THE EFFICACY OF A PROGRAMED MUSIC FUNDAMENTALS TEXT AS AN ADJUNCT TO BEGINNING INSTRUMENTAL MUSIC STUDY

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This is to certify that the

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Lloyd D. Miller

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Robert G. Sidnell

Major professor

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ABSTRACT

THE EFFICACY OF A PROGRAMED MUSIC FUNDAMENTALS TEXT AS AN ADJUNCT TO BEGINNING INSTRUMENTAL MUSIC STUDY

By

Lloyd D. Miller

This study was concerned with establishing the effectiveness of a programed music fundamentals text designed to aid the acquisition of the cognitive elements necessary to facilitate communication in beginning instrumental music. The text was to serve as a home-study adjunct for beginning fourth, fifth, and sixth grade instrumental music students. The study compared two groups of elementary instrumental music students in their beginning five or six weeks of instruction. The experimental group used the programed text at home for the presentation and study of music fundamentals. The control group followed a conventional method which included informal presentations of music fundamentals as part of normal classroom procedure.

Five pairs of elementary school instrumental music programs from the Flint, Michigan, School System were selected for the study. The schools were assigned as control or experimental in a stratified random manner. A total of two hundred and two students participated in the study.

Procedure

1. A music fundamentals test and the programed text were developed from the materials and objectives common to the situation of the study.
2. A pre-test was given each group prior to a five-week period in which the experimental group students had homework assignments from the programed text and the control group students proceeded in the usual manner of short presentations of music fundamentals in class.
3. A post-test, using the same measuring instrument, was given at the close of the five-week period. The time period of the study ended with the post-test but a retention test was administered three months after the post-test. The retention test also used the same measuring instrument.
4. Reading grade equivalent scores (Science Research Associates Series) were extracted for each student in the study. The relationship of reading skill and test achievement was examined.
5. An analysis of covariance was the means of testing the hypotheses.

Hypotheses and Results

1. There is no significant difference in cognitive achievement as a result of treatment of beginning instrumental music students grades four through six. Accepted.
2. There is no significant interaction of treatment and

grade level in cognitive achievement of beginning instrumental music students, grades four through six. Accepted.

3. There is no significant difference in cognitive achievement as a result of grade level of beginning instrumental music students, grades four through six. Accepted.
4. Regression analysis results indicated that previous musical training and reading skill accounted for approximately 38 per cent of the variance in cognitive achievement in this study. Reading skill was found to have a lesser effect on achievement than previous musical training. The correlations at each grade level between reading and gain scores of the students using the programed text were not significant at the .05 level of confidence.

Conclusions

1. The results of the programed and conventional treatments at the fourth grade level were nearly equal. The use of the texts in the fifth and sixth grades resulted in greater gains than the conventional method but the difference in gains was not statistically significant. Achievement in both groups appeared to be closely related to the active musical experiences in which the students were participating.
2. Music fundamentals achievement at the three grade levels, fourth, fifth, and sixth was not significantly different.

3. No grade level interaction effects were detected as a result of the programed or conventional treatments.
4. Reading skill did not have a significant effect on the test achievement of the experimental group. Reading skill had a greater effect on achievement in the control group but this difference was not statistically significant.

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Lloyd D. Miller

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TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

THE PROBLEM

The process of communication is a central concern in the continuing desire to improve education. The instructor is constantly confronted with the question of whether or not the student understands the spoken or written exchanges occurring in the learning situation. Gagné comments:

> The environment of the learner has many components that are important for learning. Most important among these are the communications that are included in the instructional situation.[1]

He later states:

> It is important to realize, then, that any given medium of communication may perform one or several functions during the course of instruction. Communication is indeed a major part of what happens during instruction. It would be going too far, apparently, to equate communication to instruction, since this would tend to leave out such essential elements as the operation of physical stimuli, as well as of the processes internal to the learner. Nevertheless, communications of various sorts, and with several different functions, make up a large portion of the instructional events that are designed to bring about learning.[2]

Specialized subject areas require the development of a characteristic vocabulary. Successful communications in

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[1] Robert M. Gagné, The Conditions of Learning (1st ed.; New York: Holt, Rinehart and Winston, Inc., 1965), p. 346.

[2] Ibid., p. 349.

a specialized subject area are not possible without the development of the appropriate vocabulary. Bernard recognizes the necessity of specific vocabulary development in the following statement:

> Teachers would be more effective if they would conscientiously work to make communication clearer and more facile. In fact, teaching would be simplified by the realization that some of the difficulty of getting across subject matter lies in clumsy communication. Teachers at all levels will do their pupils a great service by (1) stressing vocabulary development in general, (2) providing exercises leading to verbal facility, (3) encouraging the learning of the important key words in specialized fields of knowledge, and (4) by setting a good example of pronunciation, precision in word selection, and enthusiasm for linguistic development.[1]

Garrison also emphasizes vocabulary development in the following statement:

> Language concepts and symbols play an important role in both cognitive and connotative thinking at all age levels. The number and extent of an individual's vocabulary as well as the number and variety of associations he has with each word are positively correlated with a number of abilities. The exact nature of such relationships is not thoroughly understood at present.[2]

Music learning, as traditionally presented in public school instrumental and vocal training programs, encourages the development of a specific terminology and a knowledge of music labels and symbols. Large musical ensembles, characteristic of most public school music programs, depend on the learning of musical terms and symbols to enable the ensembles to perform a variety of musical selections.

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[1]Harold W. Bernard, Psychology of Learning and Teaching (New York: McGraw-Hill Book Company, 1965), p. 149.

[2]Karl C. Garrison, Albert J. Kingston, and Arthur S. McDonald, Educational Psychology (New York: Appleton-Century-Crofts, 1964), p. 122.

