CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)

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Project Number

J0223

Project Title

Using Simple Models to Predict the Effects of Gravity on Projectiles: Discovery of a Synergistic Effect of Two Variables

Abstract

Methods/Materials

Catapults make good model systems to study certain aspects of motion. In the present study, a homemade catapult was constructed to study the movement of different projectiles. Several parameters related to the initial launch of the object were found to affect the flight of the projectile. These parameters were studied over a range of values. The resulting data demonstrated that each change would produce a set of distance values that were found to be consistent and therefore, predictable within certain ranges.

Results

Two patterns emerged from these findings. The first pattern resembled a simple relationship between force and the distance traveled. As the force increased, so did the distance traveled by the projectile. This is described as a positive relationship. In contrast, the data curve of the second pattern resembled a hill. As the mass of the object increased in the lower ranges, the data showed a positive relationship. However, as the mass of object passed 50 grams, the relationship became negative. In other words, as the mass increased, the distance decreased. Using this data it was possible to predict the distance traveled by completely different projectiles when only the mass was known.

Conclusions/Discussion

Finally, it was postulated that the combination of optimal conditions (angle and mass) would result in the farthest distance indicating synergy. Although the results did not indicate a greater distance, it showed that the synergy allowed for the catapult to have a much more sensitive flexibility in range. This is a synergy that was an unexpected discovery.

Summary Statement

Predicting projetile behavior and the discovery of synergism between two variables using a simple mechanical model.

Help Received

Father helped build catapult.