CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
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Project Number
J0209

Project Title
Effect of Trebuchet Arm Length or Counterweight Mass on Projectile Distance

Abstract

Objectives/Goals
The Purpose of my experiment is to determine how changing the length of the throwing arm and mass of the counterweight will affect the distance that a projectile can be thrown by a trebuchet.

(Note, the results and conclusions have been typed into their boxes but are not showing up in the project summary when I check it via the following page online.)

Methods/Materials
Materials: Tools (hammer, saw, etc.); Wood glue; Scissors; Drill and bits; Sandpaper; Metal cutters; Heavy objects (penny roles); Screws; Nails; Eyehooks; Wire; Tape; 3 feet of string; 6 inch piece of cloth; Card paper; Different sizes of wood; Projectile (ping pong ball).

Procedure: Construct trebuchet; Get three weights of different masses. One with 275g or so, one with 548g or so, one with 816g or so. Measure the distances that the projectile goes with different weights and arm lengths. One at 13", one at 12", one at 11".

Results
The longest arm and the heaviest weight both made the projectile go further then the others. A trebuchet with a heavy weight and a long arm will throw projectiles the farthest.

Conclusions/Discussion
The heavier counterweight makes the projectile go further because a larger counterweight mass will make a larger mechanical advantage. A larger counterweight mass makes the projectile#s end go faster, therefore throwing the projectile further, the average distance was 4.4 meters. The smaller counterweight mass makes the projectile#s end go slower, therefore throwing the projectile not as far, only 1.7 meters.

The longer arm length makes the projectile go further because being longer, it multiplies the mechanical force of the counter weight dropping a longer distance, the average was 3.2 meters, then a shorter arm, the average was 2.8 meters. A short arm would multiply the mechanical force less then a longer arm, making the projectile go not as far as a long arm would.

So a trebuchet with a long arm and a heavy counter weight will throw a projectile further then a trebuchet with a short arm and a light counter weight. This is exactly as I predicted.

Summary Statement
This project is about how different arm lengths and counterweight masses affect the distance that a trebuchet can throw a projectile.

Help Received