Most music educators consider the knowledge of terminology and symbology essential to the musical training of public school students in performing ensembles. Mursell stated:

> Workers in music education need to understand much more clearly than they usually do the importance and the true place of verbal and arithmetical symbols and of visualization in connection with the development of musical insight. Musical practice has developed a very remarkable symbolic mechanism, including various systems of syllabification, the designation of notes and chords by various types of names and numbers, and of course the notation itself. How remarkable, how valuable all this is one can see by contrasting music with the dance, where only rudimentary beginnings of anything of the kind exist. The influence of this apparatus upon the art of music is enormous, and although it involves the constant danger of manipulating tone by abstract analysis and visual plotting instead of by direct perception and imagery, it has immense and essential values.[1]

Nye and Nye wrote on the same subject:

> The symbols of music, like words of a language, convey man's thoughts and feelings. These symbols are a means to communicate ideas. Music reading means the ability to grasp the nature and character of music through understanding its symbols, not merely the ability to identify detail. If music is taught fully, learning to read music is an integral part of it. If music reading is taught rightly, it always has for the children an immediately functional or interesting purpose. Since children differ in the ways they learn to understand notation and since music reading is a complex skill, a variety of approaches should be employed. Every normal child should gain reasonable skill in reading music for social and cultural reasons as well as musical reasons.[2]

Sur discussed the learning of musical symbology from the point of view of teacher preparation:

> The teacher's preparation should include a detailed analysis of the music to be studied in all music

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[1]James L. Mursell, Education for Musical Growth (Boston: Ginn and Company, 1948), p. 211.

[2]Robert E. Nye, and Vernice T. Nye, Music in the Elementary School (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1957), p. 296.

> ensembles and classes. Such an analysis by the teacher will make clear the need for ear and eye training dealing with lines and spaces, notation, key and time signatures, clefs, scales, modes, melodic line, intervals, harmonies, rhythms, form, and terminology. From this analysis the teacher is then able to plan for basic music instruction over an extended period of time and to incorporate some teaching of fundamentals in every lesson or rehearsal.[1]

The learning of music reading through the gradual process of becoming familiar with music terminology and symbology remains one of the important goals of public school instrumental and vocal music training.

Music teachers have employed a variety of teaching methods designed to aid the student in acquiring a knowledge of music terminology and symbology. In recent years some teachers have experimented with programed instruction to accomplish this learning. Programed instruction has been used frequently to prepare the necessary vocabulary in a variety of fields. The programed instruction technique of defining a specific body of knowledge to be learned has been a valuable aid to the development of communication skills. Lumsdaine stated:

> Effective education depends on effective communication. In the last few years some of the most interesting communication research has dealt with the processes of teaching and learning, in an effort to improve education through improving its basic communication. The development of programed instruction has been one of the most exciting results of this research. Programed instruction has been called "the first prose ever constructed especially for teaching."[2]

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[1] William R. Sur, and Charles F. Schuller, Music Education for Teen-Agers (New York: Harper and Row, 1958), p. 159.

[2] Arthur A. Lumsdaine, "Teaching Machines and Programed Instruction," The Science of Human Communication, ed. Wilbur Schramm, (New York: Basic Books, Inc., 1963), p. 139.

Programed instruction in music terminology and symbology has been the subject of some research at the secondary and college levels. Research in programed instruction at the elementary school level, however, has been limited. The development of communication skills in music, at the elementary school level, is an area of learning that might possibly be facilitated by the programed instruction technique. The present study is designed to examine the usefulness of programed instruction in beginning instrumental music at the elementary school level.

Need for the Study

Instrumental music education in the Flint elementary schools follows a pattern common to many school systems throughout Michigan. At the fourth through sixth grade levels, students are given the opportunity to enroll in a beginning instrumental music class which meets two half-hour sessions per week. Some students use or share the use of school instruments while other students purchase or rent an instrument from local stores. For the majority of the students, the instruction they receive in school is not supplemented by outside private instruction. Three years of class lessons in this situation often leave considerable gaps in necessary communication skills which hamper the student's rate of learning and possibly his feeling of accomplishment. This research project grew out of the desire to improve the situation found in Flint and many other schools in regard to communication skill development.

Little research in programed instruction has been conducted in the area of elementary instrumental music. There may be potential for valuable use of programed instruction in elementary instrumental music because of the limitations of student-teacher contact time common to many school situations. A home-study programed text might aid students in the acquisition of necessary communication skills and thereby enhance classroom progress.

The relationship of reading level and programed music fundamentals achievement is also a major concern of this study. The reading comprehension level of young students may limit the effectiveness of programed instruction. The elementary school level research projects reviewed in conjunction with this study have not clearly established the relationship of reading level and programed instruction.

Experimental Setting

Programed instruction for elementary students has been examined in some controlled situations where the researcher could prescribe the conditions of learning. This study took place in a public school setting where there was little allowance possible for controlling the use of the programed material. Beginning instrumental music classes met for two half-hour sessions per week. The instrumental music teacher had no opportunity to see the students other than at their regular sessions. Enthusiasm for playing dictated that most of the time in the two sessions each week be

spent playing instruments. Learning the facts and communication skills in this setting was often haphazard and incomplete.

This study compared two groups of elementary instrumental music students in their beginning five or six weeks of instruction. One group used a programed text while the other group followed the conventional method. The conventional method included informal lecture presentations of musical terms and symbols as part of normal classroom procedure. Home study assignments in fundamentals in the Belwin First Division Band Method, reinforcing the lecture presentations, were also considered as part of the conventional method.[1]

The purpose of the programed text in this study was to present new terms and symbols to the students before they came to the class in which this knowledge was needed. The text was designed to present the same material that was covered in the informal lecture presentations and assignments of the conventional method. Students worked in the programed texts at home without teacher guidance.

