a WOW Lab BLUEPRINT

Indoor Rockets

Lesson Logistics

Learning Outcomes

Math

Grades 10-12
Quadratic Relations
Trigonometric Functions

Physics

Grades 10-12
Motion
Force, Motion and Work

Class Organization

Divide the students into groups of two or three.

Ensure that each group has a *Student Handout*, construction paper, a craft knife, scissors, a bubble tea straw, sand paper and floral foam.

One rocket launcher will be constructed per class.

Notes

The activity can be easily completed in one class period.

Although design stencils for wings are provided in the *Student Handout*, students are encouraged to deviate from the stencils and create their own wing designs.

Further Exploration

Rocket Design

In this activity, thrust is only a factor during launch. By reducing the amount of friction between the pump nozzle and the rocket body, students can increase the initial velocity of the rocket. Drag and lift are both components of the aerodynamic force. Students can experiment with different rocket designs, such as changing the number of rocket fins or the shape of the nose cone, to see which design results in the greatest distance travelled.

Flight Time and Quadratic Equations

In the math portion of this activity, students are asked to estimate the maximum height that their rocket reached to derive a quadratic model. If students time the flight of their rocket, they can derive a quadratic equation that models the height of the rocket with respect to time (as opposed to horizontal displacement). This is done by assuming that the rocket reaches its maximum height at the midpoint of the time interval. Students can then compare their result with the theoretical measure of gravity. When the equation is in standard form ($y=at^2+bt+c$), an accurate approximation of rocket flight would have a value of a close to -4.9.