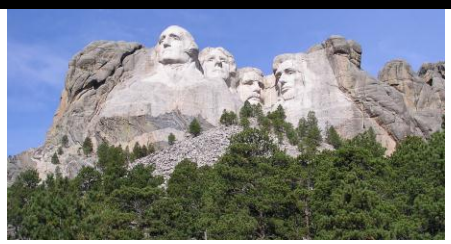

Mount Rushmore Education Program
Planning Worksheet

Instructor Name:_____

Title of Program:
Math at Mount Rushmore

Grade level: 3-5 **Subject area:** Geometry, Algebra, Measurement and Data

Content Standard: Geometry, Algebra, Measurement and Data for 3rd through 5th grades
-Standards: Common Core Curriculum Standards (http://www.corestandards.org/the-standards/mathematics)
-List Standards:

- 3.G.2. Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.
- 4.G.1. Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.
- 4.G.2. Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.
- 4.G.3. Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.

Lesson objectives: "The learner will be able to . . .

Understand that more complex shapes can be partitioned into smaller, simpler, geometric shapes. Learner will be able to understand the concept of grids and symmetry, and be able to use them to make basic or more advanced area calculations.

Introduction: What is the hook, the attention grabber, the interesting beginning?

Begin lesson with an introduction to Mount Rushmore and discuss how the sculptor, Gutzon Borglum, decided to carve the heads of the four Presidents. Simply put, he had to carve "shapes" into the rock. Show two pictures of Mount Rushmore: before and after carving. Help the students recognize that there are now new shapes in the Mountain that weren't there before. How was math involved in designing and sculpting Mount Rushmore? Look at complex objects in the classroom. Students should be able to identify that these complex shapes could be broken down into smaller, simpler, geometric shapes.

Content: Body of lesson, sequence of learning activities.
(Keep them busy, keep them active, keep them thinking, keep them involved)
Best practices include interactive, interdisciplinary, inquiry based, hands-on, multi-sensory, engaging learning activities.
Activities might include listening, viewing, reading, writing, drawing, calculating, thinking, discussing, sharing, simulations, cooperative learning.

After completing the introduction, begin with a brief history background about Mount Rushmore (where is Mount Rushmore, when was it carved, who carved it and why, where did the name come from? etc.). Begin looking closer at the sculpture by using the provided Measurable 3D PDF file or the 3D Viewer on the CyArk website. In both the 3D PDF and online 3D Viewer, the teacher can cut sections through the model to better illustrate the presence of geometric shapes.

To explain how the faces and all the shapes within them came to be, show the introduction video, which shows how the sculpture was created.

Introduce students to the pointing system used by sculptor Gutzon Borglum to figure out the geometry of the heads and facial features. Use the provided Dec. 1933 article from Modern Mechanix as an aid.

-Hands-on activity 1: Activity demonstrating the concept of the plumb-bob. Once the students watch the introduction video which shows the system used by the carvers of Mount Rushmore, help students construct their own plumb-bob pointing system using a protractor, ruler, string, and a small object for weight. Help the students construct two plumb-bobs so the class may split into two teams. The first team will draw a simple geometric shape on the front face of their cardboard box then use the plumb-bob pointing system to measure the vertices of their geometric shape and instruct the second team on how to replicate the drawing by giving them the angle and distance measurements of the vertices. The second team will take the measurement instructions and use their plumb-bob pointing system to reconstruct the drawing on the front face of their cardboard box.

-Hands-on activity 2: Activity using gridded image of Mount Rushmore to count how many grid squares or fractions of a grid square a nose takes up or, for higher class levels, divide the squares of the grid into smaller geometric shapes to calculate more accurate areas (use geometric area formulas along with the scale of the grid to determine the size of the shapes).

-Hands-on activity 3: Activity to recognize line of symmetry within the faces of Mount Rushmore. Use gridded elevations of each President's face to draw an approximate line of symmetry. Then measure the distance of symmetric features from the center line and compare. Explain how faces are never perfectly symmetric.

Materials needed: (equipment, handouts, graphic organizer, worksheets, props, papers)

-Computer for introduction presentation
-Photos of Mount Rushmore, before and after carving (provided)
-Mount Rushmore introduction video (provided—if the entire video is too lengthy, the segment between 6:25 and 11:50 provides a sufficient introduction to how the mountain was carved)
-Photo of Mount Rushmore with overlaid grid, with x-y axis for fifth grade (provided)
-Elevation drawings of the Presidents' heads with overlaid grid, with x-y axis for fifth grade (provided)
-Graphics illustrating the pointing system and plumb-bob concept (Modern Mechanix article provided)
-Two protractors created using provided PDF
-Two horizontal pointing arms created using provided PDF
-Two rulers
-Two strands of string
-Two small objects for weight
-Two identical cardboard boxes (12inch X 12inch X 12inch box is suggested)
-Two pencils used as dowels to fasten horizontal pointing arms and protractors to the cardboard boxes
-Drawing and measuring implements for all students
-Camera and printer for optional take-home activity

Summary and conclusion of lesson: What helps set a course of action or leaves them thinking?

Summarize concepts covered through activities.

Theme statement: (The "big picture", the final result, the "so what?!)

Gutzon Borglum was able to use math from his studio to design the sculpture on the Mountain. Math can help us figure out larger objects on a small piece of paper.
Talk about ideal symmetry and ideal shapes and how we use these ideals to estimate geometry in the real world which is usually never perfectly symmetric. While symmetry and shapes are "ideal" they don't always make for interesting art.

Evaluation method: How will we see the success of your program?
Example: completed worksheets, class discussion, drawings

Teacher monitors the student's engagement and progress with the hands-on activities.
Take home activity suggestions:

- Take a picture of yourself and replicate the symmetry exercise to see how symmetric your face it.
- Find a picture or a painting that demonstrates symmetry or the lack of it.