Class goals not specifically listed above were the same for both the experimental and control groups. The goals were as follows: (1) care of the instruments, (2) tone production, (3) playing exercises and songs from the Belwin First Division Band Method, (4) home playing assignments in the method book.

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[1]Fred Weber, Belwin First Division Band Method (New York: Belwin-Mills Publishing Corporation, 1962).

Purpose of the Study

This research was concerned with establishing the effectiveness of a programed music fundamentals text designed to aid the acquisition of the cognitive elements necessary to facilitate communication in early music instruction. The text was to serve as a home-study adjunct for beginning fourth, fifth, and sixth grade instrumental music students.

Hypothesis

The hypothesis and related questions under study in this experimental project are given below. The questions and hypothesis will be stated in experimental form in Chapter IV.

Hypothesis I: A programed music fundamentals text for home-study will significantly improve the learning of music fundamentals by fourth, fifth and sixth grade instrumental music students as compared with a conventional approach.

Specific questions under study:

a. What are the effects of grade level on music fundamentals achievement in beginning instrumental music: This question is the basis for Hypotheses II and III in Chapter IV which refer to interaction effect of the text and grade level with cognitive achievement.
b. Is there a statistically significant relationship between programed fundamentals achievement in beginning instrumental music and verbal reading level?

Definition of Terms

Home-study supplementary text

The term "home-study" in this experiment indicates that the text was not used as a classroom text. Work in the text was done at home. The text functioned as an adjunct to the method book each student used in class.

Music fundamentals or cognitive elements in music

"Music fundamentals" refers to the terms and symbols required for beginning instrumental music study. Examples of these terms and symbols are note names, meter signatures, note values and measures. The list of music fundamentals used in this study is found on page 69, Table 3.5.

Cognitive achievement

"Cognitive achievement" refers to the ability of students to name terms and symbols in music which are also designated as music fundamentals as defined above.

Conventional method

The control group in this study received the "conventional method" which included informal lecture presentations of the music fundamentals defined above. The informal lecture presentations are common practice in beginning instrumental music. Home study assignments in the form of performance practice material were given in the Belwin First Division Band Method Book. These assignments, which covered the same material as the lectures, were also considered part of the conventional method.

Limitations

This research is limited to cognitive achievement in music in the early stages of instrumental music study at the elementary school level, grades four, five and six.

The programed text was used as an adjunct to class work. The success of the adjunct technique was dependent upon the students using the text in the prescribed manner. In order to promote the use of the text, the teachers agreed to have the students bring their text to class once a week to enable the teacher to check progress and encourage the proper use of the text.

Assumption

The results of the available research in elementary school music programed instruction have not established definitive evidence of the merit of programed instruction at this level. The assumption of this study is that fourth, fifth, and sixth grade students can use advantageously a programed text as an adjunct to elementary instrumental music study.

Overview

Chapter II presents programed instruction from three points of view: (1) a review of the progress of programed instruction, (2) a survey of programed instruction in music, (3) an examination of research pertinent to the present study.

Chapter III gives a description of the programed text and the measuring instrument. The design and

administration of the experiment is also discussed. A description of the sample under study is included. The procedure for collecting data concludes the chapter.

Chapter IV is a presentation of the statistical analysis of the experiment. The outcomes of the hypotheses testing are interpreted.

Chapter V includes a summary and the conclusions of the study. Implications for further research in elementary programed learning are discussed.

The appendix includes the measuring instrument, programed text, and pertinent statistical data.

CHAPTER II

REVIEW OF LITERATURE

Introduction

The purposes of this chapter are threefold: (1) the first section will review the development of programed instruction from the early testing machines to the present. (2) Section two outlines the various uses of programed instruction in music. (3) The final section will examine research in progamed instruction specifically pertinent to this study.

Programed Learning: An Historical Sketch

Programed learning developed from behaviorist-oriented psychology which gained adherents in the first quarter of this century. Behaviorist psychology has its roots in the stimulus-response associationist psychology which interpreted complex learning as an accumulation of many simpler associations developed through the stimulus-response pattern. Thorndike (1911) and others, working within the associationist tradition, experimented extensively with animals and developed new theories of animal intelligence.[1] Animal-conditioning (stimulus-response) experiments prompted a shift in psychology from nineteenth-century concepts to

[1] E. L. Thorndike, Animal Intelligence (New York: Macmillan, 1911).

a behavioral orientation. John B. Watson (1924), a leading advocate of the behavioral orientation, was greatly influenced by animal experimentation. Watson, whose important experiments were in child psychology, attempted to interpret all of human behavior in conditioning terms.[1] Pressey (1926), working within the behavioral orientation, developed what may be considered the first teaching machine. Pressey was considering efficiency of learning when he experimented with the device used for testing and teaching information and drill material. Pressey stated:

> For a number of years the writer has had it in mind that a simple machine for automatic testing of intelligence or information was entirely within the realm of possibility. The modern objective test, with its definite systemization of procedure and objectivity of scoring naturally suggests such a development.
>
> The writer has also felt that the procedures in mastery of drill and informational material were in many instances simple and definite enough to permit handling of much routine teaching by mechanical means. The average teacher is woefully burdened by such routine of drill and information-fixing.[2]

In Pressey's machine a question was asked in an open window of the apparatus and the student depressed one of four push buttons. The machine would advance to another question if the response was correct. This device was conceived as an automatic testing machine, but its instructional

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[1] J. B. Watson, Psychology From the Standpoint of a Behaviorist (Philadelphia: Lippincott, 1924).

[2] S. L. Pressey, "A Simple Apparatus Which Gives Tests and Scores--and Teaches," School and Society, Vol. XXIII, (January-June 1926), p. 373.

properties soon became apparent. Pressey later developed simpler devices which were in the form of punch boards. The student would punch a pencil point through one of four holes to identify the correct response. Pressey's machine received little attention in those early years but did provide bases for further experimentation.

