Montana
Office of Public Instruction
Denise Juneau, State Superintendent
opi.mt.gov

Mathematics Model Teaching Unit

Geometric Beadwork

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Grade 5: Duration 1 – 60 minute lesson

Stage 1 Desired Results

Established Goals:

Geometric Reasoning Mathematics Content Standard 3: A student, applying reasoning and problem solving, will understand geometric properties, spatial relationships, and transformation of shapes, and will use spatial reasoning and geometric models to analyze mathematical situations within a variety of relevant cultural contexts, including those of Montana American Indians.

- **3.2 Congruence and Similarity**: Use spatial reasoning to determine congruence, similarity, and symmetry of objects in mathematics, art, science, and culture, including Montana American Indians.
- **3.3 Transformations including Dilations:** Define, identify, and execute transformations including translations, rotations, reflections, and dilations with appropriate technology.

IEFA Essential Understanding 3: The ideologies of Native traditional beliefs and spirituality persist into modern day life as tribal cultures, traditions, and languages are still practiced by many American Indian people and are incorporated into how tribes govern and manage their affairs.

Additionally, each tribe has its own oral histories, which are as valid as written histories. These histories pre-date the "discovery" of North America.

Understandings:	Essential Questions:
• The importance of dance to some Native American people. • The variety of geometric concepts applied to regalia. • The definition of regalia- Magnificent attire; finery http://dictionary.reference.com/browse/regalia	• How is dance an important part of some Native Americans' culture? • What mathematical terms can be used to describe the designs on regalia? • How many lines of symmetry does your figure have? • What makes lines of symmetry or a reflection appealing to the eye?
Students will be able to… • acknowledge that dance is an important tradition of some Native Americans'culture. • identify lines of symmetry. • identify a reflection.	*Students will know…* • how to identify lines of symmetry and reflections on regalia and other forms of art. • how to design beadwork on paper. • how to form lines of symmetry. • how to form a reflection.

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Stage 2 Assessment Evidence

Performance Tasks:

- Students will design a piece of "beadwork" on graph paper and be able to identify at least 2 lines of symmetry and 1 reflection, in which every point of the geometric figure is moved the same distance in the same direction. They will also answer the 4th Essential Question on the back of the paper: "What makes lines of symmetry or a reflection appealing to the eye?"

Other Evidence:

- Check for understanding after reading the book by asking a variety of questions. You may start by asking if anyone has ever been to a Powwow and generate some talk on regalia.

Stage 3 Learning Plan

Learning Activities:

- Read *Jingle Dancer* by Cynthia Leitich Smith to the class to bring about awareness of powwows.

- Check for understanding after reading the book by asking a variety of questions. You may start by asking if anyone has ever been to a Powwow and generate some talk on regalia. Then ask the following Essential Questions: How is dance an important part of some Native Americans' culture? (each tribe has its own unique traditions that they are still able to express today through dance); What mathematical terms can be used to describe the designs on regalia? (e.g. symmetrical, reflections, translations)

- Go to http://www.nmai.si.edu/exhibitions/identity_by_design/IdentityByDesign.html

- Throughout the Web site there are several different designs that show symmetrical bead work. Click on a few photographs and look at each one individually. Display using a projector if possible. If no projector is available, print several pictures to pass around the class or have a community member share some regalia or other beadwork with the class.

- Discuss lines of symmetry and identify any translations you may find. When discussing the patterns, be sure to use the appropriate term for the outfits, "regalia."

- Hand out graph paper.

- Using an overhead, show the students how to count over from the top to find the middle box. Start with one color there, and then design off of that, using that as your starting point. Design a simple example for them to get started. (See example below)

- Have the students begin their own designs. The students can be very creative, just remind them that they need to show two lines of symmetry and one reflection.

- When finished, have them bring the paper to you and show you where their lines of symmetry are and their reflection, which answers the 3rd Essential Question: How many lines of symmetry does your figure have? (must be able to show you at least 2 lines)

- Have it be worth 4 points; 1 point for each line of symmetry, 1 point for a reflection and 1 point for answering the 4th Essential Question on the back of their paper: What makes lines of symmetry or a reflection appealing to the eye? (e.g. they are even).

Resources:

Smith, Cynthia Leitich Smith. **(Muscogee Creek)** ***Jingle Dancer*****.** Illustrated by Cornelius Van Wright and Ying-Hwa Hu. New York: Morrow Junior Books, 2000. ISBN 0-688-16241-X

- http://www.nmai.si.edu/exhibitions/identity_by_design/IdentityByDesign.html
- http://dictionary.reference.com/browse/regalia

Materials/Resources Needed:

- Internet access with overhead OR printed pictures of regalia OR a community member that has access to beadwork or regalia.
- Graph paper
- Coloring tools