CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
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Project Number
J1399

Project Title
Accoustical Properties of a Musical Instrument

Abstract

Objectives/Goals
My objective was to determine what acoustical properties are employed in a musical instrument.

Methods/Materials
First, I measured the distance between the frets on a guitar string, calculated the percentage of decrease between each fret and recorded the results in a data table. Next I used a frequency analyzer to measure the frequency on the guitar string. I compared the two measurements to look for correlations between the length and the frequency. I used this process on a different string for comparison. Using my data, I cut PVC pipe in proportion to the lengths on the guitar fret (BP=L). Then, I measured the frequencies of the cut PVC pipe with a frequency analyzer and recorded the results. I compared the data from the guitar and the PVC instrument and looked for correlations. Lastly, I mounted the PVC pipes on wooden boards for display. Materials used on this project: Frequency analyzer, guitar, PVC pipe, chop saw, measuring tape, wood boards.

Results
I found that there is an inverse correlation between the lengths of the guitar strings and the frequencies that they give off.; the shorter the string, the higher the frequency. I also found that when comparing the two strings, if the length of string A is exactly half the length of string B, the frequency of A is exactly twice the frequency of string B. In musical terms, the perceived pitch sounds an octave higher.

Conclusions/Discussion
In doing my project, I discovered that frequency has a direct correlation to the length of an object. Also, you can make a musical instrument using these principals.

Summary Statement
Musical instruments can be designed using mathematic formulas to determine frequency.

Help Received
My father helped me cut the PVC pipes and mount them to the boards. My mother helped me format my report and project board. My uncle helped me build a stand.