

Bottle Rockets

Mechanical Engineering

Objective

This lesson introduces students to forces and how they affect the maximum height of a rocket. In this activity, students will build a rocket, launch it, and calculate the maximum height using angles, distance, etc.

Standards and Objectives

- 8th Grade Standard 4, Objective 3
- Physics Standard 2, Objective 3

Learning Outcomes

Students will learn:

1. That trigonometry can be used to determine the height of object
2. That the more pressure applied to a rocket will make the rocket go higher
3. That fin design affects the rocket's ability to travel higher

Essential Questions

1. How can you make a rocket fly higher?
2. Does the fin design affect the final height of the rocket?
3. How can you tell how high your rocket traveled?

Time Required (Itemized)

1. Explanation of forces and introduction to fin design (30 minutes)
2. Time to work on rockets and introduction to launch process (45 minutes)
3. Testing the rockets (30 minutes)
4. Discussion (10 minutes)

Assessments

Have students submit the sketch of their rocket design and calculations for final height.

Materials

1. Launcher (Can be checked out from the COE)
2. Bike pump (Can be checked out from the COE)
3. Paper Rockets for demonstration
4. Empty 20 oz. plastic bottles
5. Card stock for fins
6. Glue (may use a hot glue gun for fast drying)
7. Scissors
8. Protractor

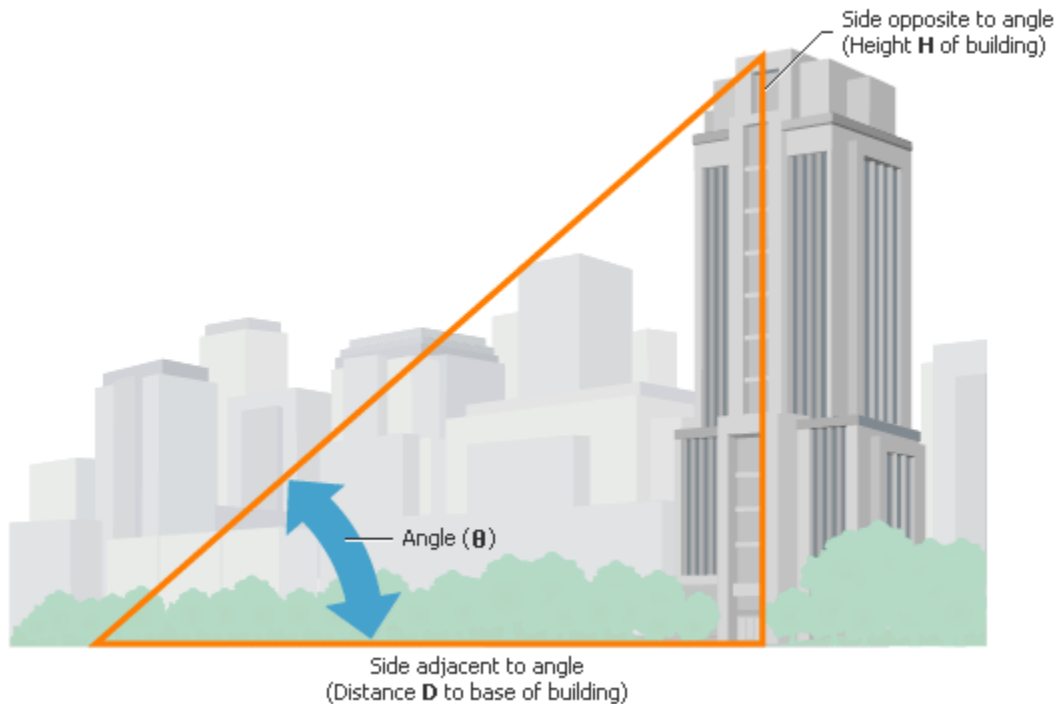
Lesson Description

Have the students bring an empty 20 oz. bottle to class. Take the students outside and introduce them to different fin designs by launching paper rockets. Three designs

include: 4 fins at the bottom of the rocket, 2 fins half way up the rocket on the same side (like an airplane), and a rocket with no fins. Launch each one with 20 pounds of pressure and ask the students what they observed. Ask them if fin placement and design affects the flight. Ask where they would place their fins to achieve maximum height.

Return to the classroom and explain that students will be creating rockets and teach them how to determine the final height.

Teach students how to solve for height by knowing the distance from the launcher and the angle.



Have them work either in groups of two (so one can launch while the other takes the angle measurement), or individually.

When the rockets are finished, have the launcher set up outside and pre-measure and mark the distance where they will stand to get the angle measurement. (Note: the farther from the launcher they are, the more accurate their final measurement will be).

After all students have launched and obtained their angles, return to the classroom and review the different fin designs created by the students. Discuss which were effective/ineffective, and discuss why this may be the case.