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Physics 1430 Lab 3 Experiment 3

Abstract: In the lab we created and then tested a mathematical model to determine distance covered from a launched projectile. Are results found they we tended to be off by about 10-30 cm. We concluded that we must have made a mistake in either crafting the formula, implementing it, or in recording it.

Mathematical Model: We used the model, Xf = (V2sin(2theta))/g. Xf is the calculated distance traveled. V is the initial velocity of the object. Theta is the angle at which we shot it. Finally, g is the account for gravity in the y direction since there is technically no acceleration in the x direction after the initial launch.

Design: We started with collecting the initial velocity or V by launching it at some theta with the psi of 50 so we could change V from a variable to a constant in our eyes. We then picked 3 different angles for theta and plugged them in to the equation and got our estimated distance for each. We then pumped the launcher up to 50 psi and then tested each angle 10 times to compare it to our calculated distance.

Minimizing uncertainties: We used the same person to pump up the launcher each time since they would most likely keep it as close to the 50psi marker as they did all previous times. We also used the same projectile throughout the launch so nothing changed that. We had one-person launch the projectile while the other would watch at eye level to see where it landed and say out the distance of where it landed.

Assumptions: There are no assumptions that can be made about this experiment to help our findings.

Data Analysis: We first plugged in our standard velocity for 50psi, our first angle (15 degrees), and the acceleration due to gravity.

(3.951m/s)2sin(2(15 degrees)))/9.8m/s2

((15.610 m2/s2) (.5))/9.8m/s2

7.805 /9.8m/s2

.796m (distance expected to go at 15 degrees)

.544m (distance expected to go at 10 degrees)

.276m (distance expected to go at 5 degrees)

Error Analysis:

Conclusion and Judgement: The averages for 15, 10, and 5 degrees respectively are .8188m, .625m, .4805m. With these measurements it’s safe to say something went wrong along the way when it came to the calculations at a lower theta. The closer it got to a straight shot at 0 degrees the farther off it would seem. I assume that this is the case because if you were to plug in zero for theta the entire equation would be zero and that would defiantly not happen at that angle. There is the possibility that our measurement method of eyeballing it wasn’t really the best way to measure it but the distances that were given at 5 degrees make no sense why they are so far off from the calculations.