



## Introduction to Music and Mathematics

Mathematics and Music are associated with each other because they are two of the same. When you study music you do so by creating the experience that is music. Music and Mathematics has existed for thousands of years. It was not until around 540BC that a Greek philosopher named Pythagoras thought of connecting mathematics and music together.

### REFERENCES

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# Mathematics And Music



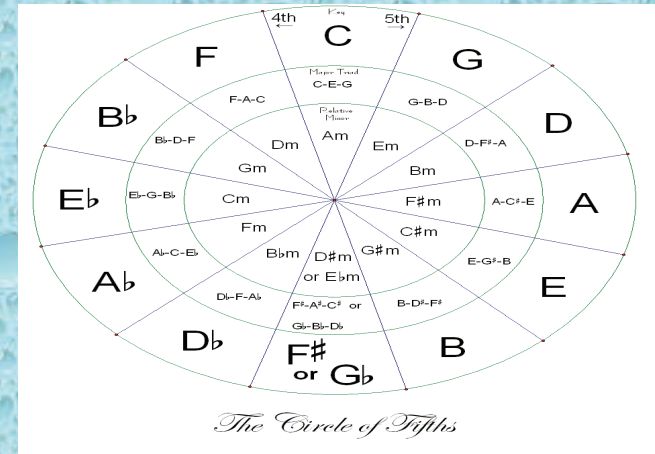
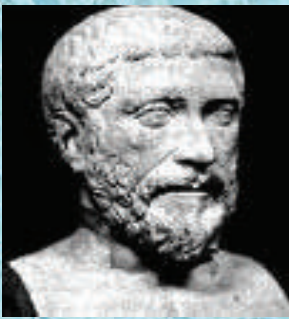
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## Pythagoras of Samos (570-495BC)

Pythagoras was an eccentric philosopher who believed mathematics related to everything in life. He was well taught from Greek, Egyptian and Oriental teachers. From his teachings, he would soon have a following of people called the Pythagoreans, who would carry on his teachings for centuries to come. One day as Pythagoras was contemplating harmonies, he passed a brazier's shop. As he looked at the workers, he realized that when the hammer hit the anvil, it made different sounds. From this he created the Pythagorean Scale. The Pythagorean Scale became the first formal musical scale.

## Pythagorean Scale

Pythagoras created a long arm made of wood. To the long arm he attached four strings that were made of like material. Since the concept came from the brazier's shop, Pythagoras selected four different weights to represent the heads of the anvil hammer's. He then placed one weight on each string in different intervals. From this, Pythagoras figured that every string had a different harmonious sound, but also had an equal distance from each other. For example, the first string had twice as much weight on it then the fourth string, but the strings were in harmony with each other. This was called a dupe or a ratio of 2:1. Pythagoras became excited by this because the ratios consisted of the numbers 1,2,,3,4 and 5. This excited Pythagoras because at the time there were five planets that moved along in similar ratios which is what he believed.

## Musical Ratios and Thirds and Fifths

For music to be in harmony, you need the ratios between the notes to be in harmony. If the distance between two notes are not in harmony, then the notes will sound off. There is a perfect ratio and an actual ratio. If you used actual ratio then the temperament of the note will be off. For this musicians settled on a compromise to play in perfect ratios so the note would have an equal temperament. Once the ratio and scale range has been established, the musician can move up a third of fifth to change the frequency of a note. For example if your ratio is 2:1 and you would like to move up a third, you would multiply 2/1 by 3/2. The ratio would now be 6/2 and the frequency would be 3. The same would be done for a third which is 5/4.