachment 1 Photos of a pueblo fireplace
5. Handout 1 Diagram of a pueblo fireplace
6. Handout 2 Questions
7. Handout 3 Rubric

Guiding Questions

1. In what ways do Pueblo People use geometry to design and build a fireplace?

Core Values: Love and Respect; A Way of Life and Family

Procedure:

1. Introduction
    - Show students the photographs of a traditional pueblo fireplace. (See Attachment #1)
    - Students share their experiences of gathering around a Pueblo fireplace with family. For many families this was common when families lived within pueblos. Today many pueblo families no longer live in traditional homes.
    - Non- native students can identify family experiences.
2. Design of Pueblo Fireplace
    - Show a simple diagram (Handout 1) of a Pueblo fireplace structure. (Note to students that there are many types of Pueblo fireplaces and that this drawing is a simplified version of one.)
    - Provide students with the attribute blocks.
        - Second Grade: 2D shapes: Triangle, Rectangle and Circle
        - Third Grade: Solid Shapes: Rectangle Prism and Hemisphere
        - Students may choose to draw instead of handling the manipulatives.
3. Construction
    - Ask students to share how they applied geometry and their spatial sense to build their Pueblo fireplaces.
    - Divide the class into small groups and ask the students to collaborate to construct a fireplace similar to the one shown in attachment 1.
    - They will have to write responses to the following prompts (Handout #2):
        1. *What shapes did you use to construct your fireplace? They will use the graphic organizer to name shape, provide a definition, identify attributes, and draw shape used.*
4. Class discussion
    - Have students regroup as a whole class.
    - Ask the students to present their reasoning, creating opportunities for students to clarify, defend, and justify their thinking and reasoning.

Assessment

Students will fill out handout 2 and complete.

See rubric (Handout #3) to assess student work during class discussion. Other can be used at the teacher's discretion, Attributes of shapes used such as faces and vertex can be added for additional assessment purposes.

Modifications:

1. Provide a visual aid that includes labels of the shapes when students have difficulty identifying shapes.

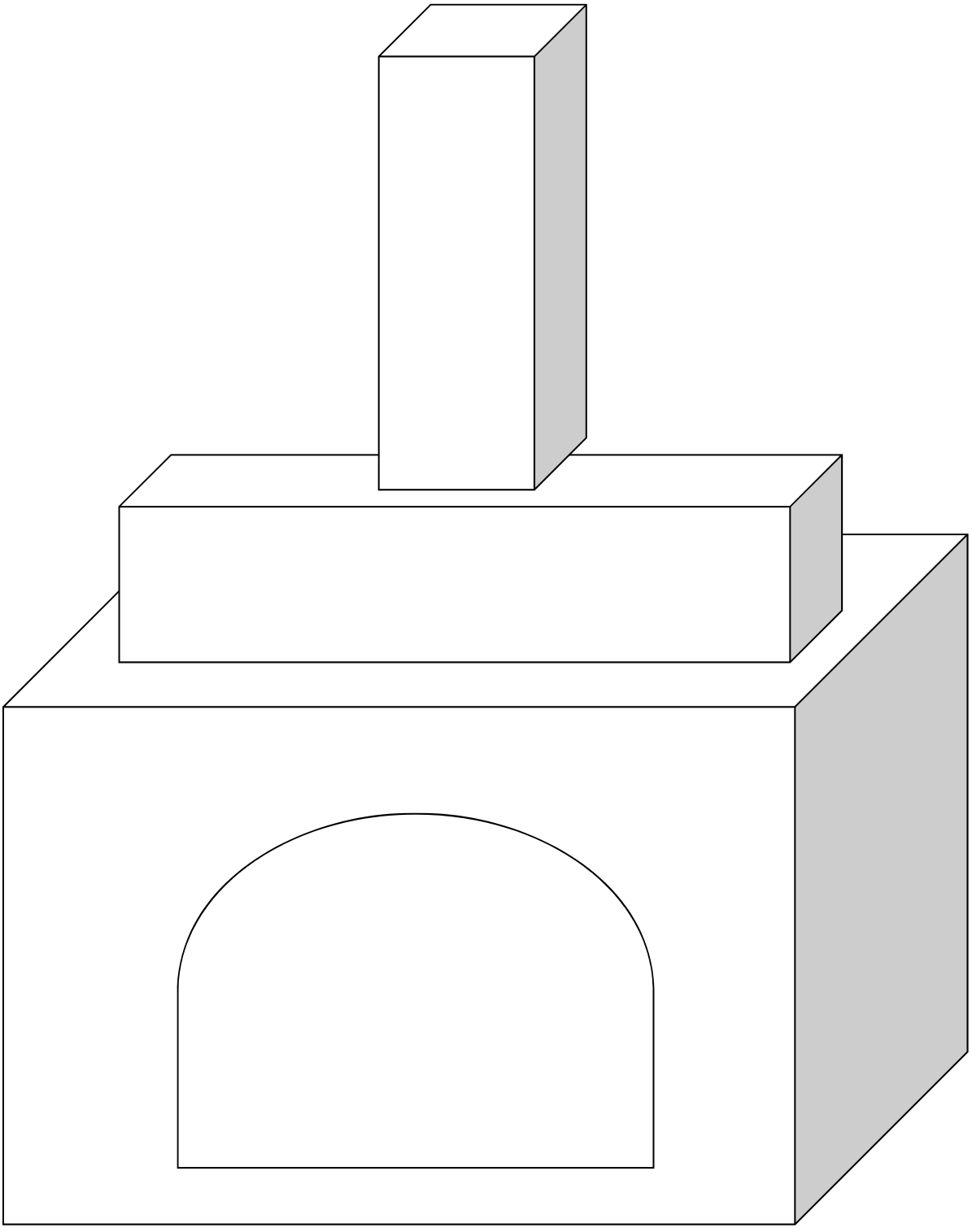
2. Scheduling accommodations: Give more time to complete a project.
3. Give directions in small steps using as few words as possible.
4. Show a model of the end product.

