Lab Part 2

**PURPOSE:**

The purpose of this lab is to improve the data collected in Part One in a variety of ways including the use of technology.

**MATERIALS:**

* Projectile launcher
* Projectile
* Camera
* Computer to analyze video footage

**PROCEDURE: VERTICAL LAUNCH**

1. Trace a very close outline of the projectile launcher onto the sidewalk’s edge.
2. Measure a 90° angle to the muzzle of the projectile launcher.
3. Load the cartridge, using only the same projectile for each trial, into the projectile launcher.
4. Line the projectile launcher up with the traced outline on the sidewalk.
5. Begin video recording.
6. Launch the projectile and wait for it to return to the ground.
7. Repeat trial for seven repetitions.
8. Analyze video in software, frame by frame, so that we can see the exact timestamps the projectile exited the muzzle as well as peaked in vertical displacement.
9. Calculate for average time of all seven trials.
10. Insert average time, acceleration, and final velocity into the equation (*vf = vi + āt*) to calculate for initial velocity.
11. Isolate initial velocity and provide correct number of significant digits.

**DATA AND OBSERVATIONS:**

Note that the day of the experiment provided notable winds that could have possibly affected the outcome of the trials.

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| TIMES | Trial 1 | Trial 2 | Trial 3 | Trial 4 | Trial 5 | Trial 6 | Trial 7 | AVG. |
| Time (s) | 1.10 | 1.12 | 1.04 | 1.10 | 1.12 | 1.04 | 1.04 | ***1.08*** |

**DATA ANALYSIS:**

Using the formula *vf = vi + āt*, since we know final velocity as zero (because it is no longer moving upwards, nor is it moving downwards), we only must calculate for initial velocity by substituting acceleration with the value of gravity, and time for our average time value (given at 1.08 seconds).

*0 = vi* + (-9.81)(1.08)

*10.5948 = vi*

***vi = 10.6 m/s***