Peterson, in the late 1920's, used the same principle as Pressey in his device except that he used chemically treated answer sheets and a special marking pencil.[1]

In the late 1930's B. F. Skinner and his colleagues conducted extensive experiments with animals. In his work with pigeons, Skinner (1938) discovered that a bird could be led, step by step, from simple to complex behavior by reinforcing desired responses. One of Skinner's experiments was the teaching of color discrimination to a pigeon. The pigeon was placed in a box containing a lever which, when depressed, would give the bird a seed. The first response, the pecking of the lever, had to be within the bird's normal or at least accidental range of behavior. Succeeding trials at pecking the lever, each being reinforced with a seed, soon established the response and learning had occurred. Skinner termed this learning process "operant conditioning."[2] By manipulating the number and color of

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[1] J. C. Peterson, "A New Device for Teaching, Testing, and Research in Learning," Kansas Academy of Science, Vol. XXXIII, (1930), p. 41-47.

[2] B. F. Skinner, The Behavior of Organisms: An Experimental Analysis (New York: Appleton, 1938).

the levers, Skinner was able to lead the pigeon from the initial accidental response of pecking a lever to the complex response of selecting a specified colored lever among several levers.

The successful experiments with animals prompted Skinner and his associates to apply the principles of operant conditioning to human learning. Skinner's writings and research gave rise to new interest in human learning theory.

In the initial stages of experimentation with human learning, teaching machines were used to present the material to be learned according to operant conditioning procedures. Skinner's first teaching machine (1950) contained a roll of paper tape on which a series of arithmetical problems were printed, one of which could be seen through a small window. The child composed an answer to the problem by moving one or more sliders to make digits from zero to nine appear in square holes punched in the paper. If the answer was correct, a turn of the knob would ring a bell and bring the next problem into view. If an incorrect answer was given, the knob would not turn and the child had to try again. Skinner's machines always retained the principle of the constructed response because he felt that the student's active participation in composing an answer would promote learning. Skinner stated:

> Except in some kinds of stimulus learning, the student should compose his response, rather than

> select it from a set of alternatives, as he would in a multiple choice scheme. One reason for this is that we want him to recall rather than merely recognize--to make a response as well as see that it is right.[1]

Crowder (1959) favored the multiple choice format because it allowed for more flexibility for bright students. Each possible answer in the multiple choice format could be used to chart the student into remedial or more advanced material.[2] The multiple choice format, referred to as branching or intrinsic programming, has the additional advantage of presenting material in larger units.

Programed instruction developed a characteristic vocabulary based on the writings of Skinner, Crowder and other experimenters. Several of the more common terms are as follows:

Frame: A single step of a program usually containing information and a question to be answered in one form or another. The word frame was used because the single step contained the amount of material that would fill the space of a display panel of a teaching machine.

Step: The space between one frame and another in terms of the mental operations necessary to go on to the next frame.

Linear Programing (Also called straight-line, non-branching or Skinnerian programing): In

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[1] B. F. Skinner, "Teaching Machines," Scientific American, Vol. CCV, (November, 1961), p. 90-102.

[2] N. A. Crowder, "Automatic Tutoring by Intrinsic Programming," in A. A. Lumsdaine and R. Glaser, Teaching Machines and Programmed Learning: A Source Book. (Washington D.C.: National Education Association, 1960), p. 386-398.

> this type of programing the sequence of items is fixed and unalterable. No allowance is possible for adjusting this type of programming for various levels of ability.

The research discussed in the following pages utilizes this characteristic vocabulary and many of the programming techniques of early researchers in programed learning.

The programming technique of Glaser and Homme (1960) utilized a question and answer book in which the answer to each question was always given on the following page.[1]

Experiments soon revealed that the important factors in programed learning success were not necessarily dependent on a machine. Numerous experiments comparing a programed machine and a programed text clearly demonstrated that the machine was not the superior learning mode. According to Porter (1958):

> The trend in designing devices based on Skinner's composed-answer principle has been toward simpler and simpler procedures. Actually, no machine is needed for the essential characteristics of a Skinner teaching box, which are, (a) to present a sequence of problem materials one at a time, (b) to provide some means by which a student can indicate or record his solution to each item, and (c) to indicate immediately the correctness of the response.[2]

Goldstein and Gotkin (1962) reviewed eight experimental

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[1] R. Glaser and L. E. Homme, "An Evaluation of Textbooks in Terms of Learning Principles," in A. A. Lumsdaine and R. Glaser, Teaching Machines and Programmed Learning: A Source Book. (Washington, D.C.: National Education Association, 1960), pp. 437-445.

[2] D. Porter, "Teaching Machines," Harvard Graduate School Education Association Bulletin, Vol. III, (1958), pp. 1-5.

comparisons between teaching machines and programed books. The studies involved linear programs including from sixty-five to more than 3000 frames in mathematics, English, physics and psychology administered either by Skinner-type machines or programed texts and requiring from twenty-seven minutes to fifty-one hours to complete. Post-test scores, time scores, and attitudes were reported. Over all, there were no significant differences between the two presentation modes on the basis of post-test comparisons. Four studies reported that significantly less time was required to complete the prescribed course using the programed text rather than a teaching machine.[1]

The experimentation with machines and programed material reached a height of activity in the early years of the 1960's. Proponents of these new techniques forecasted a revolution in public school education and human learning in other settings. Programed learning has been shown to be an effective technique in many research studies. A review by Hartley (1966)[2] located 112 studies conducted in England and the United States. According to this review, when criterion test results are considered, about 37 per cent of the studies showed the program to be significantly

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[1] L. S. Goldstein, and L. G. Gotkin, "A Review of Research: Teaching Machines vs. Programmed Textbooks as Presentation Modes," Journal of Progress in Instruction, Vol. I, No. 1, (1962), p. 29-36.

