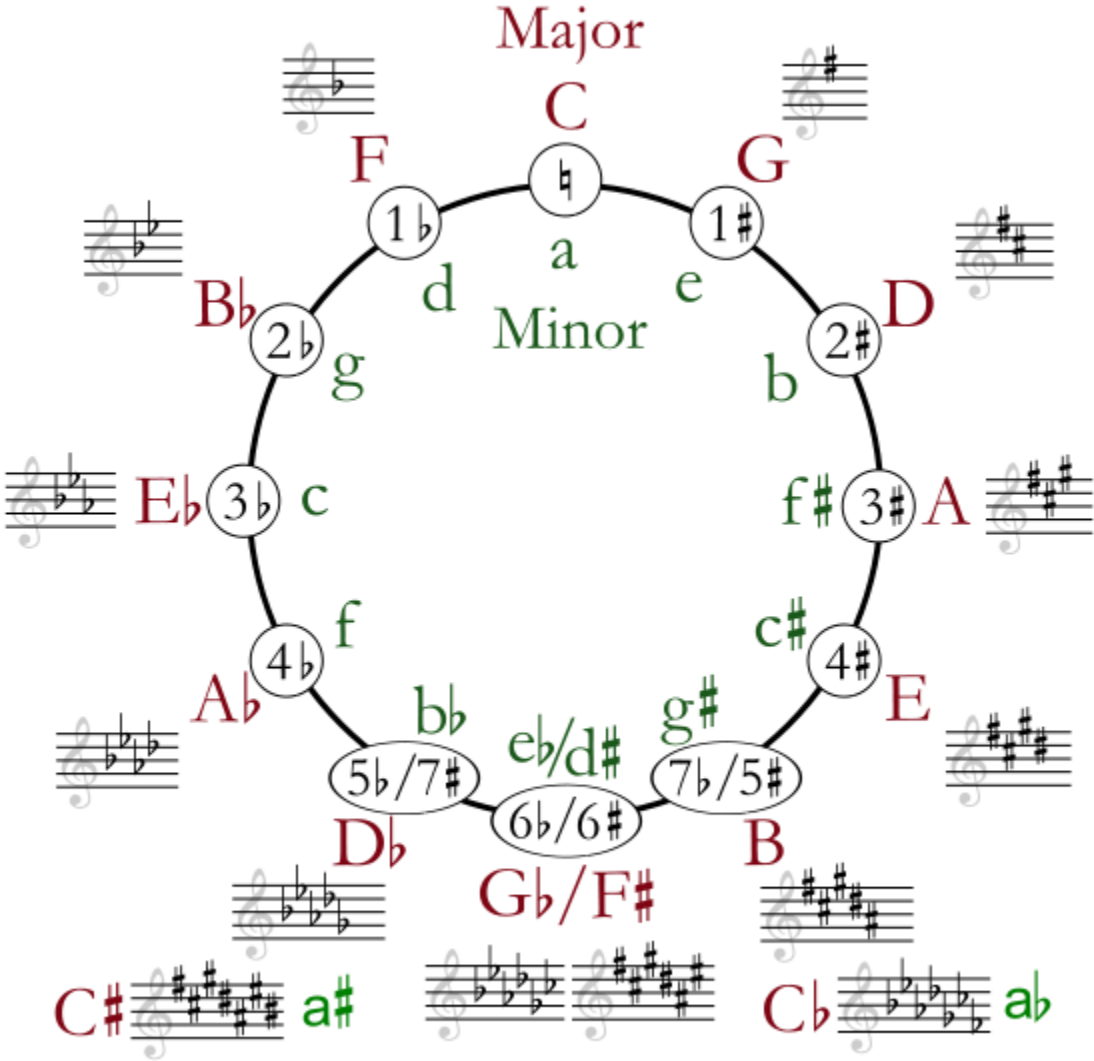


# Music and Math



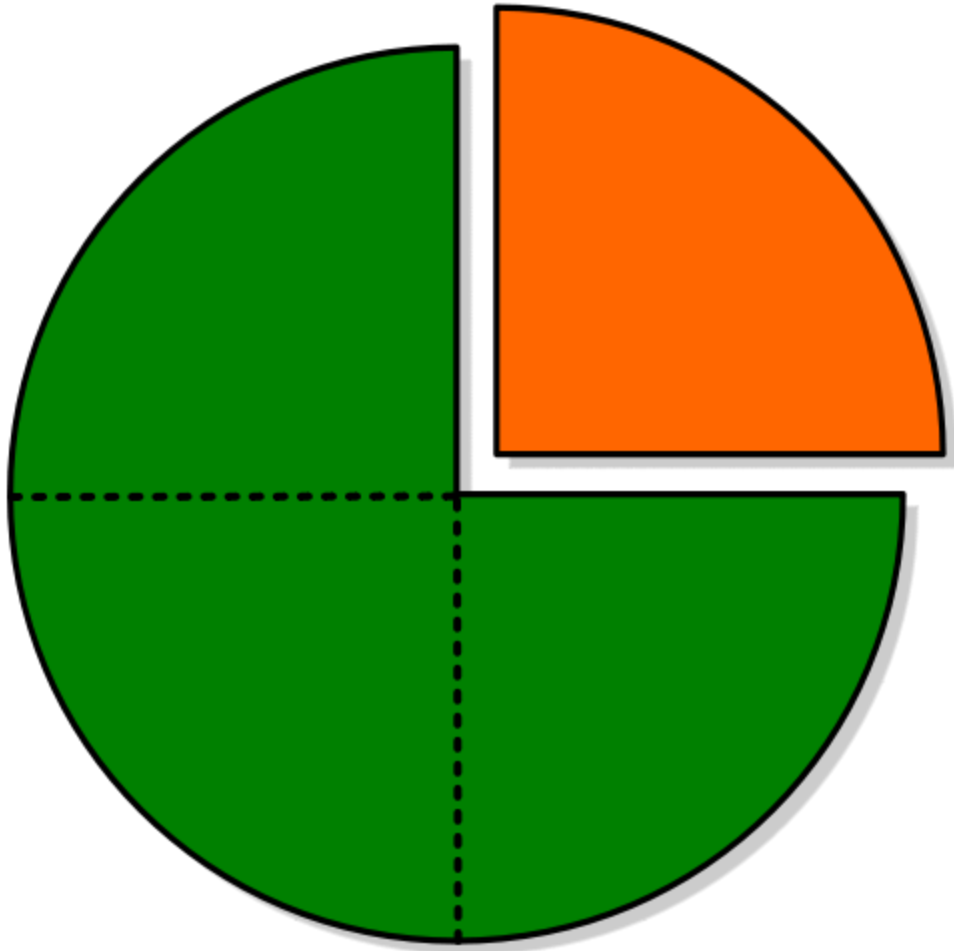
Mathematics is the foundation for music




The mathematical basis of musical rhythm and rhythmic notation is the natural connection between music and math. Some sample activities that integrate mathematics into the music classroom are listed below.

As the teacher introduces concepts in music about longer, greater than, less than, even, and odd, he can coordinate those concepts with examples from elementary mathematics. For example,

- The teacher can use musical facts to construct math problems:
  - Solo + quarter-note + quarter-rest = ?
  - Trio + dotted half-note + number of valves on a trumpet + legs on a grand piano = ?
  - Quarter + number of strings on a violin – half note = ?
- Students can cut pies or paper circles into fractions using musical notation. For example, divide pies into quarters with a picture of a quarter note in each slice.



- 
- A visual representation can help students learn the relationship of fractions and notes
  -  Enlarge
- Students can create musical instruments out of 10 clear glasses. Students measure the side of each glass and subtract one inch from the top. Divide this measurement by 10, using a crayon to mark 10 sections on each glass. Fill glasses with water to the lines. Label the first glass 1, the second glass 2, and so on, until the tenth glass is labeled 10. With a teaspoon, gently tap the first glass near the rim. Listen for the sound. As the numbers get higher and water increases,

the tones get lower. Have students tap out phone numbers to listen for pitches and create other addition and subtraction problems to play.

