Frequency

Frequency refers to the number of compression–rarefaction cycles that occur per unit of time, usually one second. Audible sounds for the human ear range from 20 to 20,000 cycles per second.

THE FOUR PROPERTIES OF SOUND

Sound has four identifiable characteristics or properties: *pitch, intensity, duration,* and *timbre.* Despite how complicated a composition may be, these four are the only variables with which composers and performers have to work.

Pitch

Pitch is the highness or lowness of a sound. Variations in frequency are what we hear as variations in pitch: The greater the number of sound waves produced per second of an elastic body, the higher the sound we hear; the fewer sound waves per second, the lower the sound.

Tone

A *tone* is a musical sound of definite pitch.

Intensity

Intensity (amplitude) is heard as the loudness or softness of a pitch. In *acoustics* (the science of sound), intensity is the amount of energy affecting the vibrating body, and the physicist measures intensity on a scale from 0 to 130 in units called *decibels.* In musical notation, gradations of intensity are indicated with the following Italian words and their abbreviations:

Italian Word	Symbol	Translation	Average Decibels
Pianissimo	*pp*	Very soft	40
Piano	*p*	Soft	50
Mezzo piano	*mp*	Moderately soft	60
Mezzo forte	*mf*	Moderately loud	70
Forte	*f*	Loud	80
Fortissimo	*ff*	Very loud	100

Duration

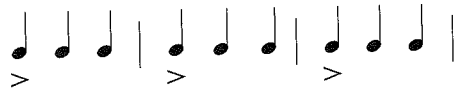
Duration is the length of time a pitch, or tone, is sounded. For patterns of duration, the following terms are used: *meter* and *rhythm.*

Meter

Meter describes regularly recurring pulses of equal duration, generally grouped into patterns of two, three, four, or more with one of the pulses in each group accented. These patterns of strong (>) and weak (⌣) pulses are called *beats.* For example:

Duple meter: > ⌣ | > ⌣ | > ⌣ | =

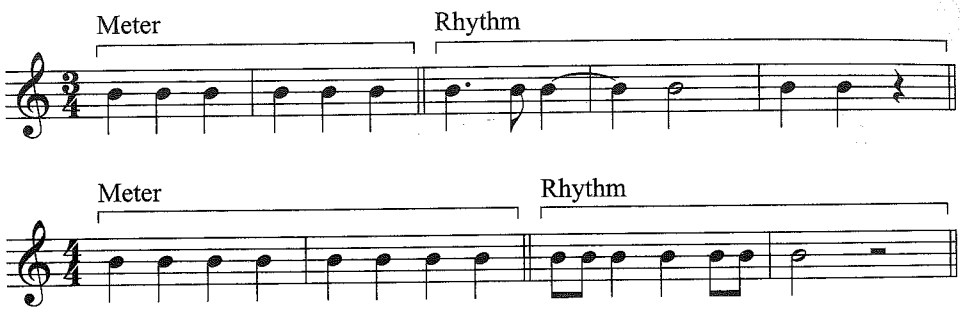
Triple meter: > ⌣ ⌣ | > ⌣ ⌣ | > ⌣ ⌣ | =



Duple (two-beat) meter and triple (three-beat) meter are the two basic meters. All other meters result from some combination of these two.

Rhythm

Operating in conjunction with the meter, *rhythm* is a pattern of uneven durations. While the steady beats of the meter combine to form measures, a rhythm may be a pattern of almost any length.



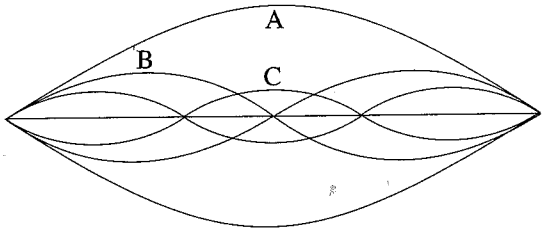
Timbre

Timbre is the tone quality or color of a sound. It is the property of sound that permits us, for instance, to distinguish the difference between the sound of a clarinet and an oboe.

This sound quality is determined by the shape of the vibrating body, its material (metal, wood, human tissue), and the method used to put it in motion (striking, bowing, blowing, plucking). It is also the result of the human ear's perception of a series of tones called the harmonic series, which is produced by all instruments.

Harmonic Series

A *harmonic series* includes the various pitches produced simultaneously by a vibrating body. This physical phenomenon results because the body vibrates in sections as well as in a single unit. A string, for example, vibrates along its entire length as well as in halves, thirds, quarters, and so on.

