TIME TEAM AMERICA

How Archaeologists Use Math as a Tool to Set Up a Unit (What's a Unit Anyway)?

Math (Geometry): Grade Level: 9-12

Time Team America Field School

MATERIALS

The materials needed for this activity are:

- Four stakes
- Two metric measuring tapes
- One calculation
- One mallet

How Does Archaeology Use Math?

One of the main aspects of an archaeologist's job is excavation in the field (in archaeology, excavation includes the digging and exposing of archaeological material, but also the systematic processing and recording of what is found, and where). Archaeologists realize it is essential to preserve the important context (data) within a site so they can hypothesize what the sequence of human activity might have been, as well as understand the landscape in which the site is set and any relationship to nearby sites. To accomplish this, archaeologists developed a systematic and scientific approach to excavation "the unit", which is a direct application of geometry. Before an archaeologist begins to excavate a site, s/he divides it into small units to more easily record what is found and where for future study. As archaeologists identifies "finds" per unit, they then work with their colleagues (in the field and back in the lab) to help analyze and interpret the site on a much broader scale, ultimately to learn more about the society that occupied the site.

There is a technology connection also. Remote sensing and geophysical technologies like those used by the Team's Remote Sensing Specialist, Dr. Meg Watters, are helping archaeologists see underground to create 3D models of what a site looks like above and below the surface. The use of technology is revolutionizing the notion of a unit with 3D geometrical modeling of units, which is becoming more and more common.

What?

Youth will use math to set up an excavation unit.

Why?

Youth will understand how archaeologists apply the Pythagorean Theorem in geometry to create exact five by five meter square units at an excavation site.

How?

First discuss the Pythagorean Theorem with youth. Ask them if they know what it is and how it might be helpful in laying out an exact unit square. If they do, discuss what they know.

If they do not know anything (or what they know is vague), share some information about Pythagoras, the Ancient Greek mathematician and philosopher who developed the first known proof—a general mathematical statement that has been proven true—of the theorem. Although the principle had been discovered and previously used by the Babylonians and Indians, Pythagoras was the first person attributed with proving it. Regarded as one of the most important developments in mathematics, the Pythagorean

Theorem allows a person to link ideas of number to ideas of space. In addition to this theorem, Pythagoras is also attributed with discovering that musical notes were simple ratios of each other and therefore could be translated into mathematical equations.

There is a lot of cool web-based content about the "Pythagoras' Theorem" (or the Pythagorean Theorem) at PBS Learning Media: http://www.pbslearningmedia.org/search/?q=Pythagorean+Theorem

Why Does the Pythagorean Theorem Matter to an Archaeologist?

If you are trying to make an exact unit square you can use this theorem to create the precise-sized square you want to make.

Have youth engage in this activity:

> *You're in a group of Time Team America archaeologists that have just arrived at the site you will be excavating for the next 72 hours. You need to begin by setting up an exact unit square.*

Break up youth into groups of 3 and take them outside on a place with level ground. Each group will be given four stakes, two measuring tapes, string, a calculator, and a mallet. Ask youth to work as a group for approximately 30 minutes to make an exact 5 x 5 meter square using the items they have been given and the Pythagorean Theorem, a2+b2=c2. Remember hypotenuse length (c2) is side "a" squared + side "b" squared divided by square root of that number.

Students should begin by laying out a square as best they can. Then have them lay their measuring tape across the diagonal of the square. This will break the square up into two triangles that are almost right triangles. Have the students use the Pythagorean Theorem to calculate how long this diagonal (the hypotenuse of both triangles) should be, if the sides are each 5 meters. Then have students adjust the angle between the sides of the square until the length of the diagonal matches the length they calculated.

- As each group finishes their unit, have youth check each other's work and measure each side of the square to make sure it is a 5 x 5 meter square.

What did you discover?

Once each group has completed the task have youth share the approaches they took to make an exact square unit.