NINTH EDITION

Basic Materials in Music Theory

A PROGRAMED COURSE

Paul O. Harder
Greg A Steinke

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Preface to the Ninth Edition

It is a challenging task to revise a book that has already enjoyed many years of success. It is an honor to undertake this latest revision of Paul Harder's text *Basic Materials in Music Theory*. I have had a deep belief in this book ever since 1967, when, as a young theory teacher, I began to use the first edition. With a great deal of history behind me, and the highest respect and regard for all of Paul Harder's diligent efforts, I now offer various revisions and enhancements that 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 that were made available to me from Dr. Harder's estate and to suggestions from reviewers and current users of the book. Earlier revisions 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. This edition sees further changes in or additions to selected exercises, changes in the appendixes, and the addition of the "Supplementary Activities." 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.

The reviser continues to be grateful to both Mildred Harder and Allyn & Bacon for providing helpful comments and support throughout the revision process. I also wish to thank Mrs. Harder for providing me access to all notes and support materials Dr. Harder used in the original creation of his book and for her ever helpful 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, and Dr. Lewis Strouse for their comments, encouragement, and assistance on revision ideas over the past several editions, as well as the reviewers who suggested changes for this edition: Albert Celotto, Rachel Inselman, and Terence J. O'Grady. I also thank Carole Crouse who copy-edited 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.

GAS

Preface to the Sixth Edition

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.

This new edition incorporates many suggestions that have been made by both students and instructors. The acoustical knowledge contained in Chapter One has been completely revised to employ terminology that has recently come into general use. Also, the order of chapters has been adjusted to provide a more logical sequence. All mastery frames have been rewritten to assess achievement more thoroughly. The supplementary assignments are all new.

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)

To the Student

A programed text is designed to induce you, the student, 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.

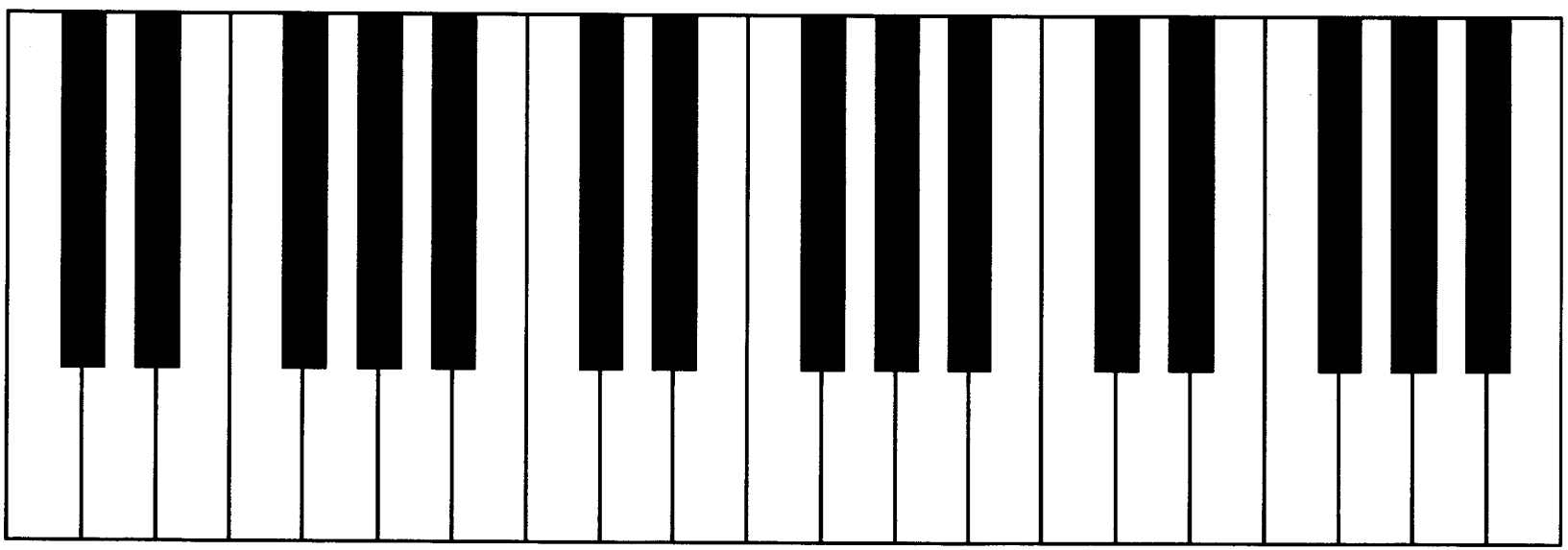
Following each chapter summary, you will find a short series of Mastery Frames. These frames will help you assess your comprehension of the key points of the chapter. *Do not continue unless your handling of the Mastery Frames assures your mastery of the preceding material.* Along with the correct answers 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. In all chapters except Chapter 5.0, Supplementary Activities are also given. These can be carried out in class or by the student alone. 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.