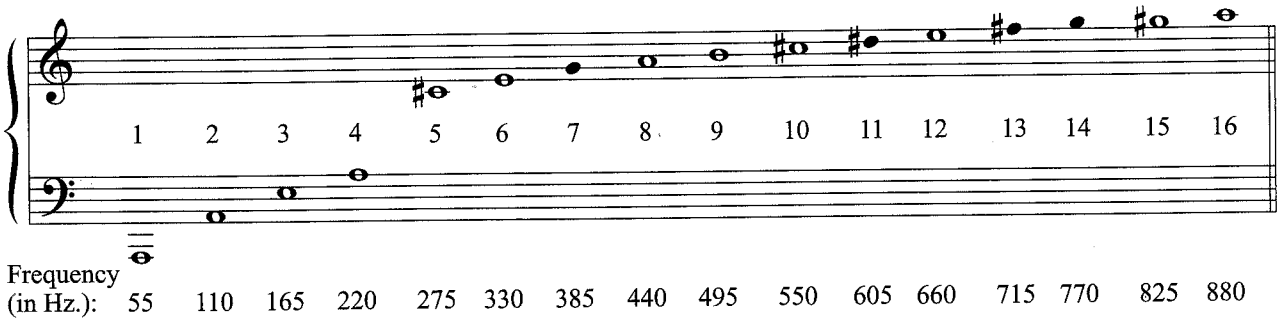


A—String Vibrating as a Unit
B—String Vibrating in Halves
C—String Vibrating in Thirds

Partials

The pitches produced simultaneously by the vibrating sections are called *partials* or *harmonics*. The first partial, often called the *fundamental,* and the series of partials constitute a musical tone. Since the fundamental is the lowest frequency and is also perceived as the loudest, the ear identifies it as the specific pitch of the musical tone.

Although the harmonic series theoretically goes to infinity, there are practical limits; the human ear is insensitive to frequencies above 20,000 Hz. (Hz is the abbreviation for hertz, a standard measurement of frequency expressed in cycles per second.) The following illustration carries the harmonic series of an A fundamental to the sixteenth partial:



CHAPTER 1

Notation

TOPICS

Pitch
Staff
Letter Names
Clefs
Treble Clef
Bass Clef
Grand Staff
Middle C
Ledger Lines
C Clef
Alto Clef
Tenor Clef
Soprano Clef
Mezzo Soprano Clef
Baritone Clef
Octave Identification
Accidentals
Sharp
Flat
Natural
Double Sharp
Double Flat
Interval
Enharmonic Equivalents
Half-Step Motion
Duration
Breve and Rest
Whole Note and Rest
Half Note and Rest
Quarter Note and Rest
Eighth Note and Rest
Sixteenth Note and Rest
Thirty-Second Note and Rest
Sixty-Fourth Note and Rest
Tie
Dot
Second Dot
Irregular Divisions and Subdivisions
Rhythm
Pulse or Beat
Meter
Meter Signatures
Simple Meter
Compound Meter
Duple, Triple, and Quadruple Meters
Asymmetrical Meter
Syncopation
Dynamic Markings

IMPORTANT CONCEPTS

Music notation is much more precise and complicated than written language. When we notate music, we use symbols that show three of the four properties of sound described in the introduction: pitch and duration are given accurately, and relative intensity is indicated. Furthermore, pitch and duration are shown simultaneously.

Notation of Pitch

The term *pitch* describes the highness or lowness (the frequency) of a tone. In music notation, pitches are represented by symbols positioned on a staff and identified with letter names.

The Staff

The *staff* consists of five equally spaced horizontal lines.

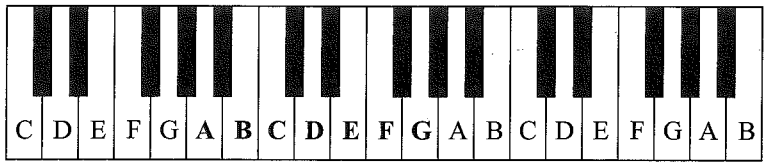
Figure 1.1

Five Lines

Letter Names

The various pitches are referred to by the first seven letters of the alphabet (A B C D E F G), as shown on the piano keyboard in Figure 1.2.

Figure 1.2



The Clefs

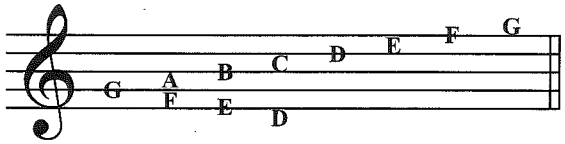
A *clef* is a symbol placed at the beginning of a line of music that establishes the letter names of the lines and spaces of the staff.

Treble Clef (G)

The *treble clef* or *G clef* is an ornate letter G. The curved line terminates at the second line of the staff, thus designating the letter name of a note on that line as G.

Figure 1.3

Staff with Treble or G Clef

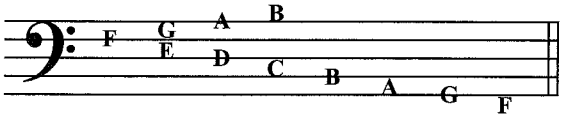


Bass Clef (F)

The *bass clef* is called the *F clef* because it was derived from the letter F. The dots are placed above and below the fourth line of the staff, designating that line as F.

