

LESSON TITLE: OBJECT PROJECT

GRADE/AUDIENCE:

- 8th – 10th grade Algebra 1 or Geometry students.

STATE STANDARDS:

- Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of relationship.
- Describe qualitatively the functional relationship between two quantities by analyzing a graph.
- Create equations in one variable and use them to solve problems.
- Create equations in two or more variables to represent relationships between quantities.
- Represent constraints by equations or inequalities, and interpret solutions as viable or nonviable options in a modeling context.
- Calculate and interpret the average rate or change of a function (presented symbolically or as a table) over a specified interval.

LESSON OBJECTIVES:

- Find the slope of the line and apply that to a real world situation.
- Create a piecewise linear function of the chosen picture. (see attached)
- Interpret the function in context of the picture.

LESSON OBJECTIVES FOR YOUR STUDENTS:

- Students will algebraically find the slope of a line between two points of the picture.
- Students will create a piecewise function from their chosen picture.
- Students will analyze the graph in context of the picture.
- Students will create a story about their chosen object and how math relates to that object (aerodynamics, speed, force, etc).

COMPELLING / GUIDING QUESTIONS:

- Why does the slope change throughout the object and what does that mean?
- Why would the Pequots have created an object like this? Do you think they understood the mathematical concepts that we know when they made it?

DESCRIPTION OF LEARNING TASKS / ACTIVITIES:

1. Students will work in pairs to choose two of the given pictures.
2. Complete the attached chart for both objects.
3. Create and draw a coordinate plane over your picture. Students will determine when the graph's slope changes from left to right, stating whether the function is increasing, decreasing, vertical or horizontal. The students will write down then starting point on the left, as when $x =$. Next they will write down at which x value the slope changed direction. This will be done for the entire picture, all sides of the object.
4. Students will algebraically find the slope between the x -values they chose in step 2.
5. From these determined slopes, students will create linear functions, stating the restrictions on the domain along with the function.
6. Students will write a one page paper analyzing the linear functions they created, discussing why the slope changed in certain areas and what that could mean in context of their object. Be sure to tie in how the Pequot's could have used this object in their everyday life, citing your sources. You may use any sources on <http://www.pequotmuseum.org/Default.aspx>.
7. The students will repeat steps 2 – 6 for both objects.

TIME NEEDED FOR LESSON: Two 45 minute classes with students doing homework.

MATERIALS, RESOURCES, TECHNOLOGY NEEDED:

- Calculators, rulers, computers or an equivalent, pens / pencils, paper.

PRIMARY OR SECONDARY RESOURCES (WORKS CITED):

- Mashantucket Pequot Museum & Research Center resources / photographs.
- <http://www.pequotmuseum.org/Default.aspx>
- <https://www.facebook.com/pequotmuseum/timeline>

PRIOR LEARNING, CONNECTIONS, STUDENT NEEDS OR INTERESTS, COMMON MISCONCEPTIONS:

Prior learning:

- To find the slope of a line and between two points.
- Creating linear functions from two points.
- The concept of piecewise functions.
- Introduction of Pequot Indians.

Student needs or interests:

- Students may individual instruction to help get them started or throughout the project to answer any misunderstandings.
- Students may be paired up by the teacher or pick their own groups.
- Students that are interested in the History of the United States, specifically New England will be engaged and interested in this project.
- Students that are interested in specific culture's objects and what they mean to their civilization will be interested.

Common Misconceptions:

- Students may have to estimate the slopes of the picture at some points if the object is not completely linear.
- Students may forget the slope of a vertical line is undefined and the slope of a horizontal line is zero.
- Students may misunderstand the meaning of the object to the Pequot.

SUGGESTED DIFFERENTIATIONS:

For struggling students:

- One-on-one instruction.
- Re-teaching.
- Lessen the requirements. For example, only find 5 slopes and create 5 linear functions of the object instead of all.
- Write a half page paper instead of a full page.
- The students may choose to work on one of the less difficult objects as noted.

For enriched learning:

- Create a scaled drawing of your object as it would be when the Pequots originally made the object. These students must show as least three of the proportions from their drawing to the given picture.
- Find your own object from the Pequot's and instead of using the second given object, use your own.

CROSS-DISCIPLINARY CONNECTIONS:

- Early American History
- Science
- English

FORMATIVE ASSESSMENT PROCESSES (INCLUDING STUDENT SELF-ASSESSMENT):

- The rubric that the teacher will use, as well as the students grading themselves.

Object Project Rubric			
Name:			Date:
Partner's Name:			Period:
	Possible Points	Points Earned	Comments
Correctly identified the 2 points where the graph changes direction	5		
Correctly states if the slope is increasing, decreasing, horizontal, or vertical	5		
Correctly algebraically finding the slope and showing all of the work!!	15		
Correctly finds the linear function of the line	25		
States the restriction of the domain	15		
Fully analyzes the graph and states what each slope could mean in context of the object	25		
Explains how the Pequot tribe could have used this object in their everyday life	10		
			Total Points: /100

Pictures to choose from:



Less challenging objects



Object Project Chart to fill out:

Name of Picture Chosen:						
	*Point #1	*Point # 2	State if increasing, decreasing, horizontal, or vertical	State the slope you found algebraically showing all work!	Linear function of the line	Restrictions of the domain for this line
Line #1						
Line #2						
Line #3						
Line #4						
Line #5						
Line #6						
Line #7						
Line #8						
Line #9						
Line #10						

*These are the points where the graph changes direction (where the slope changes)