CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
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Project Number
J1817

Project Title
The Physics of a Marble Run

Abstract

Objectives/Goals
The first experiment is to test an equation to relate the height of the track to the maximum radius of a loop the track can have for a marble to complete the loop without falling. Additionally, I tested whether this radius is dependent on the weight of the marble. Also, I analyzed the relationship between the height at the top of the run and the speed at the end, and whether the marble's mass effected this velocity.

Methods/Materials
Pipe insulator, scissors, packaging tape, cardboard, 3 marbles with different masses, meter sticks.
1. Tested maximum radius of loop at 10 different heights.
2. Measured velocity at end from 10 different heights.
3. Tested 3 different masses and measured the velocity at the end from 1 height.

Results
1. The maximum radius equation from MIT was not supported, but my direct variation hypotheses for both the mass and the height were supported.
2. The velocity equation was supported with very little error.
3. The mass hypothesis was supported - the velocity was larger with more mass.

Conclusions/Discussion
The maximum radius increased as the height increased and also increased as the mass increased. The equation from MIT was not supported, and this might have been due to the error in my structure. The velocity equations were both supported with error that was within the accuracy of the measurements. The velocity was also larger as the mass increased, which suggests that the hypothesis to the side question was supported - there is a relationship between the variables.

Summary Statement
I analyzed several physics equations and concepts using a roller coaster track and different mass marbles and showed that the maximum radius of a loop and the velocity at a certain point on the track can be easily found using equations.

Help Received
One of my STEM teachers, Dr. James Li helped me with the scientific method and with coming up with the research questions.