BASIC MATERIALS IN MUSIC THEORY

A Programed Course

Thirteenth Edition

Greg A Steinke
Paul O. Harder

THIRTEENTH EDITION

Basic Materials in Music Theory

A Programed Course

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Preface to the Thirteenth Edition

It is always a challenging task to revise a book that has already enjoyed many years of success. It is an honor to be asked to undertake this latest revision of what has now been many editions. I have had a deep belief in these books ever since I first used them as a young theory teacher in 1967 when they were first available. With a great deal of history behind me, and the highest respect and regard for all of Paul Harder's diligent efforts, I again offer various revisions and enhancements, which I believe keep to the original spirit of Dr. Harder's programed concept, and that I hope all users will find helpful as they work through these pages.

In making the revisions, I have responded to comments and suggestions from reviewers and current users of the book. Earlier revisions have contained additions made to the supplementary exercises and to the appendix material. In selected places throughout the book, I have continued to clarify definitions or to demonstrate to the reader that there are always alternatives to the ideas presented and that the reader should explore those alternatives either independently or in class with the instructor. Therefore, this edition sees a number of small changes throughout the book. I hope that the differences in theoretical and analytical approaches (which, I know, will always be there) work comfortably with previous editions and also provide many interesting points of discussion in class. I'm quite sure that Dr. Harder never intended this volume to be the final, definitive answer but, rather, to provide an informed point of departure for exploring the many anomalies that are always to be found in musics everywhere.

The exposition of the material is accomplished through a step-by-step process. To some, this approach may seem mechanical, but it does ensure, in general, a good understanding of the basic tenets of the materials of the so-called common-practice period in music. I emphasize that this approach does not preclude the presentation of alternatives or the exploration of other ways in which composers may work with various cause-and-effect relationships, rather than following any set of "rules." A rich learning experience can be created for instructors and students alike as they explore together the many exceptions to the so-called rules or principles. This allows them to ultimately link all that they study to actual musical literature or to create many varieties of assignments to solidify the understanding of the basic framework presented in these pages.

I continue to be grateful to both The Paul Harder Estate and Pearson Education for providing helpful comments and support throughout the revision process. I am also indebted to the late Mildred Harder for having provided me access to all notes and support materials Dr. Harder used in the original creation of his book and for her past comments and moral support. I also thank colleagues Dr. David Stech, Dr. Margaret Mayer, Dr. Deborah Kavasch, Dr. Tim Smith, Dr. David Sills, Prof. David Foley, Dr. Paula Telesco and Dr. Lewis Strouse, among many, for their comments, encouragement, and assistance on revision ideas over past editions. I also thank Ashwin Krishnan, who copyedited this edition and provided many helpful changes and suggestions. I am grateful to all concerned and am most appreciative of the help they have provided. I hope users of this volume will find many hours of rich, musical learning to enhance their developing musicianship.

Greg A Steinke

Preface to the Sixth Edition by the Original Author

Thorough grounding in music fundamentals is necessary for serious study of music. Unless one understands the vocabulary of music terminology, it is impossible even to converse knowingly about music. This book provides training that goes beyond vocabulary; it gives students a functional understanding of matters related to the basic materials of music: time and sound. Exercises incorporated with factual material teach not only how to write and interpret various musical symbols, but also how to construct scales, intervals, and triads.

This book employs a learning system called programed instruction, a method that results in quick, thorough learning with little or no help from the instructor. Students may work at their own pace and repeat any set of drills as many times as necessary. Comprehension of the material is subject to constant evaluation, so a missed concept or error of judgment is isolated quickly, before damage is done.

Because this book provides self-paced learning and requires little supplementation, it is ideal for use as a beginning text in a course devoted to the study of tonal harmony. It is also useful in the applied studio and for a quick review before proceeding with more advanced work.

The organization and methods used in this book are the product of practical classroom experiences over a period of many years. They reflect the experimentation and free exchange of ideas between faculty and students at Michigan State University and California State University, Stanislaus.

