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Wave Speed on a String

Music is full of science and mathematics. For ages, scientists have studied the relationships between notes, the effect of materials and designs on an instrument's sound, and the nature of sound waves.

Preliminary Observations

Observe a stringed instrument as its strings are plucked. Can you identify where the nodes are? How do the frequencies of the sound waves change as different strings are plucked? What happens when you “shorten” the string by pressing the string against the fret board or fingerboard? What factors affect the waves created on the strings?

Procedure

1. Discuss and decide what variables you will investigate.
2. Develop a purpose and a procedure for your investigation.
   * Your purpose should ask a question or propose a model for describing the relationship between the variables.
   * Include the measurement equipment you will use.
   * Decide how much data or observation to take in order to have enough information to satisfy your purpose and stand up to questioning by your peers.
3. Carry out the investigation, and record your data and observations. Make sure all group members have access to the data.

Analysis

Examine the relationship between the variable(s) you measured. What mathematical form does it take? Is the graph linear? You may wish to look back at your previous work in class or do some research.

Extensions

1. Create a rubber-band instrument. What range of notes (frequencies) can you play on your instrument? Determine the change in tension required to reproduce the range of notes on a piano.
2. Loop a rubber band around a post and pluck it, noting the pitch of the twang. Now consider stretching the rubber band to twice its length and plucking it again. Will it have a higher pitch due to the increased tension, or a lower pitch because of the increased wavelength? Explain your prediction and give it a try. Comment on your results.