Making music has been an activity of human beings, both as individuals and with others, for thousands of years. Written texts, pictorial representations, and folklore sources provide evidence that people from all over the globe and from the beginnings of recorded history have created and performed music for religious rituals, civil ceremonies, social functions, story telling, and self-expression. Some of the terminology, concepts, and vocabulary used by musicians in writing and talking about the many types of music you will be studying are discussed in this section on elements of sound and music.

Elements of Sound

From the perspective of a musician, anything that is capable of producing sound is a potential instrument for musical exploitation. What we perceive as sound are vibrations (sound waves) traveling through a medium (usually air) that are captured by the ear and converted into electrochemical signals that are sent to the brain to be processed.

Since sound is a wave, it has all of the properties attributed to any wave, and these attributes are the four elements that define any and all sounds. They are the frequency, amplitude, wave form and duration, or in musical terms, pitch, dynamic, timbre (tone color), and duration.

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**Frequency**

The frequency, or pitch, is the element of sound that we are best able to hear. We are mesmerized when a singer reaches a particularly high note at the climax of a song, just as we are when a dancer makes a spectacularly difficult leap. We feel very low notes (low pitches) in a physical way as well, sometimes expressing dark or somber sentiments as in music by country singers like Johnny Cash, and other times as the rhythmic propulsion of low-frequency pulsations in electronically amplified dance music.

The ability to distinguish pitch varies from person to person, just as different people are better and less capable at distinguishing different colors (light frequency). Those who are especially gifted recognizing specific pitches are said to have “perfect pitch.” On the other hand, just as there are those who have difficulty seeing the difference in colors that are near each other
in the light spectrum (color-blind), there are people who have trouble identifying pitches that are close to each other. If you consider yourself to be such a “tone-deaf” person, do not fret. The great American composer Charles Ives considered the singing of the tone-deaf caretaker at his church to be some of the most genuine and expressive music he experienced.

An audio compact disc is able to record sound waves that vibrate as slow as 20 times per second (20 Hertz = 20 Hz) and as fast as 20,000 times per second (20,000 Hertz = 20 kiloHertz = 20 kHz). Humans are able to perceive sounds from approximately 20 Hz to 15 kHz, depending on age, gender, and noise in the environment. Many animals are able to perceive sounds much higher in pitch.

When musicians talk about being “in tune” and “out of tune,” they are talking about pitch, but more specifically, about the relationship of one pitch to another. In music we often have a succession of pitches, which we call a melody, and also play two or more pitches at the same time, which we call harmony. In both cases, we are conscious of the mathematical distance between the pitches as they follow each other horizontally (melody) and vertically (harmony). The simpler the mathematical relationship between the two pitches, the more consonant it sounds and the easier it is to hear if the notes are in tune.

The simplest relationship of one pitch to another is called the octave. The octave is so fundamental that we give two pitches an octave apart the same letter name. The ratio between notes an octave apart is 2:1. If we have a note vibrating at 400 Hz, the pitch an octave higher vibrates at 800 Hz (2 * 400 Hz). The pitch an octave lower than 400 Hz has a frequency of 200 Hz (400 Hz / 2).

Amplitude
Amplitude is the amount of energy contained in the sound wave and is perceived as being either loud or soft. Amplitude is measured in decibels, but our perception of loud and soft changes depending on the sounds around us. Walking down a busy street at noon where the noise in the environment might average 50 decibels, we would find it difficult to hear the voice of a person next to us speaking at 40 decibels. On that same street at night that 40 decibel speaking voice will seem like a shout when the surrounding noise is only about 30 decibels.

Wave Form
The wave form of a sound determines the tone color, or timbre that we hear and is how we can tell the difference between the sound produced by a voice, a guitar, and a saxophone even if they are playing the same frequency at the same amplitude.

The simplest wave form is the sine wave, which we have seen diagrammed in the examples for frequency and amplitude above. Pure sine waves rarely occur in nature but they can easily be created through electronic means. An instrument with a timbre close to
the purity of a sine wave is the flute. The violin section of the orchestra, by contrast, has a much more complex timbre as seen in its wave form below.