Figure 1.4

Staff with Bass or F Clef

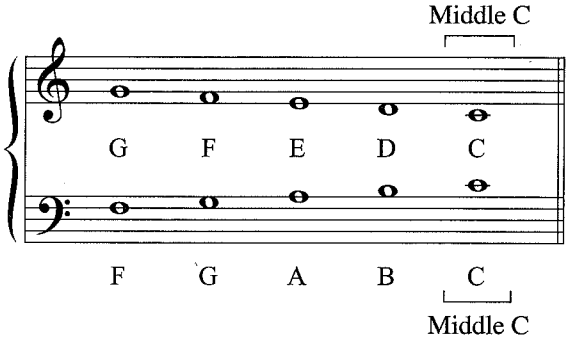


Grand Staff

Together, the treble and bass staves make up a *grand staff.* Figure 1.5 shows the point at which both clefs converge. The two Cs are the same pitch: *middle C.*

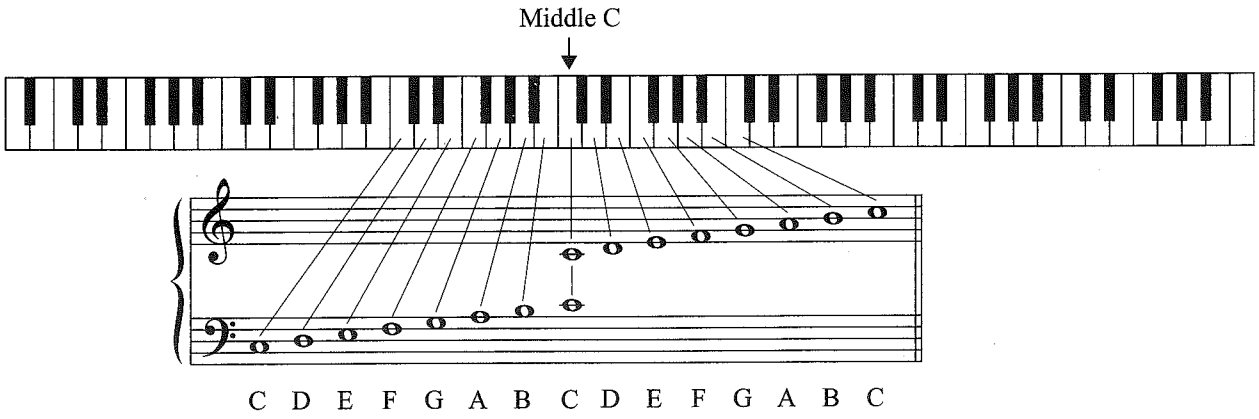
Figure 1.5

Grand Staff



The grand staff is associated most often with keyboard music. Figure 1.6 shows the relationship between the grand staff, the standard 88-key piano keyboard, and middle C.

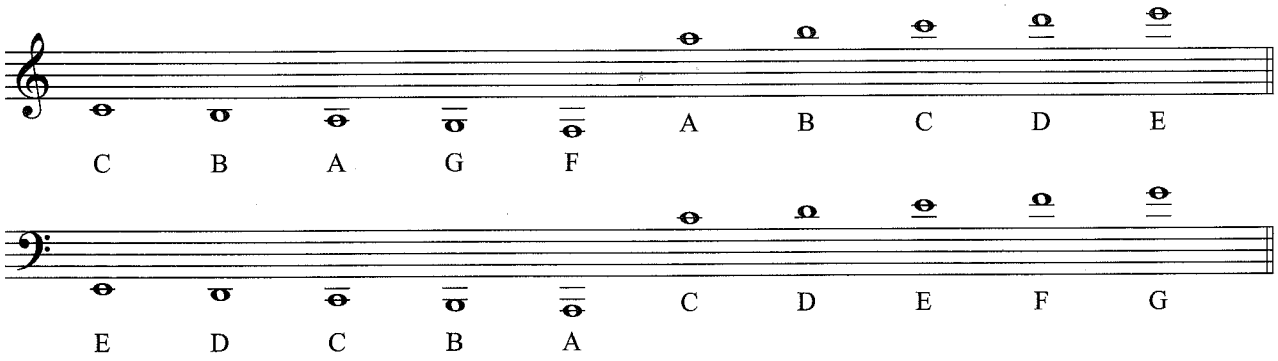
Figure 1.6



Ledger Lines

Pitches that go beyond the limits of the staff are written by adding *ledger lines* above or below the staff. Ledger lines, which parallel the staff, accommodate only one note (see Figure 1.7).

Figure 1.7



C Clef

A *C clef* may be positioned on any line of the staff to designate middle C. This clef is coupled with a set of secondary names that identify each of the possible positions (see Figure 1.8).