Paul O. Harder (1923–1986)

How to Use This Text

A programed text is designed to induce you to take an active part in the learning process. As you use this book you will, in effect, reason your way through the program with the text serving as a tutor. The subject matter is organized into a series of segments called *frames.* Most frames require a written response that you are to supply after having read and concentrated on the information given. A programed text allows you to check each response immediately, so that false concepts do not take root and your attention is focused on "right thinking." Since each frame builds upon the knowledge conveyed by previous ones, you must work your way through the program by taking each frame in sequence. With a reasonable amount of concentration, you should make few mistakes, for each successive step in the program is very small.

A glance at the first page will show that it is divided into two parts. The correct answers appear on the left side. *These should be covered with the Answer Cover, a ruler, a slip of paper, or the hand.* Check your response to a given frame by uncovering the appropriate answer. *Your answer need not always be exactly the same as that supplied by the text.* Use your common sense to decide if your answer approximates the meaning of the one given. If you should make an excessive number of errors, repeat several of the preceding frames until your comprehension is improved. If this fails to remedy your difficulty, you should seek help from your instructor or knowledgeable colleague.

Following each chapter summary, you will find a short series of Mastery Frames. These frames will help you assess your comprehension of the key points of the chapter. *Do not continue unless your handling of the Mastery Frames assures your mastery of the preceding material.* Along with the correct answers on the left side of the frame are references to the specific frames in the main part of the chapter that cover that subject. These references are in parentheses. This arrangement allows you to focus remedial study on the points missed. Because the Mastery Frames are concerned with the essential matters covered in each chapter, you will find that they are useful for later review. There are also Supplementary Assignments, which are intended primarily for use in a classroom setting. The answers to these assignments are contained in the *Instructor's Manual for Harder and Steinke Basic Materials in Music Theory,* which is available upon request from the publisher. In all chapters Supplementary Activities also are given. These can be carried out in class or by the student alone, or with a colleague.

This book concentrates on the *knowledge* of music fundamentals. Knowledge alone, however, is but one aspect of your musical development. To be useful, knowledge about music must be related to the actual experience of music as *sound.* To that end, Ear-Training Activities appear at the end of each chapter. These exercises are designed for self-study; they are coordinated with the text but are not meant to be all-inclusive. They are intended to supplement other ear-training experiences. Do not approach the study of music fundamentals as merely the acquisition of knowledge; bring to bear your musical experiences as both a performer and a listener. Try to sing or play each item as it is presented. In this way, the relation of symbols to sound will become real and functional.

A  beside a frame, example, or ear-training exercise indicates that you can listen to the music. The short samples are offered to demonstrate how a particular exercise might be practiced or utilized to develop that particular ear-training skill. Remember, however, these exercises are meant to supplement other, more comprehensive ear-training experiences. (For in-depth study of ear training, you can reference the Ear Training section of the *Bibliography for Further Study*, pp. 378–379).

About the Authors

Dr. Greg A Steinke (b. 1942) holds a Bachelor of Music degree from Oberlin Conservatory, a Master of Music degree from Michigan State University, a Master of Fine Arts degree from the University of Iowa, and a Doctor of Philosophy degree from Michigan State University.

Dr. Steinke retired in June 2001 as Chair of the Art and Music Departments, Associate Dean for Undergraduate Studies, and as holder of the Joseph Naumes Endowed Chair in Music at Marylhurst University in Oregon. Formerly, he was Dean of the College of Fine Arts and Professor of Music at Millikin University, Director of the School of Music and Professor of Music at Ball State University, Assistant Director of the School of Music at the University of Arizona, Chairman of the Music Department at San Diego State University, Director of the School of Music at the University of Idaho, Chairman of the Music Department at Linfield College, and a faculty member at Northern Arizona University, The Evergreen State College, California State University, Northridge, and the University of Maryland. Currently, he is a freelance composer, writer, oboist, and conductor.