[2] J. Hartley, "Research Report," New Education, Vol. XVIX, No. 2, (1966), p. 29-35.

superior, about 49 per cent showed no significant differences, and 14 per cent showed the conventional method (lecture, teachers, etc.) to be significantly better. These results do not prove the superiority of programed learning but they do indicate the usefulness of exploring this learning technique more thoroughly.

The use of programed material has declined in popularity if not in actual use during the past ten years. Several reasons have conspired to slow the trend towards programed instruction. Many educators and psychologists are critical of programed instruction because it eliminates social interaction during the learning process. Hodgson (1972) wrote on this subject:

> There are some task areas, work or learning, which by their very nature are inseparable from their social setting. These tasks integrate together the cognitive and the affective, the individual and the social, the intrapersonal and the interpersonal. Examples of such task areas are business management, administration and government, social and medical care, raising a family, becoming a balanced and effective citizen, sharing in an expedition and so on. Such task areas are by their very nature incompatible with the procedures of programed learning as exemplified by linear and multiple choice techniques. Indeed, they are not compatible with the concept of learning as a process of absorbing knowledge at all.[1]

Small step linear programming, in particular, has been attacked as a technique suitable for animals but not a good approach for complex human learning. Smith and Smith (1966) stated:

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[1] A. M. Hodgson, "Structuring Learning in Social Settings," Journal of Programmed Learning and Educational Technology, Vol. IX, No. 2, (March, 1972), pp. 79-81.

> If we were to attempt a summary evaluation of linear programs, it would be that they are too inflexible to do justice to human capabilities in learning and creative thought. The concepts of linear programming tend naturally toward an educational regimentation that does not make adequate allowance for the differences that exist among learners, among their teachers, and among the subjects to be taught. Nor does a linear program take advantage of the many avenues of communication that can be used in teaching or the many types of experiences that promote fuller understanding of a subject matter.[1]

Individualizing instruction has been a goal associated with programed instruction. The problems associated with individualizing instruction, however, are not easily solved. Spohn (1969) stated:

> It is important to realize that individuals must receive specialized attention and instruction to attain the greatest benefit from an instructional or learning environment. It cannot be assumed that every individual receives the same benefit from the same instruction. The elements of individual variability and motivation make even a highly organized instructional environment different for different people. The need is to provide as much flexibility in the system utilizing modern technology and new media in order to enhance the multiple presentations of information to a variety of individuals. The teacher and student should be aware of as many possibilities as are available to meet the challenge of improved learning.[2]

Suchett-Kaye (1972) also commented on the difficulties of individualizing instruction:

> The problem of individual differences and programed instruction is now seen to be more complex

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[1]Karl U. Smith, and Margaret F. Smith, Cybernetic Principles of Learning and Educational Design (New York: Holt, Rinehart and Winston, Inc., 1966), p. 89.

[2]Charles L. Spohn, "Individualizing Instruction Through New Media Research," Journal of Research in Music Education, Vol. XVII, No. 1, (Spring 1969), p. 99.

> than hitherto thought; certainly it is realized that a synthesis of the psychology of individual differences and the psychology of learning is now necessary. Indeed until recently it might have been said with some fairness, that not only did instructional technology lack the means of coping with individual differences (for example branching remedial loops based on a priori conceptions of where student deficiencies existed), but also lacked satisfactory ways of finding out what the differences were.[1]

Another serious difficulty associated with programed instruction is the lack of a unified approach in supplying programed material to fit the demands of instruction. Lysaught wrote on this subject:

> In the absence of an articulated curriculum, such as that in the physical or biological sciences, it is almost impossible for us to make a concerted drive to develop self-instructional programs in all the areas that would be appropriate. We have many times found unnecessary duplication in some subject fields (statistics being a prime example), whereas others have been undeveloped. On the other hand, two available programs in a subject may have no necessary relationship or integrating features because they have been written by different authors without any attempt to fit the program together.[2]

Two important facets of creating programed material, defining precise objectives and developing an instructional strategy, have become part of the basic approach in many subject areas. These facets, although not new to conventional methodology, are now having a leavening effect on many

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[1]Charles Suchett-Kaye, "Personality Factors and Self-Instruction: A Survey," Journal of Programmed Learning and Educational Technology, Vol. IX, No. 4, (July, 1972), pp. 206-208.

[2]Jerome P. Lysaught, "A Funny Thing Happened on the Way to the Market," Music Educators Journal, Vol. LVII, (January, 1971), pp. 55-57.

aspects of education that are not directly related to programed instruction. Jones (1969) stated:

> The main elements of the so-called "systems approach," as you all know, derive from the principles of programed learning, and the pioneers among you have reason to be proud that these basic principles, evolved in connection with one specific technology, should not only have proved to be of inherent value to it, but that they should have permeated and been adopted into wider fields of education and training. Educationalists and others are now more conscious than ever before of the need to formulate objectives, even if necessary in fairly broad terms; to construct provisional materials and to make provisional decisions about media; to test empirically and to revise; in short, they appreciate the need to accept responsibility for the learner's success or failure.[1]

The influence of behavioral objectives can be noted in the developments initiated recently in the Michigan State Department of Education. A project in the Art and Music area is directed towards an assessment program comparable to the programs in reading and some other subject areas. Music and art teachers from throughout Michigan have formed committees representing each grade level and subject. These committees have developed behavioral objectives and a systematic method of assessing a teacher's success in accomplishing these objectives. The concept of teacher accountability is based on the premise that the teacher is reponsible for his students' assimilation of a specific body of knowledge or skill development. O'Keeffe (1972) stated:

> The issue of behavioral objectives, much discussed at recent symposiums and conferences, is about to leap

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[1] Sir Brynmor Jones, "Educational Technology in Tomorrow's World," Programmed Learning, Vol. VI, No. 1, (April, 1969), pp. 77-82.