![Wave form of a solo flute.](image1)

![Wave form of a violin string section.](image2)

**Duration**

Every sound event has its unique duration, which we perceive as being either short or long, depending on the context. Several durations, one after another, create the rhythm of a piece.

**Elements of Music**

**Rhythm**

All music involves the unfolding of sounds in time. Some of the terminology used in describing music therefore refers to the durational and temporal organization of musical sounds. The attack points of a sequence of sounds produce *rhythm*. The three syllables of the word “strawberry” can be pronounced at evenly spaced intervals (straw-ber-ry), or the first syllable can be stretched out, producing one long and two shorter durations (straaaaw-ber-ry)—two different speech rhythms. The speech rhythm of “My country, ‘tis of thee” moves in evenly spaced syllables up to “tis,” which is elongated, followed by “of,” which is cut short and leads directly to “thee”—ta ta ta taaa t-ta. In both vocal and instrumental music, rhythm is generated by the onset of new sounds, whether the progression from one word or syllable to the next in a song, the succession of pitches of a violin melody, the striking of a drum, or the strumming of chords on a guitar.

**Meter**

The succession of attacks and durations that produces rhythm may proceed in a quite unpredictable flow (“to be or not to be, that is the question”—the opening of Hamlet’s soliloquy)—what is called *nonmetered* or *free rhythm*—or may occur so as to create an underlying *pulse* or *beat* (“bubble, bubble, toil and trouble”—four beats coinciding with buh–buh–toil–truh—from the witches’ incantation in Macbeth). Recurrent groupings of beats by two’s, three’s, or some combination of two’s and three’s, produces *meter*. The first beat of each metric group is often described as accented to characterize its defining function in the rhythmic flow (My country ‘tis of thee, sweet land of liberty, of thee I sing—six groups of three beats, each beginning with the underlined syllable).

Another important rhythmic phenomenon is *syncopation*, which signifies irregular or unexpected stresses in the rhythmic flow (for example, straw-ber-ry instead of straw-ber-ry). A distinctive sequence of longs and shorts that recurs throughout an individual work or groups of works, such as particular dance types, is called a *rhythmic pattern, rhythmic figure*, or *rhythmic motive*.

**Pitch**

*Pitch* refers to the location of a musical sound in terms of low or high. As we have seen, in terms of the physics of sound, pitch is determined by frequency, or the number of vibrations per second: the faster a sounding object vibrates, the higher its pitch.

Although the audible range of frequencies for human beings is from about 20 to under 20,000 vibrations per second, the upper range of musical pitches is only around 4,000
vibrations per second. Frequency is determined by the length and thickness of the vibrating object. In general, longer and thicker objects vibrate more slowly and produce lower pitches than shorter and thinner ones. Thus, men’s voices are usually lower than those of women and children, who have comparatively shorter and thinner vocal cords. The same principle is visible in the construction of many instruments. The longest wooden bars of a xylophone produce the lowest pitches, the shortest produce the highest. The alto saxophone is smaller and has a higher range than the slightly larger tenor saxophone.

Pitch, like temperature, is a sliding scale of infinite gradations. All theoretical systems of music organize this pitch continuum into successions of discrete steps analogous to the degrees on a thermometer. And just as the Fahrenheit and Celsius systems use different sized increments to measure temperature, different musical cultures have evolved distinctive pitch systems. The conventional approach to classifying pitch material is to construct a scale, an arrangement of the pitch material of a piece of music in order from low to high (and sometimes from high to low as well). Each element of a scale is called a “step” and the distance between steps is called an interval. Most Western European music is based on diatonic scales—seven-tone scales comprised of five “whole steps” (moderate-size intervals) and two “half steps” (small intervals). The position of the whole and half steps in the ascending ladder of tones determines the mode of the scale. Major and minor are two commonly encountered modes, but others are used in folk music, in Western European music before 1700, and in jazz. Another important scale type particularly associated with music from China, Japan, Korea, and other Asian cultures is pentatonic, a five-note scale comprised of three whole steps and two intervals of a step and a half.