Dr. Steinke is the author of numerous articles, has done the revisions to Paul Harder's *Basic Materials in Music Theory* (seventh through thirteenth editions), *Harmonic Materials in Tonal Music,* (sixth through tenth editions), *Bridge to Twentieth Century Music* (revised edition), and, with H. Owen Reed, *Basic Contrapuntal Techniques* (revised edition, Alfred Music). He holds membership in a number of professional organizations and served for nine years (three terms, 1988–97) as the President and National Chairman of the Society of Composers, Inc.; currently President of National Association of Composers, USA (NACUSA)(2012-2020). Professor Steinke is active as a composer of chamber and symphonic music with a number of published works, as a speaker on interdisciplinary arts, and as an oboe soloist specializing in contemporary music.

Dr. Paul O. Harder (1923–1986) received a Master of Music degree in Music Theory from the Eastman School of Music, University of Rochester, where he performed as oboist with the Rochester Philharmonic Orchestra. Later, as a fellowship student at the University of Iowa, he received his Ph.D. in Music Composition. He studied composition with Mlle. Nadia Boulanger at the École des Beaux Arts de Fontainebleau, France, and at the Royal Academy of Music in Copenhagen, Denmark.

Dr. Harder held the post of Chairman of Music Theory at Michigan State University before becoming Assistant Vice President and Professor of Music at California State University, Stanislaus. He was a Professor Emeritus at Michigan State University.

In addition to approximately fifty compositions for a variety of media including orchestra, band, chorus, and chamber groups, Dr. Harder was *the author of Harmonic Materials in Tonal Music,* Parts I and II, through the fifth edition; *Basic Materials in Music Theory,* through the sixth edition; *Music Manuscript Techniques,* Parts I and II; *Bridge to Twentieth Century Music,* through the first edition; and as co-author (with H. Owen Reed), *Basic Contrapuntal Techniques*. All were published by Allyn & Bacon (see the Bibliography).

Chapter 1.0

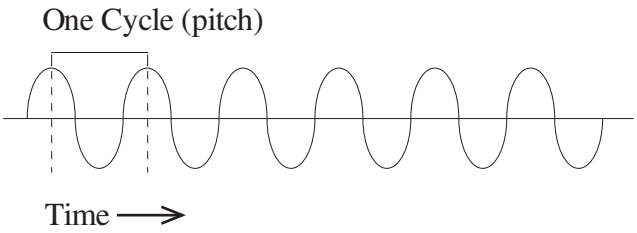
The Basic Materials of Music: Time and Sound

Time and sound are the basic materials from which music is made. In music, time is organized into patterns of duration. Sound consists of several characteristics, each of which contributes in its own way to the music. Further, the sounds of music are organized to convey an aesthetic or artistic purpose. The objective of this book is to acquaint the reader with the terms and the systems of notation that apply to the organization of time and the properties of sound generally found in the context of American and European art music. Many of these concepts and principles can also be utilized in studying and discussing other musics of the world.

This chapter will help lay the groundwork for understanding the more complex materials of music. The discussion that follows presents some of the scientific parts of music. This aspect of music study is known as ACOUSTICS.

sound	1.1 The source of sound is a VIBRATING OBJECT. Any object that can be made to vibrate will produce sound. *Vibrating objects* that are familiar to musicians include strings, columns of air, and metal or wooden bars or plates. A *vibrating object* is the source of _____.
ear	1.2 A vibrating object generates energy that is transmitted to the ear by vibrational disturbances called SOUND WAVES. These waves are transmitted as alternate compressions and rarefactions of the molecules in the atmosphere. *Sound waves* transmit energy from the vibrating object to the _____.

1.3 A simple *sound wave* may be represented as follows:



One complete oscillation both above and below the central axis is called a CYCLE. The example measures the *cycle* from one peak to another. How many *cycles* are represented if measured at the central axis itself?

