a WOW Lab BLUEPRINT

Indoor Rockets

Additional Information

Projectiles follow a parabolic path while in flight. Using three points along the path, we can derive the quadratic function that describes the rocket's motion (**Figure 1**). This is accomplished by using the quadratic function in factored form:

$$y = p(x-x_1)(x-x_2)$$

In this demonstration, where x is the distance from the launchpad in metres, x_1 is zero and x_2 is the distance from the landing spot to the launchpad. It is easy to see that the only unknown constant in the equation, *p*, can be derived by letting x and y equal the coordinates of the maximum height and then solving for *p*.

If the teacher chooses to have students derive the quadratic model with respect to time, the technique is largely the same. The only difference is that time, instead of horizontal distance, will be the x variable. Once students derive the model, they should convert the quadratic into general form:

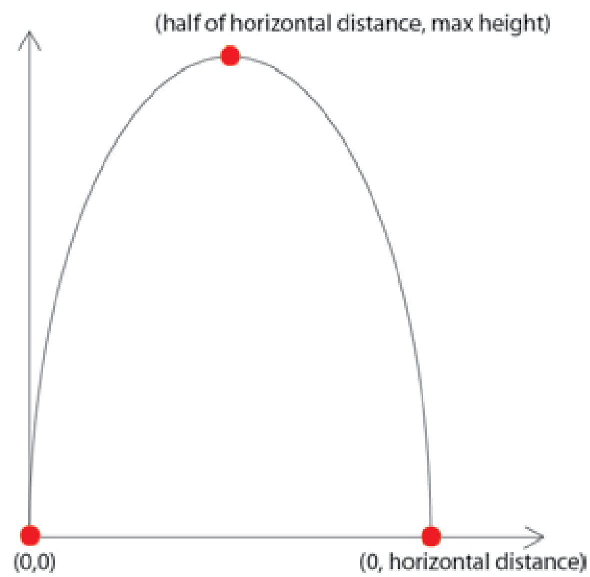

Figure 1

$$y = ax^2+bx+c$$

An accurate approximation of *a* with respect to time should have a value that is close to -4.9. From Isaac Newton's equations of motion, the value of *2a* should equal the acceleration due to gravity, which has been measured to be approximately -9.8.