



The Demise of Copper's Trading Power

Subject: Algebra, Grade 8
Skills: Functions, quadratic equations, matrices,
Strategies: Use of real-life data
Time: 2 class periods

Objectives: SOL Algebra A.2, A.4, A.5, A.14, A.15
Students will:

1. represent verbal quantitative situations algebraically and evaluate these expressions for given replacement values of the variables
2. use matrices to organize and manipulate data [which] will arise from business
3. create and use tabular and graphical representations to analyze a given set of data for the existence of a pattern
4. solve quadratic equations in one variable both algebraically and graphically
5. given a rule, find the values of a function for elements in its domain and locate the zeros of the function both algebraically and with a graphing calculator

Procedure:

1. Explain to students that they will be completing some very high level **statistics** by using information gathered by archaeologists at the Jamestown Rediscovery Project.
2. Discuss the background information.
3. Model use of the **statistical equation**.
4. Have students complete the statistical equation with the remaining three sets of data.
5. Have students **graph** their findings.

Background: The first settlers of the English colony at Jamestown knew the native Powhatan Indians prized items made of copper. Many native people believed copper held spiritual properties in the promise of an afterlife, thus they had themselves buried with all the copper they possessed. The colonists, therefore, used copper to trade for food and other goods from the Powhatan community. Captain John Smith documented that the Powhatans would sell nearly an entire country for a significant amount of copper. Used in this way, copper played an important role in the survival of the Jamestown

Colony, especially during the early years. Archaeologists at the Jamestown Rediscovery Project reported that copper objects were among the most common artifacts found. The allure of copper as a desired trade item, however, dwindled as years passed. Dr. Seth Mallios of the Jamestown Rediscovery Project reported, “The relationship between copper items and time is very strong...so strong that the date of a deposit can be reliably estimated on the basis of how much copper is in it. The more copper objects found in a given deposit, the earlier it was filled.”

Dr. Mallios was able to pinpoint an exact copper/time relationship by using an equation that “equates the percentage of copper in a feature with the date it was filled.” The equation Dr. Mallios used was:

$$y=1.023x^2 - 13.625x + 1657.831$$

To use this equation, archaeologists had to first find the percentage of copper found in the feature being excavated. Dr. Mallios explained that they did this “by dividing the total number of objects in the feature by the number of copper items.”

This percentage equals “x.” The answer that results when the value of “x” is inserted in the equation is the approximate year that the copper items were deposited in the ground.

The following is a chart containing the number of objects found in various features. Find the percentage of copper in each feature. Remember to round numbers up or down. Once the years in which the copper items were deposited are determined, graph the results to illustrate how the advancing years at the Jamestown settlement meant a decrease in copper items.

FEATURE NUMBER	NUMBER OF TOTAL ITEMS	NUMBER OF COPPER ITEMS
1	432	27
2	260	13
3	533	8
4	400	3

What might have caused the decline of the value of copper?

Notes: The percentages and corresponding dates are as follows:

Feature Number	Percentage of Copper	Feature Date
1	6.25	1613
2	5	1616

3	1.5	1640
4	1	1645

The value of copper declined in the later years of the Jamestown Settlement most likely due to the glut of copper in the Powhatan community.

Copper vs. Time