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.

Basic Materials in Music Theory

Answer Cover

Note: To create the Answer Cover, tear out the entire page at the perforation and fold to size, or cut keyboard portion off and mount on light cardboard to create a cover.



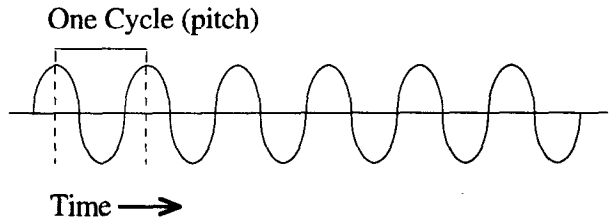
Contents

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. The objective of this book is to acquaint you with the terms and the systems of notation that apply to the organization of time and the properties of sound. Acoustics is the scientific study of sound. The elementary acoustical facts presented in this chapter lay the groundwork for understanding the more complex materials of music.

	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.
sound	A *vibrating object* is the source of _____.
	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
ear	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

lower

body vibrates, the "_____" the *pitch*.

pitch

1.6 Frequency of vibration determines the_____ of the sound.

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 we proceed, the term *hertz* will be used instead of *cycle*.

(no response required)

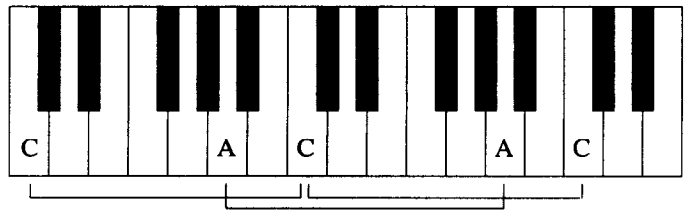
higher

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.

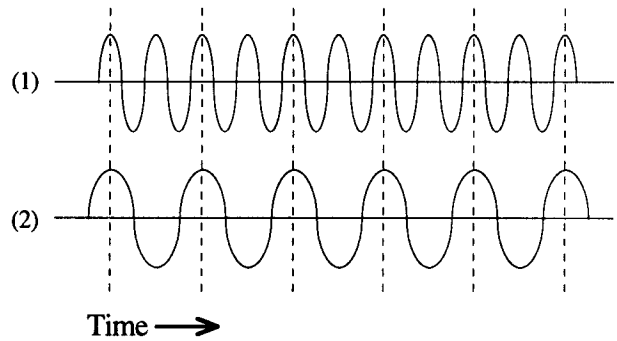
lower

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.***



higher

1.10 Two simple sound waves are represented below.

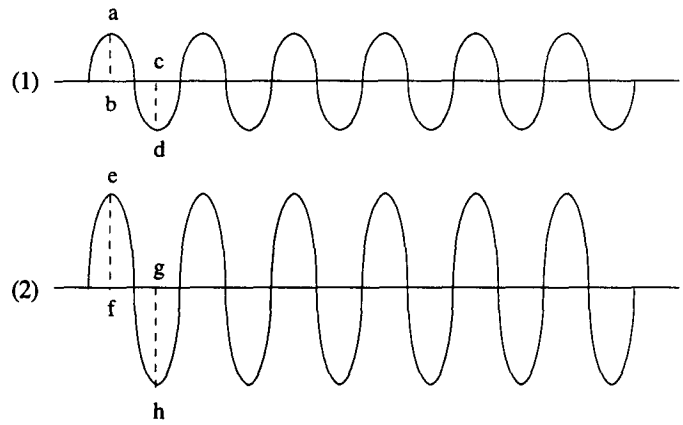


Two vibrations of Wave 1 occur for each vibration of Wave 2. Thus Wave 1 represents a tone whose pitch (frequency) is one *octave* (higher/lower) _____ than that of Wave 2.

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 _____.

(2)	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? _____
soft	1.18 Sounds of *wide amplitude* or *high intensity* impress us as being "loud," whereas sounds of *narrow amplitude* or *low intensity* impress us as being "_____."
louder	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.
(no response required)	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.

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

soft

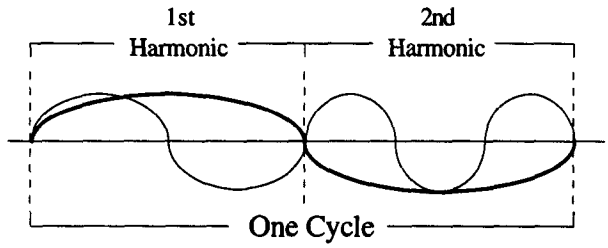
impress us as being _____.

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,

waves

timbre is transmitted to the ear by sound _____.

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.