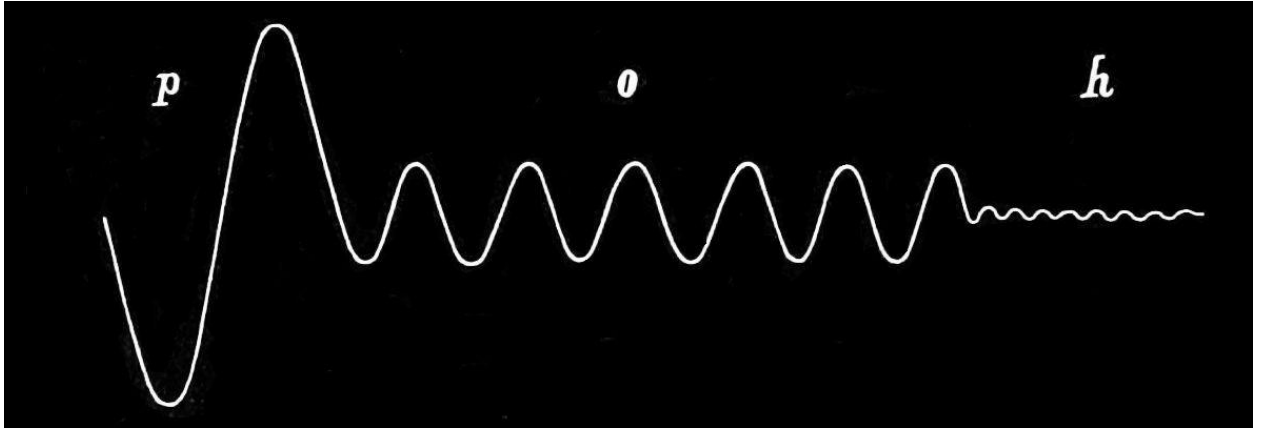
- Students need 15 to 20 geometric pieces of paper (multiple numbers of three to five different shapes cut ahead, or they can cut triangles, squares, circles, and diamonds). The teacher can review shape names. In groups, students lay out a pattern they like and then decide on a sound for each shape. They may use rhythm instruments. Groups rehearse and then perform their composition (e.g., square = drum, circle = shaker).
- Music is made up of scales that are tuned according to frequencies, which are expressed in cents and measurable by electronic tuners. Students can experiment with using a synthesizer to tune intervals to scales found in different cultures.
- Equations in math represent symmetrical balance, a principle found in the musical notation.
- Students can number each tone of the scale (twelve-tone or diatonic) and then play with random orders of those numbers in lines, playing them forward, backward (retrograde), upside down (inversion), and any combination thereof. They can also stretch the length of the sounds by doubling them (augmentation) or cut them in half (diminution).