Notes to Teacher:

Not every pueblo fireplace is the same. Each is unique depending on the need. Handout 1 is simplified version of a fireplace that was purposely created to define specific shapes for the lesson. In a pueblo home, the fireplace is considered to be the center of its well-being. Many non-pueblo people refer to this type of fireplace as a "kiva" fireplace. It is important to not confuse the fireplace in this lesson with an outdoor oven or horno.

Attachment 1: Example of a Traditional Pueblo Fireplace

Handout 1:



Handout 2:
Names of group participants: Date:

Use pictures and words to answer the following questions.

1. What shapes did you use to construct your fireplace?

Shape	Definition	Attributes	Visual

Handout 3:
Oral Presentation Rubric: Pueblo Fireplace Activity

Student Name:

CATEGORY	4	3	2	1
Collaboration with Peers	Almost always shares, and supports the efforts of others in the group.	Usually, shares with, and supports the efforts of others in the group.	Often, shares with, and supports the efforts of others in the group.	Rarely, shares with, and supports the efforts of others in the group.
Content	Shows a complete understanding of the math content.	Shows a substantial understanding of the math content.	Shows a vague understanding of the math content.	Does not seem to understand the math content.
Other				

Project Total:

Lesson Plan 3
Title: Making Moccasins
Duration: 60 Minutes
Grade Level: 2-3

Learning Objectives:

1. Students will be able to apply geometric thinking to design a traditional pair of moccasins.
2. Students will be able to apply congruency and symmetry in the design process of making moccasins.

Materials and Resources:

1. Staple
2. Scissors
3. Markers/Crayons
4. Pencils & Erasers
5. Attachment 1 Photographs of beaded moccasins
6. Attachment 2 Pattern of moccasins
7. Attachment 3 Photographs of uncompleted moccasins (cut out and designed)
8. Attachment 4 Photographs of moccasins with sides AA stapled together
9. Attachment 5 Photographs of completed moccasins.
10. Attachment 6 Rubric
11. https://www.youtube.com/watch?v=mHIYnZ6dBAE
12. https://www.youtube.com/watch?v=bzt8Ov_IWUU examples of different designs.

Guiding Questions:

1. How do Pueblo people incorporate geometrical designs to moccasin making?
2. What geometrical shapes are used in creating a design for a pair of moccasins?

