

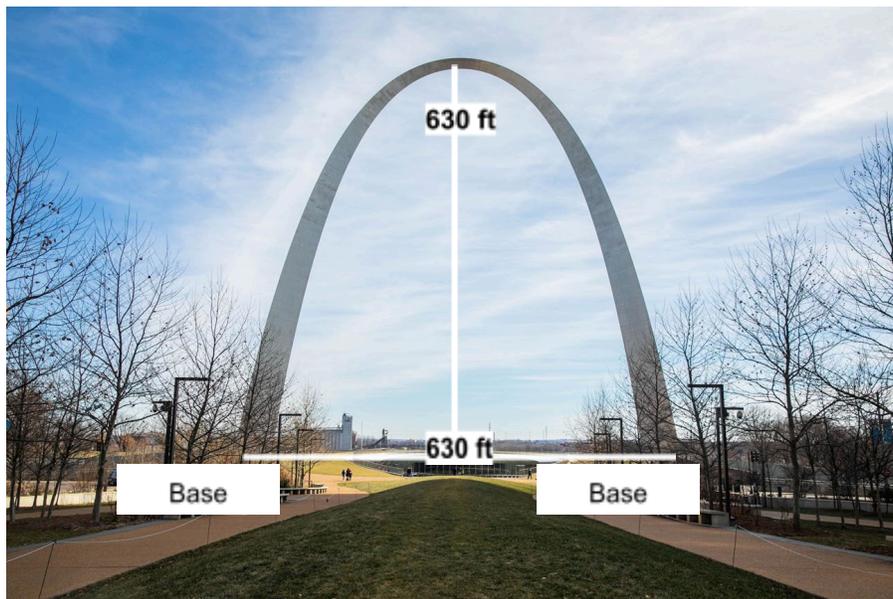
M103: Modeling with Functions of Quadratic Type Pre-Badge Task

New Badge Alert!

This task will provide a preview of what we will be learning during the M103 - Modeling with Functions of Quadratic Type Badge. You already know so much math, so use this task to share any understanding that you have before we start our learning. You will have a chance to do the same task at the end of the badge to see how your thinking has evolved.

The Task

The Gateway Arch is a monument in St. Louis, Missouri. Use the information about the Gateway Arch to answer the following questions.



QUESTION 1 How does the image of the Gateway Arch relate to concepts you have learned about in math?



QUESTION 2 The height of the arch at its center is 630 feet. The distance from the bottom of one base to the bottom of the other base is 630 feet.

Use graph paper or technology to plot the three points described below, using an appropriate scale.

- Plot the first point on the vertical axis to represent the height of the center of the arch.
- Plot the second point on the horizontal axis to represent the left base of the arch relative to the center.
- Plot the third point on the horizontal axis to represent the right base of the arch relative to the center.
- Label the coordinates of each point.



[Attach a file with your work or describe how to find it if it is stored online.]

QUESTION 3

- a. Create an equation that models the shape of the curve through these 3 points.
- b. If you wrote an equation in part (a), explain how you came up with that equation.
- c. On your graph paper or using technology, graph the curve represented by your equation.

**QUESTION 4**

- a. What is the height of the arch 100 feet from the center? How did you determine this?
- b. What is a reason why an architect or engineer might want to check the height of the arch 100 feet from its center on both sides?



Question 5 You receive some feedback that the equation would be more useful if it models the arch such that the left base is at the point $(0, 0)$.

- a. Write a new equation for the arch that situates the leftmost point at $(0, 0)$.
- b. How does this compare to your original equation?