## Music and Science

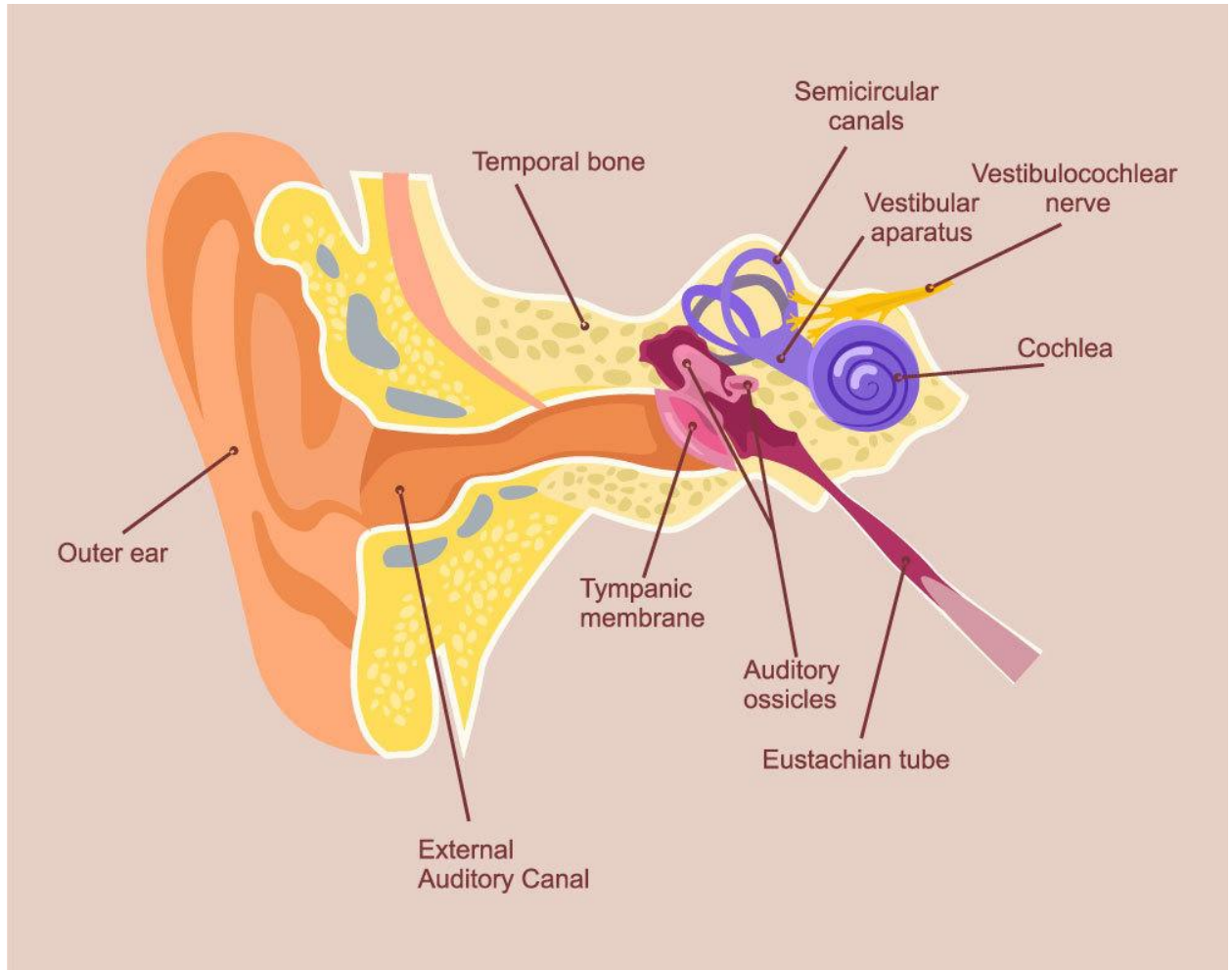
Some topics in science provide common ground for elementary music activities.

- Students can study the principles of the science of sounds such as vibration amplification, and the relationship of the length of the

vibrating surface to the pitch of the sound. Students can experiment with creating their own instruments or use standard instruments to illustrate some of these principles.



- 
- Sound vibrations change with different instruments
  - [Enlarge](#)
- Vibrations pass through the eardrum hammer and stirrups, and the water of the cochlea and are sent as an electrical nerve signal to the brain. Sound also conducts through the bones of the skull. Ask students to cover their ears and hum to hear the sound coming through the bones. Students can try to make as many different timbres as possible with a pencil, hands, and the like.



- 
- The eardrum conducts sound
  - [Enlarge](#)
- Science can serve as the theme of a music lesson. This approach is illustrated using the programmatic music, *Ballet of the Unhatched Chicks*, by Mussorgsky, using the topic of chicks to help students explore long and short musical sounds.
- Nature consists of patterns. Students can explore the patterns in nature (pinecones, flowers, tree leaves, shells) and compare them to patterns in music.
- In the spring, students can go on a listening walk to find bird songs. Students can tape each song and match with bird pictures on return to

class. Then they can discuss the differences in melodies, pitches, rhythms, and timbres of each bird. Variation: Use musical notation to write down bird songs. Students can also write lyrics to bird songs, like the "bob white" we use to make the quail song.



- 
- Nature displays many patterns
  - [Enlarge](#)
- What would a rainy day sound like? Towering cumulus clouds? Thunder and lightning? A hurricane? The teacher asks students to create and present weather reports in which the meteorologist makes sounds when they mention each type of weather. Variation: Write or find songs about the weather that could introduce or conclude weather reports. They may also use poetry.
- Students imitate or tape record sounds in nature, such as a bird whistling, dog barking, water splashing, and the wind. Combine sounds

to create a nature orchestra. Variation: Compose environmental rhythms song: rap or chant by audio taping toilet flushes, the door shutting, stirring with a metal spoon, the clock ticking, and typing.