The starting pitch of a scale is called the tonic or keynote. Most melodies end on the tonic of their scale, which functions as a point of rest, the pitch to which the others ultimately gravitate in the unfolding of a melody. Key is the combination of tonic and scale type. Beethoven’s Fifth Symphony is in C minor because its basic musical materials are drawn from the minor scale that starts on the pitch C.

**Melody**
A succession of musical tones perceived as constituting a meaningful whole is called a melody. By its very nature, melody cannot be separated from rhythm. A musical tone has two fundamental qualities, pitch and duration, and both of these enter into the succession of pitch plus duration that constitutes a melody.

Melody can be synonymous with tune, but the melodic dimension of music also encompasses configurations of tones that may not be singable or particularly tuneful. Conversely, music may employ pitch material but not have a melody, as is the case with some percussion music. Attributes of melody include its compass, that is, whether it spans a wide or narrow range of pitches, and whether its movement is predominantly conjunct (moving by step and therefore smooth in contour) or disjunct (leaping to non-adjunct tones and therefore jagged in contour). Melodies may occur without additional parts (monophony), in combination with other melodies (polyphony), or supported by harmonies (homophony)—see the following discussion about Texture.

Melodies may be designed like sentences, falling into clauses, or phrases. Indeed, in composing vocal music, composers generally design melodies to parallel the structure and syntax of the text they are setting. The termination of a musical phrase is called a cadence. A full cadence functions like a period, punctuating the end of a complete musical thought. A half cadence is analogous to a comma, marking a pause or intermediate point of rest within a phrase. The refrain of Jingle Bells, for example, contains four phrases with three half cadences and a concluding full cadence:
Jingle bells, jingle bells, jingle all the way (half cadence)
Oh, what fun it is to ride in a one horse open sleigh (half cadence)
Jingle bells, jingle bells, jingle all the way (half cadence)
Oh, what fun it is to ride in a one horse open sleigh (full cadence, melody descends to the tonic)

In another melodic style, associated more with instrumental than vocal music, melodic material is not organized in regular, balanced units, but spins out in a long, continuous line.

**Texture**

Like fabric, music has a *texture*, which may be dense or transparent, thick or thin, heavy or light. Musical texture also refers to how many different layers of sound are heard at once, to whether these layers have a primarily melodic or an accompaniment function, and to how the layers relate to each other. A texture of a single, unaccompanied melodic line is called *monophony* from the Greek “*monos*” (single, alone) and “*phone*” (sound). Monophony becomes *heterophony* when spontaneous variations of two or more performers produce different versions of the same melody at the same time. The simultaneous combination of two or more independent melodies is classified as *polyphony* and of two or more simultaneous rhythmic lines as *polyrhythm*. Another principal textural category is *homophony*, one dominant melody with accompaniment. These classifications are often useful in describing individual works and repertory groups, but in practice many works and styles do not fall neatly into one category. For example, a common texture in jazz entails some instruments whose interaction would be described as polyphonic and others whose function it is to accompany them.

Two important concepts in the analysis and description of musical textures are counterpoint and harmony. *Counterpoint* refers to the conduct of simultaneously sounding melodic lines, one against the other. Rhythmic counterpoint denotes the unfolding of concurrent rhythmic parts in polyrhythmic textures. While counterpoint focuses on linear events, *harmony* is concerned with the vertical combination of tones that produces chords and successions of chords.

The Western system of musical notation, while somewhat limited in the expression of subtleties of rhythm and pitch, can indicate many simultaneous sounds and has enabled Western composers to create music of greater textural complexity than that of any other musical tradition. Principles or rules of composing multipart, or contrapuntal, music were first formulated during the Middle Ages and have evolved and changed to reflect new musical aesthetics, performance practices, and compositional techniques.