Figure 1.8

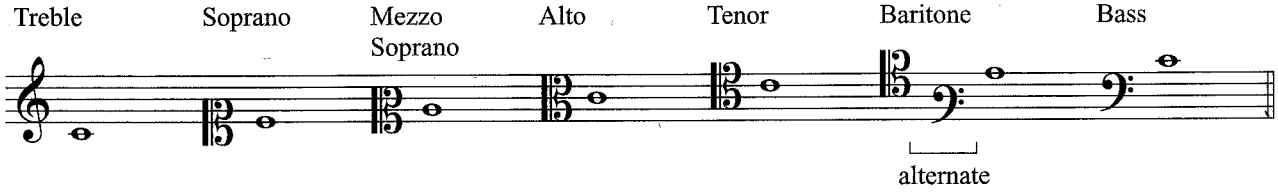
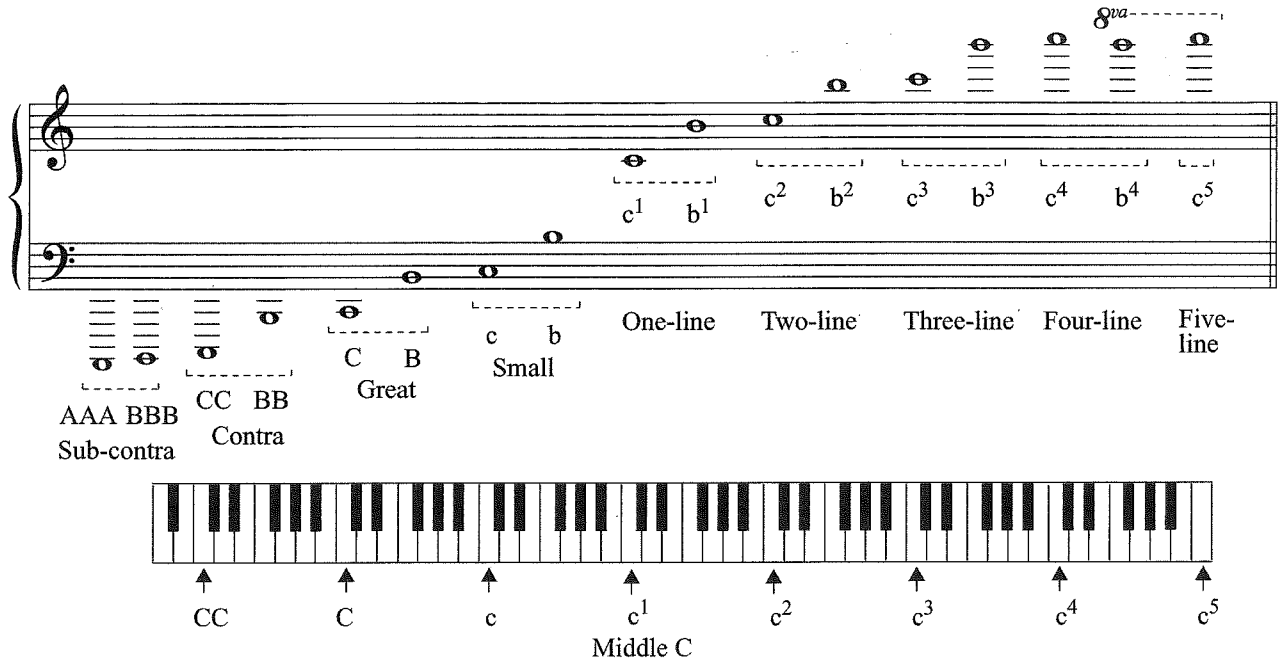


Figure 1.10



The octave identification system in Figure 1.10 is often referred to as the Helmholtz system after the German acoustician who made the system popular. This widely used designation method has been prevalent since the nineteenth century.

Accidentals

Accidentals are symbols that are placed to the left of the noteheads to indicate the raising or lowering of a pitch.

Sharp (♯)—raises the pitch a half step.

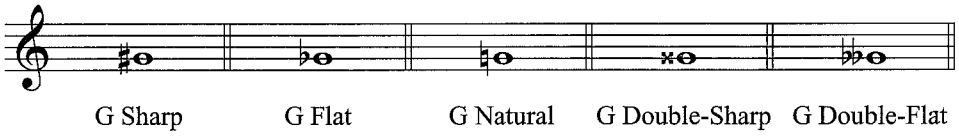
Flat (♭)—lowers the pitch a half step.

Natural (♮)—cancels any previous sharp or flat and returns to the natural, or unaltered, pitch.

Double Sharp (𝄪)—raises the pitch two half steps.

Double Flat (𝄫)—lowers the pitch two half steps.

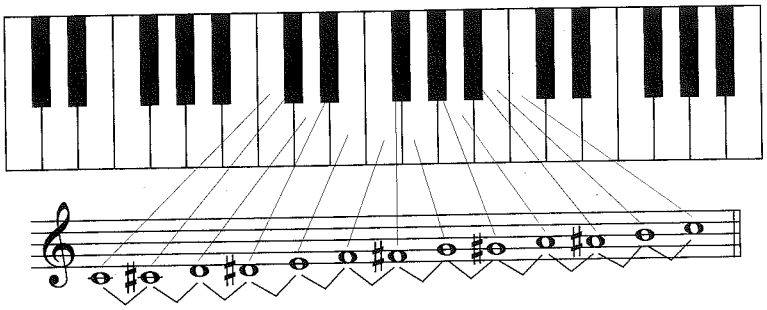
Figure 1.11



Interval

An *interval* is the relationship between two tones. In Western music, the half step is the smallest interval used. It is the interval between any two adjacent keys—black or white—on the keyboard.

