1.1 Modeling with a Quadratic Function

Student Activity

Name: _____

Open the TI-Nspire™ document
Modeling with a Quadratic Function.tns.

You will determine the equation of a quadratic function that models the path of a basketball. Based on your equation, you will solve problems related to the path of the basketball.

Move to page 1.2.
Note: Two tick marks represent 1 meter.

1. Graph the parent quadratic function, $\mathbf{f}(x) = x^2$, on page 1.2. Transform the parent function so that it matches the path of the basketball. What is the equation of the quadratic function that matches the path of the basketball?
   Note: *You may need to drag the function definition away from the graph in order to transform the parabola.*

2. In this activity, the horizontal distance traveled by the basketball is the independent variable. What is the dependent variable?

3. Determine the maximum height of the basketball in meters. Explain your reasoning.

4. Visualize a point on the ground directly beneath the ball when it reaches its maximum height. How far is this point from the person shooting the basketball? Explain your reasoning.

5. How high was the ball when it was a horizontal distance of 2 m from the person shooting the basketball? Explain your reasoning.

6. If the ball followed the path modeled by your quadratic function and the basket was not there, how far would it have landed from the shooter? Explain your reasoning.

7. Create a new page in the TI-Nspire App and open the image *St. Louis Gateway Arch.jpg* located in *Camera Roll*. Create X-Y axes on top of the image with the origin located at the left foot of the arch and determine the equation of the function that best fits the arch.

8. Create a new page in the TI-Nspire App and open the image *Water Fountain.jpg* located in *Camera Roll*. Create X-Y axes on top of the image with the origin located at the opening of the water outlet in front and determine the equation of the function that best fits the path of the water.

   Using the same axes, determine the equation for the function that best fits the water fountain located at the back. Include the domain restrictions for this function.

9. Create a new page in the TI-Nspire App and open the image *McDonalds Arch.jpg* located in *Camera Roll*. Create X-Y axes on top of the image with the origin located at the left foot of the left arch and determine the equation of a quadratic function that best fits this arch. What do you notice?

10. Search on the Internet, for an image in nature or man-made that you think can be modeled using a quadratic function. Save the image to your iPad's photo library, open from the *Camera Roll* in TI-Nspire App and determine the equation of the quadratic model.