**Math modeling unit and activity** -

Activity name: Building a dog pen

Big Idea(s)/ Concept(s)/major math area(s): Quadratic Optimization

Grade level(s): Algebra I/Algebra II

**Math Standards included:**

Algebra I: A1.QE.5 “Represent real-world problems using quadratic equations in one or two variables and solve such problems with and without technology. Interpret the solution and determine whether it is reasonable.”

Algebra II: AII.Q.1 “Represent real-world problems that can be modeled with quadratic functions using tables, graphs, and equations; translate fluently among these representations. Solve such problems with and without technology. Interpret the solutions and determine whether they are reasonable.”

**Procedure overview/ teacher directions** ........................

**Lesson details**

Expected timing: 45 minutes

Math Vocabulary: quadratic, parabola, vertex, minimum/maximum

Prior to this lesson, students will have spent at least one day graphing quadratic functions by hand using the vertex and a table of five values.

**Part 1** Initial whole group discussion – Present the problem and assign groups for students to collaboratively work through the task. \*One option is to only present the problem (without the handout) and see how much groups can do without the scaffolding.

**Part 2** After working through the task, groups will display their work on white boards including:

 - A diagram (of the house and fence)

 - A table (as given in terms of width, length and area)

 - A sketch of the graph

 - An equation of the quadratic function

**Part 3** Students will share their white boards. They will compare work and draw conclusions based on their observations and discussion. They will point out connections between each representation.

**Part 4** 20 minute follow up: we will ask the same question, but without the pen adjacent to the house (thus requiring 4 sides of fencing with the same 200 feet of fencing).

**Part 5 Final discussion**

Students will make connections to the meaning of the vertex and the way it is represented differently through the table, graph and table. They will also make generalizations of how to find the maximum area with only the use of the equation.

**Brief summary** This will be an application of quadratic functions to use throughout the use Quadratic unit, perhaps after graphing but before learning the quadratic formula.