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Art & Culture, Music

Since I like music and I was curious to know how the math control the music theory and music chords, I decided to a small exploration on the topic for my fourth independent task. The discovery of harmonicsThe root of the western music is the harmonics discovered by Pythagoras who himself played music as he made some major discoveries in mathematics. The discovered that certain string ratios can produce sounds that were in harmony with each other. For example, in an electric guitar, when a string is played, and then when the string was half way pressed, it plays a same note but an octave higher. The ratio of the octave is 1: ½ = 2: 1This is not only about the octave notes but this can be applied to other notes. In the electric guitar, the chord sequence of E, A, B (base note, perfect fourth and the perfect fifth of E as the base note). The A can be played when the fifth fret of the string of the base note E is pressed, which in the ratio of the string, is E: A= 1: ¾= 4: 3.

The B can be played on the same string with the seventh fret pressed, which in the ratio is E: B= 1: ? = 3: 2. Another common note of the music chord of the base E is G with the ratio of 6: 5 or G sharp with the ratio of 5: 4. We tend to think that the sound of those particular whole number ratio “ right”. Making music in sign wavesOne of the most interesting connection between music and math is the model of the wave frequencies of notes using the sine curves. Sine and cosine curves are important for understanding any kinds of waves in physics and the wave in music is not an exception.

Music notes can be expressed in the sine curves whose basic formula is y= sin (bt)Where t is the time in seconds and b is further expressed in the connection to the period of the function by the formula period = 2?/b. Normally the Hertz (frequency) is used when we work with sound waves where one Hertz mean a full period per second. For example, 20 Hz mean there are 20 periods of the wave occurring per second, which in turn, 1 period per1/20s. We can get the b for the sine wave of 20 Hz like this: Period = 2?/b1/20= 2?/bb= 40y= sin (bt)= sin (40t)Therefore it can be generalized that if one sound wave has x Hz, the sine graph will look like 1/x= 2?/bb= 2xy= sin (bt)= sin (2xt)Harmonic progression and its paradoxAnother interesting math in music is said to be the harmonic progression that looks like this.