**Tone Color**

*Tone color*, or timbre, is the distinctive quality of a voice or instrument. Tone color is the result of an acoustic phenomenon known as overtones. In addition to the fundamental frequency heard as a sound’s pitch, musical tones contain patterns of higher frequencies. Though these higher frequencies, or overtones, are not usually perceived as pitches in themselves, their relative presence or absence determines the characteristic quality of a particular voice or instrument. The prominence of overtones in musical instruments depends on such factors as the materials from which they are made, their design, and how their sound is produced. Similarly, the individual physiology of each person’s vocal cords produces a unique speaking and singing voice. The term tone color suggests an analogy with the visual arts, and indeed the exploration, manipulation, and combination of instrumental and vocal sound qualities by performers and composers may be compared to the use of color by painters. Terms such as *orchestration*, *scoring*, and *arranging* refer to the aspect of composition that involves the purposeful treatment of tone color. A composer may choose to use pure colors (for example, the melody played by violins) or mixed colors (the melody played by violins and flutes), or to exploit a particular quality of an instrument, such as the unique sound of the clarinet in its low range. The art of orchestration encompasses various performance techniques that affect tone color, among them the use of mutes, which are devices for altering the sound of an instrument. In violins and other bowed strings, the mute is a small comb-shaped device that is clamped on the strings, making the sound veiled and somewhat nasal. Brass instruments
are muted by inserting various materials into the bell.

Although tone color has a scientific explanation, its function in music is aesthetic. Music is an art of sound, and the quality of that sound has much to do with our response to it. Indeed, the concept of tonal beauty varies considerably in different periods, styles, and cultures. On the other hand, within a particular context, ideals of beauty may be quite firmly established and performers often pay extraordinary prices for instruments that can produce that ideal sound. But no instrument automatically produces a beautiful tone, so the finest violin will produce a rasping, scraping sound in the hands of a beginner. Even at the most advanced stages of accomplishment, achieving what is considered to be a beautiful tone is a criterion of a good performance.

The attitude toward tone color has played an interesting role in the history of Western art music. Prior to the 18th century, composers were often quite vague, even indifferent, with respect to how their musical ideas would be realized. It was customary to play music on whatever instruments were at hand and to perform some or all parts of vocal compositions on instruments. During the 18th century, as composers became more sensitive to the idiomatic quality of instruments, they began to conceive musical ideas in terms of particular tone colors. In the 19th and 20th centuries, the fascination with expanding and experimenting with the palette of tone colors has elevated the art of orchestration to a level equal to other aspects of the compositional process.

**Form**

The interaction of such elements as melody, rhythm, texture, and harmony in the unfolding of a musical work produces form. Most music conforms to one of the following three basic formal prototypes:

1. sectional, falling into units of contrasting or repeating content,
2. continuous, usually involving the development and transformation of one or more germinal ideas,
3. a combination of sectional and continuous.

In addition, four general concepts help in the appreciation of many forms: repetition, contrast, return, and variation. The concept of “return” is especially important, for when listeners hear something familiar (that is, something they heard earlier in a work or performance) the sense of “going home” can be very powerful, whether it takes place in a 45-minute symphony or a four-minute pop song. One traditional method of representing these concepts is to use letters of the alphabet to identify individual phrases or sections, AA indicating repetition, AB contrast, ABCD a continuous structure, ABA return, and ABACA a design involving contrast, repetition and return. Capital and lower case letters may be used to distinguish between different levels of formal organization, while symbols for prime (A’, B’ etc) signify restatement of material with some changes. When a section is repeated more than once with different changes, additional prime symbols may be used (ABA’CA”, for example, where the second and third A’s are both versions of the original “A,” but different from each other).

To illustrate, the chorus of *Jingle bells* would be represented as abab’ (a for the repeated music of the first and third lines, b and b’ for the contrasting music of the second and fourth phrases with their different endings -half and full cadences, respectively). The entire song is in ABA form (A for Jingle bells….open sleigh), B for the second section of the song (Dashing through the snow...) and A for the return of the chorus.

In variation form, a melody or chord progression is presented successively in different versions; the form could be diagrammed as A A’ A” A”’ and so forth. Changes may be made in key, instrumentation, rhythm, or any number of ways, but the original tune is always recognizable. Aaron Copland’s variations on the Shaker tune *Simple Gifts* in his *Appalachian Spring* is a famous example of variation on a tune, while Pachelbel’s *Canon in D* might be considered a series of variations on a chord progression. Some have compared a jazz performance to a kind of variation form, where musicians play a pre-existing tune and then provide a series of improvised “variations” on that tune.