Name: _____ Date: _____ Hour: _____

# Pop Bottle Rockets

**Purpose**: To engineer a rocket out of a 2-liter bottle and other household items and determine the distance that it flew using our kinematics equations. This is also a nice representation of projectile motion and Newton's Laws of Motion.

**Goal**: To build a rocket that flies as stable as possible, for as long as possible.

**Things to consider**:
•How do rockets fly?
•Will your rocket fly with just compressed air or do you need to add water? If you add water to your pop bottle rocket, how much is the right amount?
•What purpose do fins serve on a rocket? Where would you place them on your rocket? How many would you add?
•What type of rocket will work better, a lighter one or a heavier one? Where is the center of mass of your rocket and why might this be important?
•Should your rocket have a nose cone? Why or why not?

**Rules**:
-You can work by yourself, with a partner, or in a group of three. Write your name/group/rocket name on the rocket.
-Students need to supply a 2-liter bottle and any other materials that might aid in the overall construction of their rocket. (Duct tape, glue, construction paper, weights of any kind, etc.)
-Mr. Pepper will supply the launcher.
-The body of the rocket (bottle) must not be damaged in anyway that weakens or compromises its structural integrity.
-The only source of launch force is the air pumped into the rocket and the water/air mixture in the bottle. No other sources of energy allowed!
-Each rocket has to be checked to make sure that it is built safely prior to the launch.
-A mass measurement of the rocket (empty) needs to be taken.
-During the launch, you will need to time the rocket's descent. Once it reaches its maximum height, start timing and stop the watch when it strikes the ground. *If you struggle to determine when the rocket is at its highest point to start the stopwatch, record the whole time of the flight (leaving launchpad to impact) and divide the time by 2.

**Predict**: How high do you think your rocket will go? Why do you think this?

**List materials used here**:

**Data collection and calculation**: What formula do you need to use to determine the height of the rocket? Write it here: _____

Fill in the table for your group and three other groups data.

| **Your Group/Rocket Name** | **Mass of Your Rocket (g)** | **Distance from launchpad (m)** | **Time of descent (s)** | **Height based on formula (m)** |
|---|---|---|---|---|
| | | | | |
| **Other Group/Rocket Names** | **Mass of the Other Rockets (g)** | **Distance from launchpad (m)** | **Time of descent (s)** | **Height based on formula (m)** |
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| | | | | |

**Conclusion**:
How high did your rocket travel? Show your work for this calculation.

Do you think this is an accurate measurement? Why or why not?

How did your rocket compare with those of other groups?

Did your rocket go straight up and fall straight back down? If not, describe its motion. What do we call this type of motion?

Did the horizontal motion affect the vertical motion at all? How do you know?

**Reflect**:
What do you think were your successes in building your rocket?

How could you have improved on your rocket?