> forward at the music education profession. Its importance has been emphasized by the creation of a full committee in Music Educators National Convention's recent GO project concerned with the identification and evaluation of musical behaviors, by meetings at several universities, by the application of behavioral systems to a number of educational ventures (from the assessment of reading skills to school budget ventures), and by interest in accountability as a measurement of teacher efficiency. Music teachers will soon have to decide whether a behavioral approach to music education has merit and should be adopted as a guiding principle for the profession.[1]

Every new trend has its detractors and the behavioral objectives emphasis is no exception. Some educators feel that objectives should grow out of the progress and interaction of the students. Another stated objection is that behavioral objectives unnecessarily constrain the intellectual and creative atmosphere of the classroom. Adams (1972) pointed up some of these common criticisms:

> Much that is creative, imaginative, and innovative seems to be hampered and fenced in by demands for identifying and teaching toward behavioral objectives. Perhaps we should also take a long hard look at whether this make-believe framework of precision really helps. This does not mean that it is automatically necessary to rule out completely the use of behavioral objectives; they may, at times, prove useful. But with the same degree of fairness, we should not assume that a teacher is wasting his time if he doesn't make use of objectives. After all, when one deals with real people, many unanticipated, intuitive, and spontaneous things happen. And these things, in the long run, may be the most important.[2]

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[1]Vincent O'Keeffe, "What are Behavioral Objectives All About," Music Educators Journal, Vol. LIX, (September, 1972), pp. 50-51.

[2]Dennis M. Adams, "Some Questions Concerning Behavioral Objectives," Education Digest, Vol. XXXVIII, No. 1, (September, 1972), p. 26.

Many subject areas of education are now profitably using programed materials to carry part of the instructional load. The expectation that programed instruction would become the main educational technique, however, has not materialized. Rather, programed instruction has become one of many techniques used in a multimedia system of instruction. Other multimedia techniques include film-strips, films, video tape recorder, phonograph, tape recorder, and computers. Education is moving in the direction of a multimedia approach in which the principles and techniques of programed instruction play an important role. The Music Educators National Conference Research Training Institute (March, 1972) emphasizes this point:

> The system for teaching or learning music appears in several forms. The classroom, tutorial instruction, small group instruction, band, orchestra, and choir are all part of that system. In addition to these relatively older forms, the new areas of instructional technology--computer-assisted instruction, self-instructional materials, films, and videotape--are making an enormous impact on the whole scheme of education. The problem is how to manipulate and control all of these forms for effective learning.[1]

Summary

Activity in the field of programed instruction over the past two decades has helped to define the strengths and weaknesses of the technique. The use of programed instruction continues to be an important part of the instructional procedures of many institutions. There are

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[1]Music Educators National Conference Research Training Institute, "Learn to Apply a Systems Approach in Music Education," Music Educators Journal, Vol. LXVII, (November, 1971), p. 71.

many educators, however, who consider programed instruction too limiting a technique for many subject areas.

An important by-product of programed instruction is the growing acceptance of the principles of programed instruction in the planning and management of instruction in many schools.

Programed Instruction in Music Education

Initial programed instruction in music education centered around the teaching of music fundamentals and theory. One of the earliest books, Fundamentals of Music,[1] published in 1960, covers the following topics for fifth and sixth grade level to adults: note names and their relationship to the piano keyboard, major scales, note values, key signatures and dynamics. No information is available from the publisher on the development and testing of the book. In 1962 a book titled The Learn-About Book[2] was published. This linear programed book presents music fundamentals along with classroom singing at the fourth grade level. The publisher has indicated that no information is available on the book and that it is permanently out of print. In 1963 two additional

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[1]Lloyd D. Homme, and Donald T. Tosti, Fundamentals of Music (New York: Teaching Materials Inc., 1960).

[2]Beatrice Krone, and Margaret Fullerton, The Learn-About Book (Chicago: Follett Publishing Co., 1962).

programed music texts, Music Notation[1] and Music Makers[2] were published for the elementary school level. Music Notation by John Batcheller is a book of music fundamentals designed for fifth grade students. The linear format includes 1,042 frames on 158 pages. No information on the development or testing of Batcheller's book is available from the publisher.

Since 1963 many more music programs have been published. John Clough's Scales, Intervals, Keys and Triads[3] was published in 1964. This text was begun as part of an Oberlin College project on programed learning and supported by a Ford Foundation grant. Development and testing of the text was conducted in beginning music theory classes at Oberlin College. Paul Harder of Michigan State University is the author of probably the most extensive project in programed music instruction. His Basic Materials in Music Theory,[4] published in 1965, was developed out of the necessity of presenting basic music

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[1]John Batcheller, Musical Notation (Chicago: TEMAC-Programmed Learning Materials, Encyclopedia Britannica Press, 1963).

[2]Winifred Neal, Music Makers (Belmont, California: Wadsworth Publishing Co., 1963).

[3]John Clough, Scales, Intervals, Keys and Triads: A Self-Instruction Program (New York: W. W. Norton and Co., 1964).

[4]Paul Harder, Basic Materials in Music Theory (Boston: Allyn and Bacon, 1965).

theory to large numbers of summer music students at Michigan State University. A 25 per cent average improvement in pre-test/post-test gain was achieved by summer music students as a result of using the programed text. The gain in achievement, although not resulting from a controlled experimental situation, was considered by Harder to be great enough to warrant continued use and publication of the programed text. Another series by Harder, Harmonic Materials in Tonal Music: A Programed Course (1968),[1] was developed at Michigan State University to be used in the first two years of college music theory. The development of these texts was sponsored by the Educational Development Program at Michigan State University.

