



CALIFORNIA STATE SCIENCE FAIR 2005 PROJECT SUMMARY

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Project Title Slope vs. Mechanical Advantage	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The title of our project is #At what angle does the mechanical advantage of a bicycle disappear in comparison to running?# Our purpose is to discover the effects of slopes on mechanical advantage on a bicycle. To find out which size slope was the turning point, tests were performed consisting of time trials of multiple test subjects on variously sloped hills.</p> <p>Methods/Materials The procedure was as follows: First, measure multiple slopes that were all of different angle measures to have an array of test areas. Then, gather test subjects of different athletic ability in order to provide results that are not only narrowed down to conditioned people, but include both physically fit and unfit subjects. Next, have each test subject run and bike on each slope multiple times and collect the results. Finally, compare the results from each of the test subjects and identify at which slope the times from the bicycles became equal to or slower than the running ones. Our materials included a white chalk stick, ten slopes with varying degrees, and a graphing calculator. To run the trials we also needed our ten test subjects, the single speed street bicycle, and a GPS stopwatch. The stopwatch also contained the necessary equipment to measure the slopes in degree measures and the distance of 100 meters.</p> <p>Results Our results showed that when the test subjects were tested on slopes with angles greater than thirty degrees, the running times were more efficient than the bicycling. On average the point at which the greatest change occurred was in between the thirty and thirty-five degree hills. Any angle less than thirty degrees, the bicycles mechanical advantage was present and provided a greater output with the energy supplied.</p> <p>Conclusions/Discussion Overall, our project accomplished the goal of finding the slope at which mechanical advantage is no longer present. However, it was different than the angle measure that was hypothesized. Now, when riding a bicycle up a slope there is a known angle at which the rider should dismount the bike and begin running up the slope.</p>	
Summary Statement The project is designed to calculate the angle at which the mechanical advantage of a bicycle is no longer present by comparing trial times to those of running trials.	
Help Received Mr. Beach, a former teacher, helped formulate the process by which the problem would be tested. Also, the school track coach, Mr. Newton, supplied the test subjects for our project.	