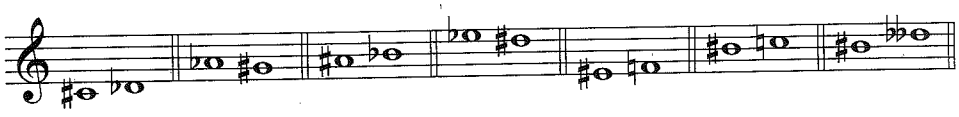
Figure 1.12



Enharmonic Equivalents

Enharmonic equivalents are tones that have the same pitch but different letter names.

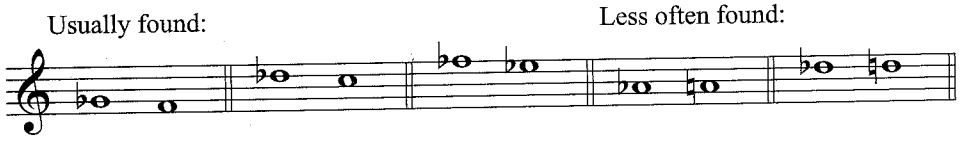
Figure 1.13



Half-Step Motion

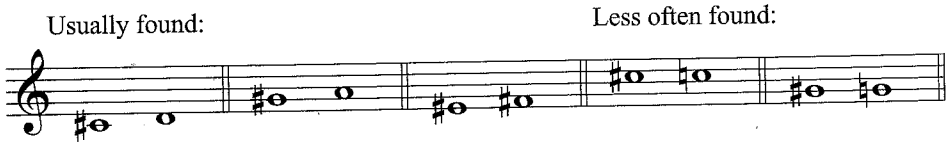
In passages of music involving *half-step motion,* a flatted note is followed most often by a note with a different letter name a half step lower.

Figure 1.14



A sharped note is followed most often by a note with a different letter name a half step higher in passages involving half-step motion.

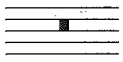
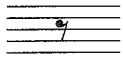
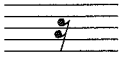
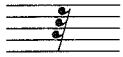
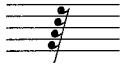
Figure 1.15



Notation of Duration

The notation of *duration* is illustrated in the following chart:

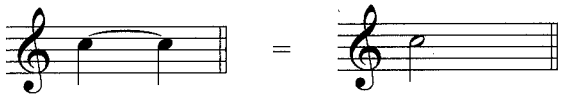
Figure 1.16

Name	Note	Rest	Equivalents
Breve (Double Whole Note)			Two Whole Notes
Whole Note			Two Half Notes 
Half Note			Two Quarter Notes 
Quarter Note			Two Eighth Notes 
Eighth Note			Two Sixteenth Notes 
Sixteenth Note			Two Thirty-second Notes 
Thirty-second Note			Two Sixty-fourth Notes 
Sixty-fourth Note			Two One Hundred Twenty-eighth Notes 

The Tie

The *tie* is a curved line that connects two adjacent notes of the same pitch into a single sound with a duration equal to the sum of both note values.

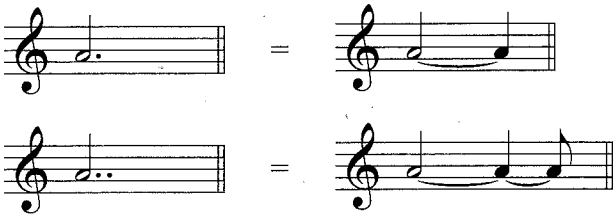
Figure 1.17



The Dot

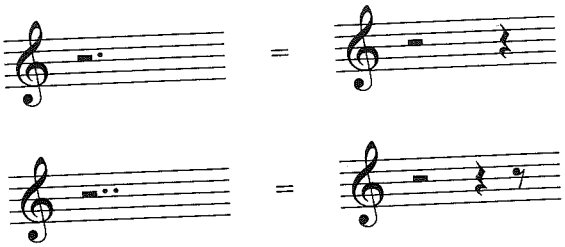
Placed to the right of a note head, the *dot* lengthens the value of the note by half again its value. A *second dot* lengthens the dotted note value by half the length of the first dot.

Figure 1.18



Dots may also be used with rests and affect them in the same way.

