CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)
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Project Number
38488

Project Title
Brachistochrone: The Shortest Time

Abstract

Objectives/Goals
The objective for my project was to find out the the path of least time between two points which are on a diagonal plain with the presence of gravity.

Methods/Materials
My method/procedure to test if my hypothesis was right was to build a life size model of the 3 different types of paths. These 3 paths would be a straight line, an abrupt sheer shaped path, and a brachistochrone curve. I made an L shaped wooden base 36 inches long and 24 inches high with 3 slots in which I could slide in and glue the 3 paths which were drawn out a cut on clear plexiglass. After making the model, I made 3 wheels which would be able to roll down the plexiglass and stop at the end of their path. With the help of my brother keeping track and recording the time with a stopwatch and a camera recording in slow motion with a sensor also recording the time.

Results
After doing the experiment I proved my hypothesis right. The Brachistochrone curve was the fastest curve between the 2 points. Because it provided just the right balance between short distance and a steep drop. Next came the steep shaped path as second fastest. Because after the wheel came down the steep portion of the curve, it began to lose speed and acceleration as it came down the flat sections of the path. Last came the straight line, many would think the straight line would be the fastest way down because length wise its the shortest, but because of it gradual slope it takes a longer time for gravity to accelerate the wheel to faster and faster speeds.

Conclusions/Discussion
Many accurate trials proved that the Brachistochrone curve would be the fastest way down point A to point B because a perfect balance of gravity's acceleration and a short path is needed for something to go from one place to another the fastest. Although I have not learned the fundamentals of calculus and geometry yet it is worth mentioning that this project has many mathematical values behind it like calculus and geometry.

Summary Statement
From the three paths, straight line, brachistochone curve and the steep curve it was clear that the brachistochrone was the fastest

Help Received
I did all the research and the experiments by myself. I received help from my dad to make the model. As he has the right tools I needed.