Six

_____

1.4 One complete oscillation of a sound wave is called a

cycle

_____.

1.5 Sounds are perceived subjectively as being relatively "high" or "low." This property of sound is called PITCH. The speed at which an object vibrates is affected by the object's physical nature, including its size, shape, and material. The faster the vibrating object vibrates, the "higher" the *pitch*. Conversely, the slower the vibrating object vibrates, the

lower

"_____" the *pitch*.

pitch

1.6 Frequency of vibration determines the _____ of the sound.

Expository Frame

1.7 Frequency of vibration may be expressed as the number of cycles per second. Musicians are familiar with the standard of A = 440. This means that the note A (above middle C) vibrates at 440 cycles per second.

The term *cycle* lately has been supplanted by HERTZ (abbreviation: Hz). This is to honor the nineteenth-century physicist Heinrich *Hertz*. As discussion proceeds, the term hertz will be used instead of *cycle*.

(No response required.)

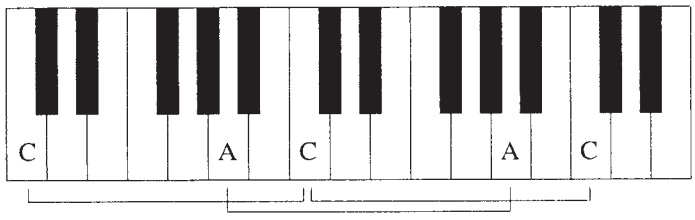
Higher

1.8 Will a *pitch (tone)* whose frequency is 620 *hertz* sound higher or lower than one whose frequency is 310 *hertz*? _____

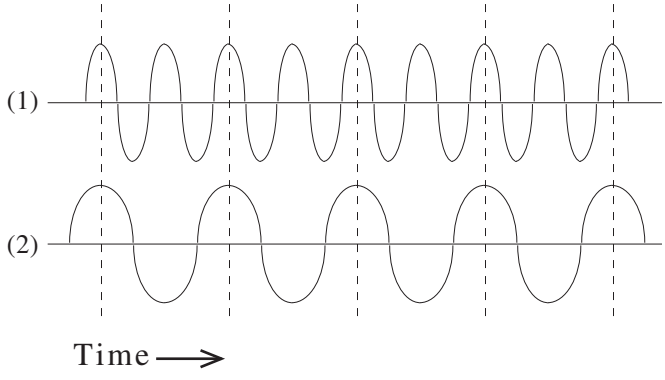
Note: If you are unfamiliar with some basic principles of music notation, you may wish to cover frames 2.1–2.16 from Chapter 2.0 before proceeding.

lower

1.9 When the frequency of a pitch is *doubled*, the resulting tone will be perceived as sounding an OCTAVE *higher*. When the frequency of a pitch is halved, the resulting tone will be an *octave* _____. ***Experience this effect at the piano by playing a note such as C or A in various*** octaves. ***Note that pitches an octave apart have the same name.***



1.10 Two simple sound waves are represented below.



higher

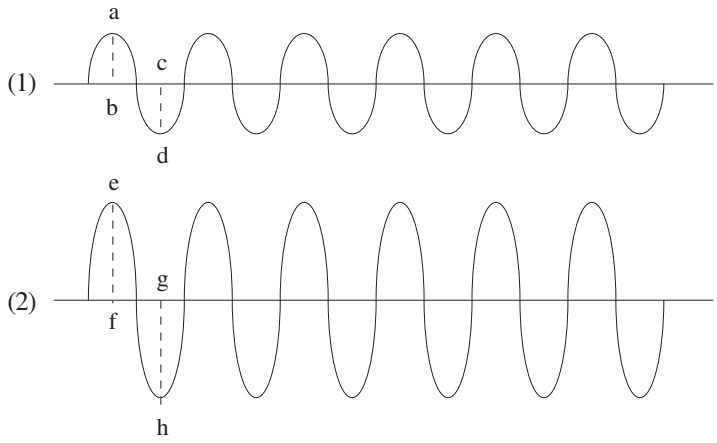
Two vibrations of Wave 1 occur for each vibration of Wave 2. Thus Wave 1 represents a tone whose pitch (frequency) is one *octave* (higher/lower) _____ than that of Wave 2.