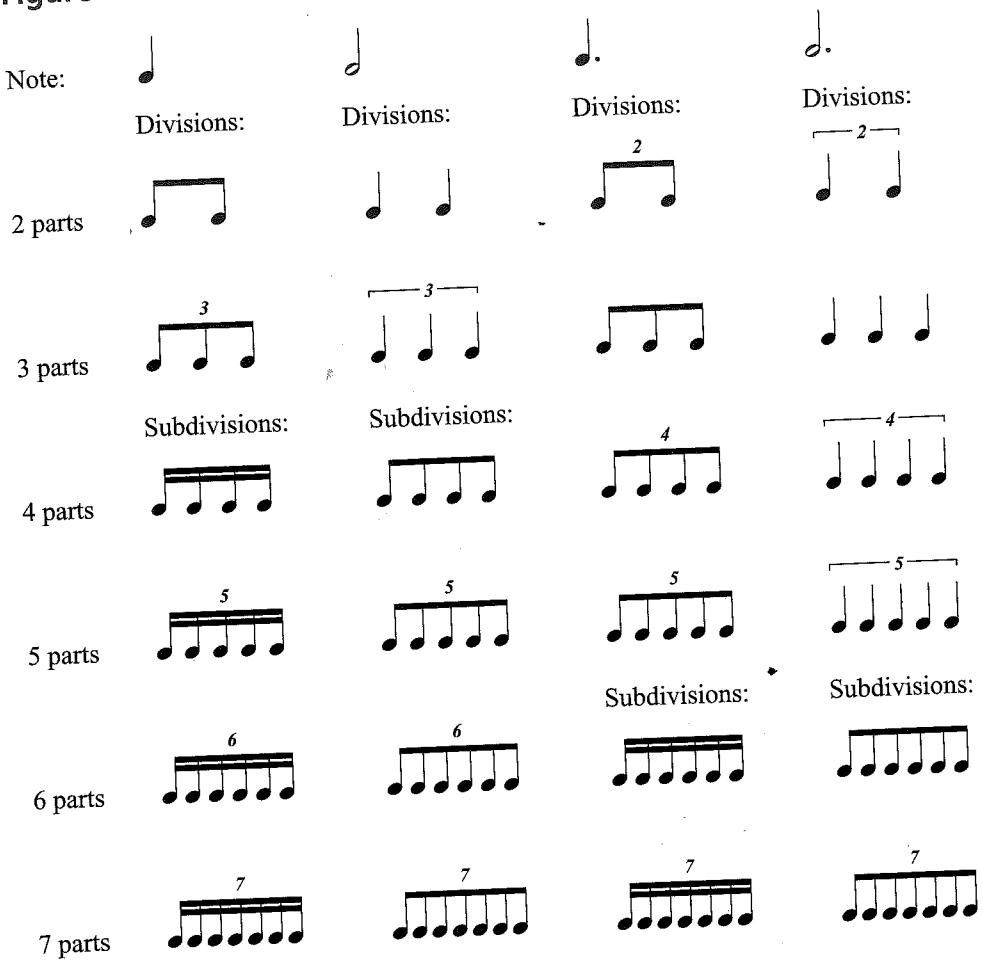
Figure 1.19



Irregular Division of Notes

A note value may be divided or subdivided into any number of equal parts, as shown in the chart in Figure 1.20. Those divisions and subdivisions that require added numbers are called *irregular divisions and subdivisions.*

Figure 1.20



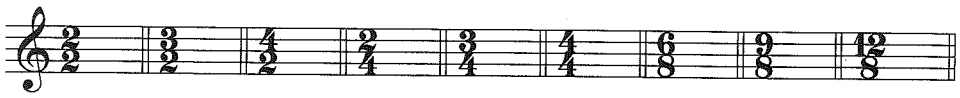
Rhythm

Rhythm is a general term used to describe the motion of music in time. The fundamental unit of rhythm is the *pulse* or *beat.* Even persons untrained in music generally sense the pulse and may respond by tapping a foot or clapping.

Meter Signatures

Meter can be defined as a regular, recurring pattern of strong and weak beats. This recurring pattern of durations is identified at the beginning of a composition by a *meter signature* (time signature).

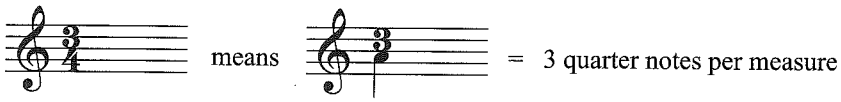
Figure 1.21



The upper digit indicates the number of basic note values per measure. It may or may not indicate the number of pulses per measure (as we will be see later in compound meters).

The lower digit indicates a basic note value: **2** signifies a half note, **4** refers to a quarter note, **8** to an eighth note, and so forth.