Core Values: Respect

Procedure:

1. Introduction
    - Show photographs of the moccasins. (Attachment #1)
    - Explain that moccasins were and are still worn by Native Americans, varying in design depending on the tribe. Not all moccasins have beaded geometrical designs - moccasins with beaded designs are worn for special occasions.
    - Have students look at the designs and identify shapes and attributes of the designs, such as congruency and line of symmetry.
2. Construction
    - Students make a pair of moccasins with the provided template.
        - Provide students with the template. (Attachment #2) **Note: this can be enlarged to create a larger moccasin. This pattern will only make one side.**
        - Have enough copies so that students can make a design and check for symmetry. Their designs will need to be colored and completed before construction. *This is steps a through c.*
        - Before cutting out and construction teacher should have constructed a moccasin for reference and to model for students how to construct.
            a. Make sure students begin by cutting the solid black lines (not the dotted lines) going around the figure A.
            b. Students cut along the T shaped lines which are located in the middle of Pattern A.
            c. Students add colors and decorative figures inside the broken lines. (See Attachment #3 for example)
            d. Students put it together as illustrated in Attachment #4.
            e. Students attach Pattern A to Pattern B by stapling the top to the bottom. (See Attachment #5)
3. Display the moccasins around the classroom and allow students to present their art work.
    - The students' descriptions should address their use of geometry and their creativity in the design process.

Modifications:

1. Provide precut patterns for students with difficulty cutting along the lines.
2. Provide a completed example for students with difficulty visualizing the end product.

Notes to Teacher:

1. The traditional clothing worn by Pueblo people during special occasions may include beaded moccasins. The significance of the moccasins and their designs to the Pueblo people represents the reverence that they have for all things surrounding them. Included in the lessons are photographs that can readily be used as graphic aids for you and your students. You will need to note on the

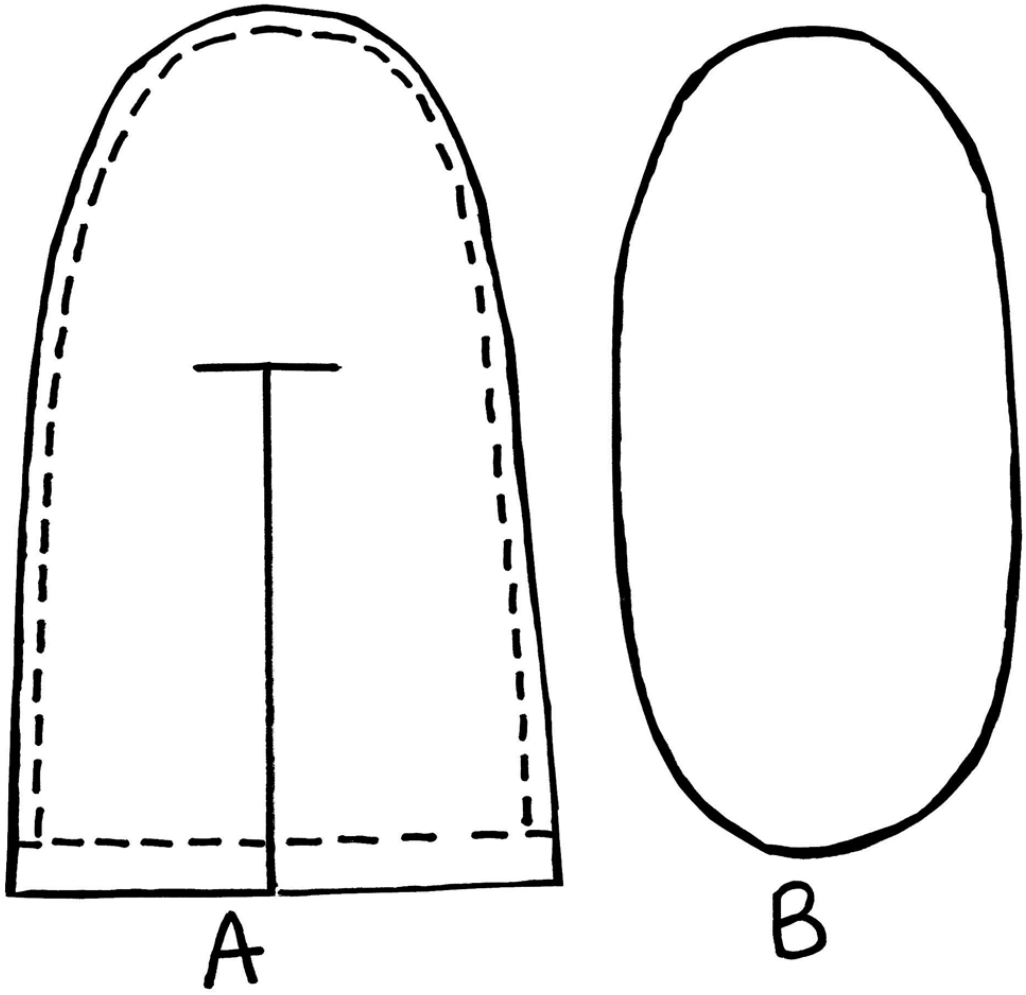
finished project that each side of the moccasin is congruent and follows a line of symmetry. Your students should be able to observe this and demonstrate these skills in their own patterns.

