Note: You are free to use (e.g. copy verbatim) any text in black. All text in red indicates areas where you need to insert your own work.

Experiment #5: Calculating a landing zone for the cannonball

Introduction:

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Instructions:

This goal of this project was to predict the landing zone for a brass ball (our "human" cannonball) launched from a cannon inclined at an angle above the horizontal. You conducted this process in three parts:
1. Determining the exit speed of the cannon ball using measurements of time.
2. Determining the exit speed of the cannon ball using measurements of position (x and y).
3. Using this information to calculate the landing position of the cannon launched now at an angle.

Write an introduction that explains what the goals of the experiment were and how this was accomplished.

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Setup and procedures:

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Instructions:

Describe the equipment used for this experiment. Define the detailed procedure used to determine the various measured quantities.

Provide an analysis of the projectile motion assuming that there is no air resistance. There are three parts to this lab, so you should have three parts to your derivation and three main equations that are used, one for each part of the analysis.

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Data and analysis:

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Instructions:

You measured three quantities and used this to determine the unknown launch speed of the cannon. The three quantities you measured are:
a. the range (horizontal distance) from the cannon

b. the time it takes to leave the cannon and hit the ground
c. the vertical distance traveled from cannon to floor.

You should calculate the means and standard deviations for each of these. Use this information to put error bars on your calculations of the exit speed (for the first two parts), and then the range (in the third part).

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Conclusion:

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Instructions:
Write a concluding statement where you compare and comment on the success of the first two methods for calculating the exit speed of the cannon (perhaps by reflecting on the relative uncertainty in these calculations).

After you do that, comment on the uncertainty in your predictions of the range and whether you were successful in these experiments. Perhaps you can offer some general reflections about what could have been done to improve this setup. Whatever you do, do not blame "human error" or make any comments to that effect – such statement are meaningless and essentially indicate that you were just being sloppy in lab. Comment on specific things that could have been to improve the experiment.

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