Figure 1.22

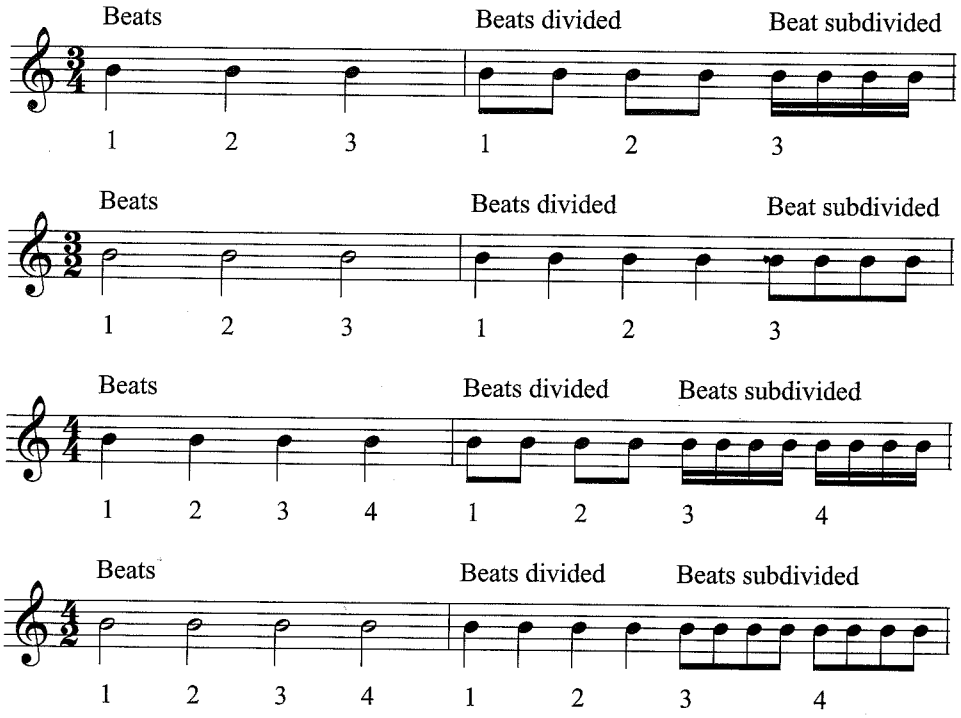


Although meter is generally indicated by time signatures, it is important to realize that meter is not simply a matter of notation.

Simple Meter

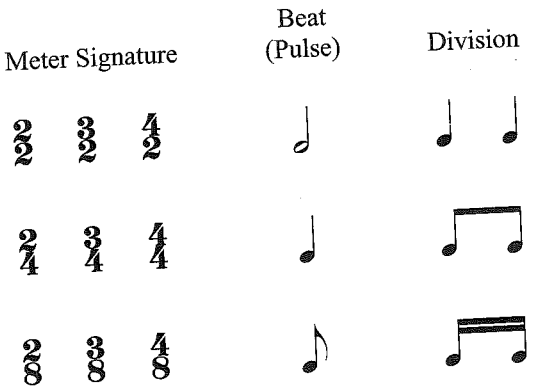
In *simple meter,* each beat is divided in two parts (simple division). The upper numbers in simple meter signatures are usually **2**, **3**, or **4** indicating two, three, or four basic pulses. Some simple meters showing the division of the beat are shown in Figure 1.23.

Figure 1.23



The basic pulse in simple meter will be some kind of a note value that is *not* dotted:

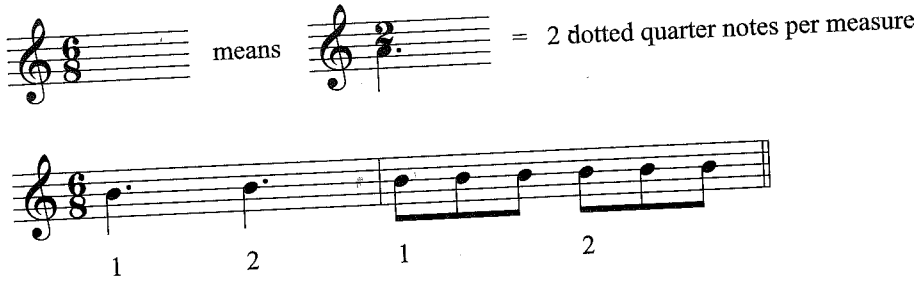
Figure 1.24



Compound Meter

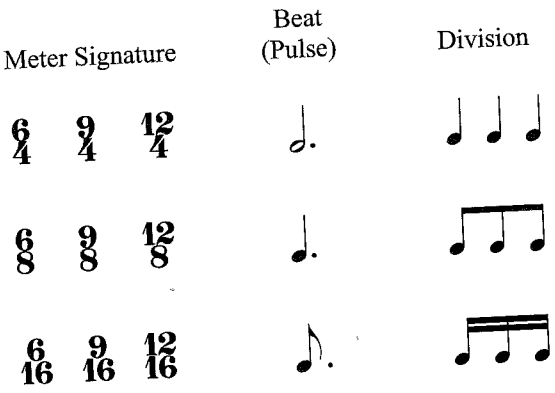
In *compound meter,* each pulse is a dotted note, which is divided into groups of three parts (compound division). The upper numbers in compound meter signatures are usually **6**, **9**, and **12**. In compound meter signatures, the lower number refers to the division of the beat, whereas the upper number indicates the number of these divisions per measure.