220

1.11 The tone whose frequency is 440 hertz is called A. The A an octave lower would have a frequency of _____ hertz.

522	1.12 The tone whose frequency is 261 hertz is called C. The C sounding an octave higher would have a frequency of _____hertz.
lower	1.13 A tone whose frequency is one-half that of another tone will sound an octave (higher/lower) _____.
1/4	1.14 The frequency of a tone two octaves lower than a second tone is (1/2, 1/3, 1/4, 1/8) _____ the frequency of the latter.
Yes	1.15 In addition to pitch, music makes use of various degrees of "loudness" or "softness" of sound. This property of sound is called INTENSITY. *Intensity* is determined by the amount of power transmitted to the ear by the sound wave. ***Produce a soft sound by humming or singing; then produce the sound again, but considerably louder.*** Does the louder sound require a greater expenditure of energy? _____
intensity	1.16 *Intensity* is determined by the amount of energy transmitted from the sound source to the ear and is measured by the AMPLITUDE of the sound wave. Sound waves can be compared to waves on the surface of water: the greater the agitation, the higher the waves. *Amplitude* is a measurement of _____.

1.17 Two *simple* sound waves are represented below.



Lines a–b, c–d, e–f, and g–h show how amplitude is measured.

Amplitude is a measurement of the disturbance caused by the sound waves. Which of the sounds represented above would be the louder? _____

(2)

1.18 Sounds of *wide amplitude* or *high intensity* impress as being "loud," whereas sounds of *narrow amplitude* or *low intensity* impress as being "_____."

soft

1.19 Assuming no interference from absorbing or reflecting surfaces, sound travels outward in all directions from the source. The intensity, however, decreases inversely as the square of the distance increases. Ordinarily, the closer the listener is to the sound source, the (louder/softer) _____ it will sound to him or her.

louder

Expository Frame

1.20 Our perception of sound is highly subjective. A sound that seems loud and offensive in the quiet of a library study area may pass unnoticed in a busy dining room. Pitch, distance, and interference caused by other sounds and obstructions are factors that affect our perception of sound.

(No response required.)

1.21 Excluding other factors, sounds of high intensity impress us as being loud, and sounds of low intensity

soft

impress us as being _____.

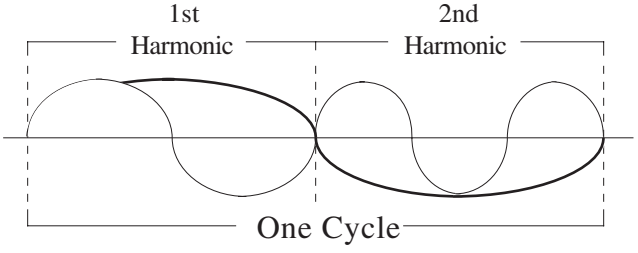
1.22 Tones produced by various sound sources have their own distinctive *tone quality*. This property of sound is also called TIMBRE. In addition to pitch and intensity, *timbre* is

waves

transmitted to the ear by sound _____.

Expository Frame

1.23 Sounds from different sound sources vary in quality because most sounds are not a single pitch but consist of a complex of pitches called HARMONICS.* These pitches are the result of the sound source (a string or a column of air, for example) vibrating not only in its entire length but also simultaneously in 1/2, 1/3, 1/4, and so on, of its length. The result is a complex sound wave that transmits all the frequencies produced by the source.

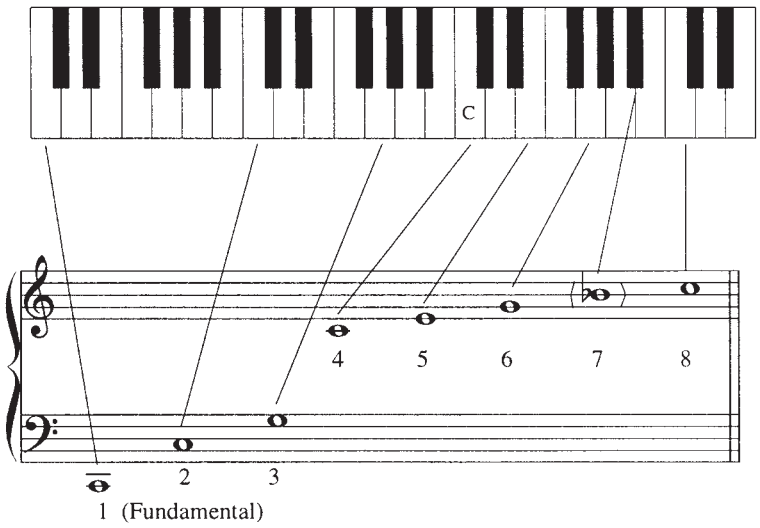


(No response required.)

