

Monticello Topography: Let's Make a Mountain

MATH

SCIENCE

Overview:

For this exercise, we will focus on interpreting topographic maps, modelling their relief data, and using this data to calculate angle of elevation. This is a two part activity for two subjects. One part will be given to a Science class and one part will be given to the math class during the Right Triangle Trigonometry Unit. These lessons can be done in just the math class, just the Science class, or given to both classes.

Prior Knowledge

Math

Basic trigonometric principles, such as:
–angle of elevation
–the tangent function
— the inverse tangent function

Science

An introduction to topographic maps

Standards

Next Generation Science Standards:

2-ESS2-2. Develop a model to represent the shapes and kinds of land and bodies of water in an area.

4-ESS2-2. Analyze and interpret data from maps to describe patterns of Earth's features.

Objectives

Math

Students will understand how to solve a right triangle using inverse trigonometric functions.

Students will be able to use an inverse trigonometric function to solve for an angle in a right triangle.

Students will know how to solve multi-step problems.

Science

Students will practice reading a topographic map and identifying elevation and important features.

Students will build a 3D model of Monticello.

Students will apply their understanding of topography to questions about life on Monticello.

Steps:

1. Divide class into groups of 3-4.
2. Hand out both or either of the copies of the Math and Science handouts. Allow students to work on the worksheet for approximately 20 – 30 min.
3. Review student responses and provide correct answers to problems.
4. For the 3D model, see the [3D model teacher instructions](#).

Materials: Copies of [math student worksheets](#), copies of [science student worksheets](#), copies of [3D](#)

[model student handout](#), [3D model teacher instructions](#), scientific calculator, dark colored sharpie, clear plastic stacking lids.

Assessments:

Formative

Assessment Criteria:

This content can be incorporated into a larger unit test or project for geology/earth science, or environmental science. It falls within the AP environmental science unit on earth systems and resources, and within a unit on earth processes in geology/earth science. It falls within the right triangle trigonometry unit of a math class (Trigonometry, Geometry, Alg2/Trig, etc).

Accommodations:

For classes with an ELL population, mix groups to have a balance of native English speakers in each group.

In the math section, to make the problem more challenging, the dimensions can be changed so that the students first must use dimensional analysis in order to get all units the same.

In the math section, to make the problem less challenging, the side opposite the angle at Monticello can be labeled (413 feet).

The 3D model can be complicated or simplified depending on student audience. See [3D model teacher instructions](#) for more information.