Figure 1.25



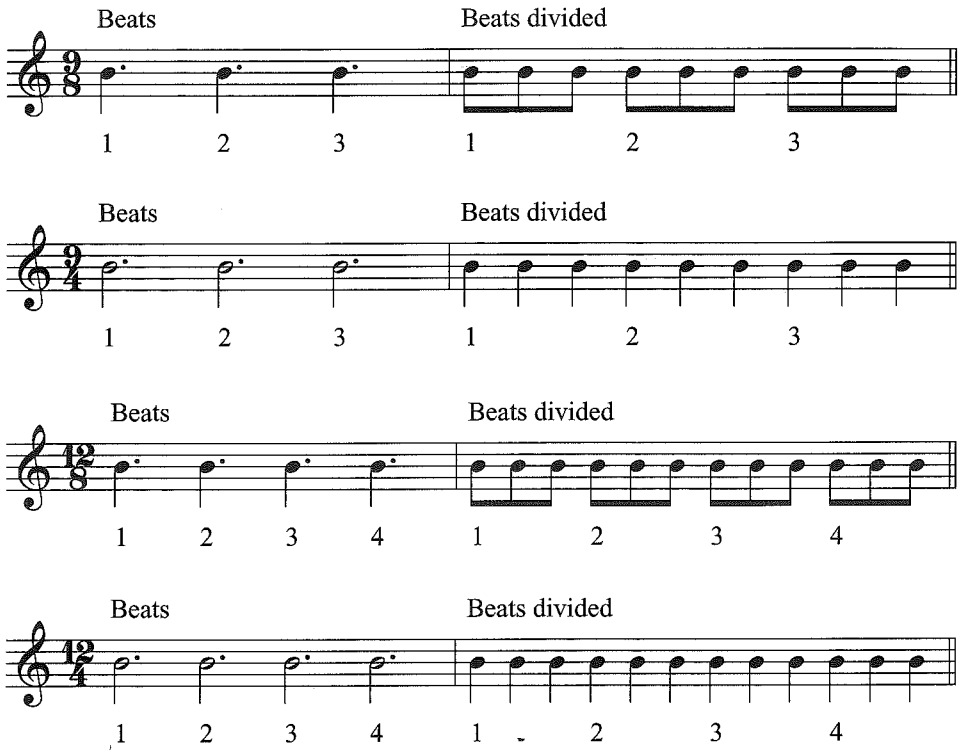
Note that the basic pulse in compound meter will be some kind of dotted note value:

Figure 1.26



In $\frac{6}{8}$ meter there are only two basic pulses, in $\frac{9}{8}$ meter there are three, and in $\frac{12}{8}$ meter there are four.

Figure 1.27



Duple, Triple, and Quadruple Meters

Both simple and compound meters will have two, three, or four recurring pulses. Meters are identified as *duple* if there are two basic pulses, *triple* if there are three, or *quadruple* if there are four. These designations are often combined with the division names to describe a meter. For example, $\frac{2}{4}$ is a "simple duple" meter and $\frac{6}{8}$ is a "compound duple" meter.

Figure 1.28

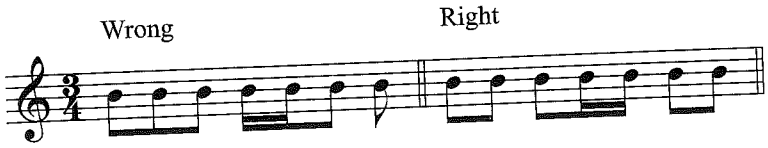
	Simple Meters			Compound Meters		
Duple Meters	$\frac{2}{4}$	$\frac{2}{2}$	$\frac{2}{8}$	$\frac{6}{8}$	$\frac{6}{4}$	$\frac{6}{16}$
Triple Meters	$\frac{3}{4}$	$\frac{3}{2}$	$\frac{3}{8}$	$\frac{9}{8}$	$\frac{9}{4}$	$\frac{9}{16}$
Quadruple Meters	$\frac{4}{4}$	$\frac{4}{2}$	$\frac{4}{8}$	$\frac{12}{8}$	$\frac{12}{4}$	$\frac{12}{16}$

Asymmetrical Meters

The term *asymmetrical* means "not symmetrical" and applies to those meter signatures that indicate the pulse cannot be divided into equal groups of 2, 3, or 4 beats. The upper numbers in asymmetrical meters are usually **5** or **7**.

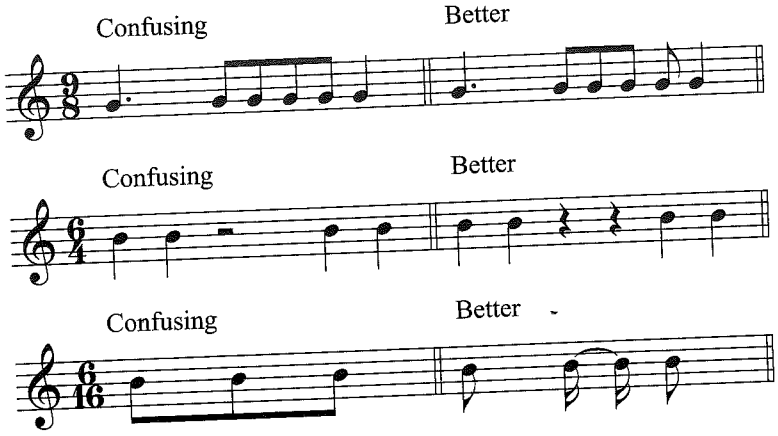
6. Beam groups of eighth notes (and smaller values) according to the beats in the measure.

Figure 1.39



7. In compound meter, it is important to show the basic pulse structure of the measure and the division (of three) as clearly as possible.

Figure 1.40



8. Use flags for eighth or shorter-value notes that are not grouped within a beat.

Figure 1.41

9. Connect no more than six notes by beams unless all are part of one beat.
10. Flagged and beamed notes are generally not mixed, except when notating vocal music. In vocal music, flagged notes have traditionally been used when the text–music relationship involves one note for each syllable. However, modern practice has moved toward the use of "instrumental" notation for vocal music.

Figure 1.42