The number, distribution, and relative intensity of the *harmonics* contained in a sound are chiefly responsible for its *timbre*.

* The term *partials* is also used for these pitches.

1.24 The complex of simultaneously sounding pitches generated from a fundamental that determines the timbre of a tone is called the HARMONIC SERIES. Theoretically, the *harmonic series* extends indefinitely, but for our purposes, the naming of the first eight *harmonics* will suffice.*



The example above shows that the *harmonic* with

fundamental

the lowest frequency is called the _____.

* To avoid confusion, the practice of referring to the harmonics other than the first (fundamental) as "overtones" (i.e., notes 2 through 8 above) generally has been abandoned.

1.25 Not all the tones of the *harmonic series* are present in some musical sounds. The tuning fork, for example, produces a "pure" sound consisting of the first *harmonic* only; a closed tube, such as a stopped organ pipe, produces only the odd-numbered *harmonics*.

The number of *harmonics* present and their relative

timbre

intensity determine the _____ of the sound.

1.26 *Timbre* is a technical term that refers to the quality of a sound. *Tone color* is a descriptive term that refers to the same phenomenon. Reference to the visual effect of color is appropriate in the context of sound because sounds often impress us as being "bright" or "dark," or even suggesting specific colors. Some individuals are endowed with "colored hearing," a condition called *synesthesia*, in which sounds produce accompanying visualization of colors.

Factors other than harmonics affect our perception of timbre. These include the physical nature of the sound source, the acoustical characteristics of the place in which the sound is heard, and the subjective response of the listener.

Generally, the greater the number of harmonics present in a sound, the "richer" the effect will be. In comparison, a sound with few audible harmonics will sound "pure." Such a tone may be no less beautiful, but the timbre will be different.

The terms *timbre, tone quality*, and *tone color* refer to the same characteristics of sound.

True

(True/False) _____

Expository Frame

1.27 The harmonic series (shown in frame 1.24) has been introduced here to help explain what causes different timbres. It has importance in other areas of music study, such as harmony and orchestration. Because use of the harmonic series will be made in future study, try to learn its structure and be able to play and write it on any pitch. *This should be possible once intervals, keys, and key signatures have been mastered later on in this study.*

(No response required.)

1.28 The structure of the harmonic series is the same regardless of the pitch of the fundamental—the series of tones is identical.

Is the fundamental considered to be one of the harmonics of a sound? _____

Yes

(1) pitch (2) intensity (3) timbre *(any order)*	1.29 List the three *properties of sound* that have been examined to this point. (1) _____ (2) _____ (3) _____
(No response required.)	*Expository Frame* 1.30 Since time is one of the basic materials of music, DURATION of sound is an important factor. Even though time is required for the vibrations that produce sound to occur, *duration* is generally not regarded as a property of sound. In music, however, the *duration* of sounds is an important consideration. Patterns of *duration* create the element of music called RHYTHM. Because of its importance to music, *duration* will be included here as the fourth *property of sound*.
rhythm	1.31 The term RHYTHM applies to all aspects of time in music, including *duration*. Music utilizes sounds ranging from very short to very long, and the Western system of notation is designed to indicate with precision the exact duration required. All aspects of duration are part of the basic element of music called _____.
Time	1.32 Is *rhythm* primarily a matter of time or of sound? _____
(your opinion)	1.33 Can *rhythm* be conceived without sound? _____
duration	1.34 The property of sound that refers to the "length" of tones is called _____.