During the second half of the 1960's many additional music texts were published, some of which were designed for specific purposes. Introduction to Music Reading (1966) by Leon Dallin[2] was designed for laymen for the purpose of learning singing, playing, listening or teaching. The book is still an active publication but no information is available on the effectiveness of the book. A music fundamentals text by Andrews and Wardian was published in 1967 titled Introduction to Music Fundamentals: A

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[1]Paul Harder, Harmonic Materials in Tonal Music: A Programed Course (Boston: Allyn and Bacon, 1968).

[2]Leon Dallin, Introduction to Music Reading: A Program for Personal Instruction (Glenview, Illinois: Scott, Foresman and Company, 1966).

Programmed Textbook for the Elementary Classroom Teacher.[1] The book was designed for the classroom teacher needing a practical knowledge of singing and the keyboard. Wardian, one of the authors of the text, conducted a research study in programed learning of the fundamentals of music. The study compared a programed method with the more conventional lecture-recitation method. The subjects for the study were all second-quarter freshmen or above at Eastern Washington State College. The students were enrolled in a music fundamentals introductory course for non-music majors. Wardian's conclusions were as follows:

1. Students taught in the experimental group using the programmed learning method performed as well as the students in the control group using the conventional method. The mean scores favored the experimental method, though not at a statistically significant level.
2. Students in the experimental group spent a significantly smaller amount of time in the completion of the course than the control group.[2]

Classroom Melody Instruments by Leslie Woelflin[3] was published in 1967. The purpose of this book was to instruct prospective elementary school teachers on how to

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[1]J. Austin Andrews and Jeanne F. Wardian, Introduction to Music Fundamentals: A Programmed Textbook for the Elementary Classroom Teacher (New York: Appleton-Century-Crofts, 1967).

[2]Jeanne F. Wardian, "An Experiment Concerning the Effectiveness of Programmed Learning for Use in Teaching the Fundamentals of Music," Dissertation Abstracts, Vol. XXIV, No. 3, (1963), p. 1101.

[3]Leslie E. Woelflin, Classroom Melody Instruments: A Programed Text (Glenview, Illinois: Scott, Foresman and Company, 1967).

play and finger the flutophone, recorder, song flute, and tonette. Subsequent programed instruction research and materials development has become quite varied. The use of audio and visual programed presentations have been researched and accepted as part of the regular instructional procedures of some university music departments.

Spohn (1963) experimented with the relative effectiveness of various modes of presenting and responding to recorded intervals, rhythm and tone groups. Special programs were written which offered instruction in three different music elements. This information was specially adapted for presentation on magnetic tape so that it could be used in the audio-visual training laboratory. Conclusions from this experiment indicated that there was no one best treatment mode unless a particular objective is stated. Another finding was that what the students do may be more important than the manner in which the tasks are presented, especially when the task is a difficult one.[1] Sherburn (1967), using taped and written material, created a programed approach to the learning of basic ear training and sight singing for college music majors. Tapes and written lessons were sequenced and made available in the

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[1]Charles L. Spohn, An Evaluation of Two Methods Using Magnetic Tape Recordings for Programed Instruction in the Elemental Materials of Music, U.S. Office of Education Document No. ED 003 611 (Washington, D.C.: Bureau of Research, 1963).

listening laboratory at Michigan State University.[1] Trythall (1965) developed a similar procedure for Peabody College in Nashville, Tennessee.[2] Smith (1968), using Kanable's A Program for Self-Instruction in Sight Singing, conducted an experiment with college freshmen. The purpose of the study was to test a sight singing program of self-instruction in comparison to specific classroom situations using a standard text. To assess the effectiveness of the program, a test was devised, evaluated, and administered to fifty-two freshmen music students at Florida State University. The students were then assigned to four groups on the basis of pre-test scores. Subjects in group I studied the Kanable program. Subjects in group II were taught by the experimenter in the classroom. Subjects in group III were taught by another instructor in the classroom, and subjects in a control group received no instruction. No differences were detectable between the group using the program, the groups using the conventional approach and the group that received no instruction whatsoever. Perhaps one of the reasons for the outcome of this experiment was the assumption that the control group received no instruction whatsoever. All the students were

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[1] Merrell Sherburn, "Basic Ear Training" (East Lansing, Michigan: Unpublished Instructional Material in use at Michigan State University, 1966).

[2] Gilbert Trythall, "Observations on Music Dictation Programming," Journal of Research in Music Education, Vol. XVI, No. 3, (Fall 1968), pp. 267-277.

music majors and were probably involved in a variety of other musical activities which may have contributed to sight singing ability. The results of the research prompted a staff review of sight singing procedures.[1]

Shrader (1970), utilizing a programed stereo tape machine, experimented with rhythmic sight reading of high school students. It was the purpose of the study to design, construct, and test a method of rhythmic instruction which was based upon established techniques of programed learning; and which provided a means of quantitative response evaluation and immediate response reinforcement. The course of study, or program,consisted of a series of ten forty-five minute lessons, and was administered to thirty-four students participating in the University of Oregon High School Music Camp during June, 1969. An equivalent number of students from the camp population were utilized as a control group. The research design consisted of pre-test, program, post-test, with the control group participating on the post-test. Statistical analysis of the data indicated that the program was successful. Shrader reported that students with low pre-program ability showed great improvement as a result of the program while students with high pre-program ability showed much less improvement. A similar inverse relationship was illustrated

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[1]James Craig Smith, "A Performance Test of Kanable's A Program for Self-Instruction in Sight Singing," Dissertation Abstracts, XXIX, 6, (1968), p. 1921-A.

by a negative .96 rank-order correlation between program success and amount of prior individual instruction. Such evidence indicated that the program was most effective as a remedial tool, particularly for students with little or no prior individual instruction.[1]

