# CALIFORNIA STATE SCIENCE FAIR
## 2008 PROJECT SUMMARY

**Name(s)**
Danielle M. Behrens

**Project Number**
**J0203**

**Project Title**
## Distances a Catapult Can Propel Spheres of Differing Mass and Density

**Abstract**

**Objectives/Goals**
To determine the farthest distance a catapult can propel a sphere.

**Methods/Materials**
Eleven spheres of differing mass and density were tested in a custom built catapult. Spheres were loaded into the catapult one at a time and propelled out along a tape measure where a spotter identified and called out the distance. Before testing all the spheres, the median weight sphere was chosen to test and improve catapult repeatability. Design modifications were made that reduced the variability in shot distance by ten times. This repeatability improvement turned out to be critical in determining the distance ordering of the spheres. The other ten spheres were then also tested with 25 shots each and the distances recorded.

**Results**
The 5 g marble went farthest for a single shot, but on average the 18 g marble went the farthest.

**Conclusions/Discussion**
I hypothesized that the golf ball would go the farthest, but at 46 g it was too heavy and only went 67% of the distance of the 18 g marble. The 5 g marble with a diameter of 1.6 cm was too small for the 3.1 cm throwing cup so it had poor repeatability. To deal with this problem I would make a series of several smaller nested cups so smaller spheres would not roll around in the cup while being fired. I would also like to find the ideal mass for this catapult by testing with 10 and 15 g spheres to refine my conclusion that the ideal mass is between 5 and 20 g.

**Summary Statement**
A catapult was custom built and improved for repeatability before shooting spheres of different mass and density to determine which would go the farthest.

**Help Received**
Dad helped design & build the equipment. Mom helped run the experiment. Dad helped in the data analysis & presentation.