2. Please note that not only do pueblo people wear beaded moccasins. They are worn by many tribes and are not unique to Pueblo people.

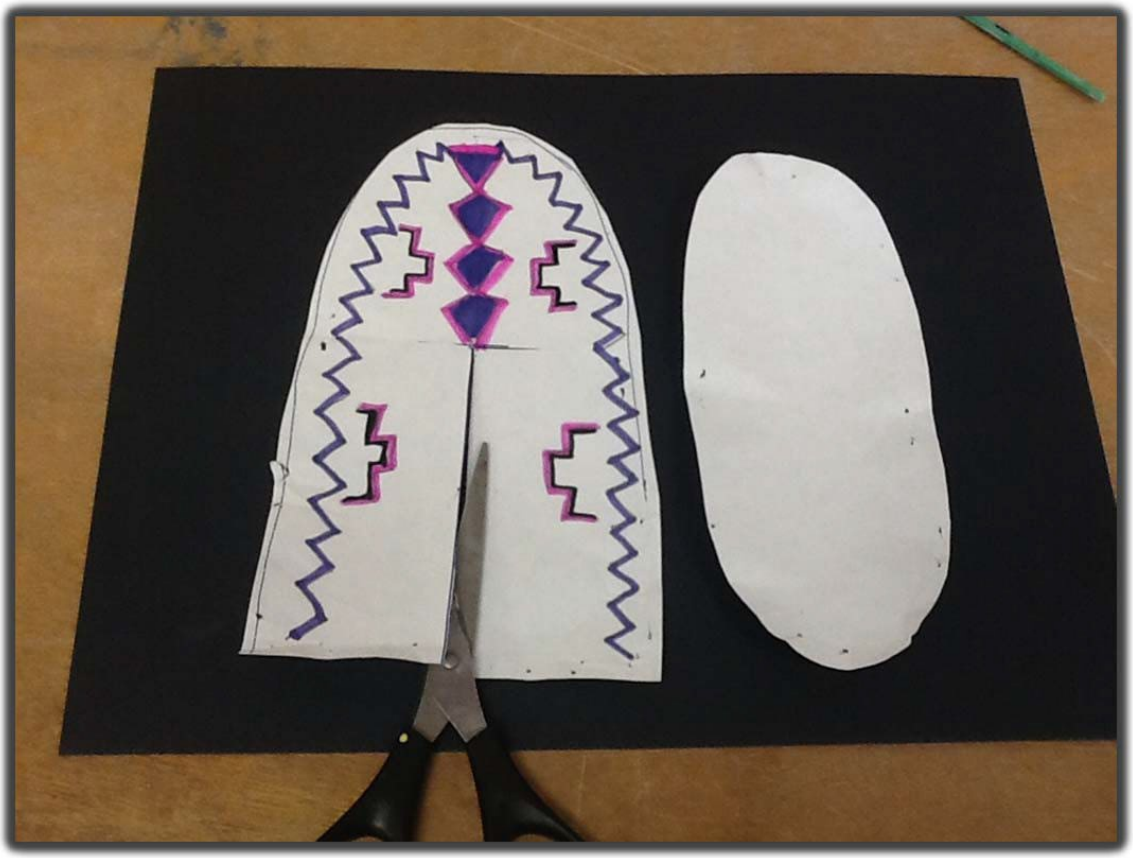
3. It may be helpful for the teacher to construct the moccasin and create a pattern to illustrate mathematical thinking. It would also help in giving instruction of the construction phase.

Attachment 1: Beaded Moccasins

Attachment 2:



Attachment 3:



Attachment 4:

Attachment 5:

Attachment 6:

Moccasin Making Rubric

Student Name:

CATEGORY	3	2	1
Mathematical Concepts	Work shows substantial understanding of the mathematical concepts needed to complete the project. • Congruency • Line of symmetry	Work shows some understanding of the mathematical concepts needed to complete the project. • Congruency • Line of symmetry	Work shows very limited understanding of the underlying concepts needed to complete the project. • Congruency • Line of symmetry
Completed Project	Project is fully completed.	Project is somewhat completed.	Project was attempted but not completed.

Total points: