Curiosity Guide #608
Piano Science

Accompanies Curious Crew, Season 6, Episode 8 (#608)

Piano Plucking

Investigation #3

Description

Have you ever looked inside a piano? Find out how the strings work, and how the strings can be tuned so they sound the right notes.

Materials

- Piano
- Plastic guitar pick
- Tuning hammer
- Mute (a device for changing the sound of an instrument)
- Tuning fork
- Rubber mallet
- A friend
- An adult

Procedure

1) Open the lid to the piano to expose the piano strings.
2) Predict what sounds will be produced when the strings are plucked. Will the sounds be low or high?
3) Gently pluck several strings with a plastic guitar pick.
4) What do you notice?
5) How do the thicknesses of the strings relate to the sound they produce?
6) With an adult's help, play a note, find the strings that correspond to that key, and then use the tuning hammer to adjust one of the strings.

7) Use the mute to silence the adjacent strings to the string you adjusted.
8) Play the note again by pressing the piano key. What did you notice?
9) Now adjust the string back and try to match the sound to the corresponding strings.
10) Strike the tuning fork with a rubber mallet and place the tuning fork on the wood of the piano.
11) Can you find the corresponding note?
12) Does the note need to be tuned?

My Results

Explanation

Pianos have an average of 230 steel wire strings for 88 keys. The strings range in length from 5 cm to 230 cm. The piano's pitch is determined by several factors: length of string, tension, diameter, and string material. When plucking the strings, several observations come to mind. The shorter the string, the higher the pitch. The tighter or thinner the string, the higher the pitch. The longer, looser, or thicker the string, the lower the pitch. The less dense the string material is, the faster the vibration as well. The 230 strings are all under tension. The combined string tension is as much as 15 to 20 tons on an upright piano, and 30 tons of tension on a grand piano.

Tuning a piano is better left to professionals, but it is easy to see how the process works. Tuning hammers look like levers but are called hammers. They have star-shaped openings that fit over the pins to tighten or loosen the strings. On a grand piano, pulling the hammer toward you will tighten the string and make the pitch higher, while pushing the hammer away from you will make the string looser and create a lower pitch. Mutes are used to prevent some of the strings from sounding, so you can play just one or two strings together during tuning. Using a digital tuner, tuning forks, or comparing notes by octaves are different methods of tuning the piano.

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