Costanza (1968) examined a programed approach to melodic and harmonic score reading utilizing aural and written material. The study sought to determine whether materials utilizing programed instruction techniques could be developed to effectively teach melodic and harmonic score reading skills, and whether melodic and harmonic score reading skills could be significantly increased by the developed programed materials. Melodic and harmonic score reading skills were measured by a score-reading test developed by Costanza. The programed material consisted of 320 aural and visual frames organized into eight sections of forty frames each. In each section the subject was directed to follow a part or parts of the printed score as he listened to a tape-recorded musical example in which an error might or might not be played. Costanza's conclusions were: (1) Melodic and harmonic score reading skills can be effectively taught by programed instruction utilizing aural and visual materials. (2) Melodic and harmonic score reading skills developed are transferable

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[1]David Lewis Shrader, "An Aural Approach to Rhythmic Sight Reading Based Upon Principles of Programed Learning, Utilizing a Stereo-Tape Teaching Machine," Dissertation Abstracts, XXXI, 5, (1970), p. 2426-A.

and could be applicable to other musical situations involving these skills. (3) The score reading test developed for the study is an effective instrument for measuring melodic and harmonic score reading skills.[1]

Sidnell (1968) experimented with programed training tapes as a means of improving score reading skill of student instrumental conductors at Michigan State University. Music material for the drill tapes was gathered from public school performances. Short excerpts were re-recorded in which only one pitch or rhythm error was allowed in an otherwise near perfect performance. Errors were programed so that detection and identification were accomplished in four frames. Twenty tapes of twelve excerpts each were developed. Comparable nonprogramed material was developed for the purpose of an experimental study. The drill materials were tested under experimental conditions at Michigan State University. A matched-pair two group design was used to test the materials. Subjects were paired on several bases thought to have relevance to the dependent variable, score reading skill. Each group was exposed to two tapes per week during a ten-week term. The experimental group used programed drills and the control group, nonprogramed. Sidnell submitted the following conclusions: (1) Extraclass drill material specifically

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[1]Anthony Peter Costanza, "The Development and Evaluation of Programed Instruction in Score Reading Skills," Dissertation Abstracts, XXX, 3, (1968), p. 1193-A.

directed to the improvement of score-reading skill is beneficial. (2) Drill material of a self-instructional nature arranged in a programed format is superior to nonprogramed material in bringing about gains in score-reading skill.[1]

Froelich's (1970) research in aural discrimination examined the feasibility of a programed audio-tape in the presentation of material for a music literature class. Items for the programed audio-tapes were selected from the instrumental solo, chamber music, and orchestral literature found on commercial disc recordings and were recorded on tape. A pre-test and post-test were prepared by selecting fifty items from the recorded audio-tapes. Progress of learning was determined by the measuring devices after a two-week period of using the programed material. Froelich concluded that students did improve their aural discrimination by the use of the programed materials. No comparison of the effectiveness of the programed and conventional materials was made.[2]

Research associated with instrumental or vocal development is one of the newer directions in programed

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[1]Robert G. Sidnell, The Development of Self-Instructional Drill Materials to Facilitate the Growth of Score Reading Skills of Student Conductors, Final Report, U.S. Office of Education Document No. ED 023 344 (Washington, D.C.: Bureau of Research, 1968).

[2]William Robert Froelich, "Programed Instruction in the Development of Aural Discrimination of Musical Instrument Timbres by College Students," Dissertation Abstracts, XXXI, 7, (1970), p. 3580-A.

instruction. Woelflin (1961) conducted the first research in this area when he compared conventional and programed methods of teaching clarinet fingering. A teaching machine program to teach the clarinet fingerings through the use of photographs and fingering diagrams was developed. The teaching machine program was used in a controlled experiment. There were three groups in the experiment, a control group and two experimental groups. The control group met four times a week and received all of their instruction in the classroom. Both experimental groups met in class twice a week. They received the instruction for the other two days from the teaching machine. Woelflin concluded that the students in the experimental groups learned how to play the clarinet as well as the students in the control group. This was accomplished with spending only one-half as much time in class with the teacher as the control group spent.[1]

O'Neal (1968) examined the possibility of teaching string instrument technique concepts to non-string instrument majors using programed material. O'Neal concluded that prior string instrument playing experience was not necessary for learning technique concepts.[2] Schmalstieg (1969)

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[1]Leslie Edward Woelflin, "An Experimental Study on the Teaching of Clarinet Fingerings with Teaching Machines," Dissertation Abstracts, XXIII, 2, (1961), p. 650.

[2]Neal O'Neal, "The Development of a Concept of String Techniques by a Programmed Course of Instruction for the Heterogeneous String Methods Class," Dissertation Abstracts, XXX, 4, (1968), p. 1590-A.

experimented with programed instruction in vowel sound production in correct singing. Ausio-visual programed materials were developed to be used in music classes designed for elementary classroom teachers. A vowel sound measuring device was developed for the judging of the accuracy of the vowel sounds. Schmalstieg reported a significant gain in correct vowel sound production as a result of the use of the programed materials.[1] Shaw (1971) experimented with high school students in the development and evaluation of programed instruction in teaching the elements of snare drum technique.[2]

Unsworth's (1970) experiment compared programed and teacher-oriented instruction in recognition of the diatonic modes. Two sections of fourth semester theory students were utilized. One section, acting as a control group, followed a teacher-directed path in which the instructor controlled the presentation of the background material and performed dictation materials at the piano. One class period, approximately fifty minutes was spent on this project each week. The project lasted twelve weeks. The second section was excused from class one period each

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[1]Emily Schmalstieg, "The Development and Evaluation of Programed Instruction in Singing Correctly Produced, Uniform Vowels," Dissertation Abstracts, XXX, 5, (1969), p. 789-A.

[2]Albert C. Shaw, "The Development and Evaluation of a Programmed Learning Method in Teaching the Elements in Snare Drum Technique," Dissertation Abstracts, XXXI, 31, (1971), p. 6653-A.

week to devote time to a programed text which was devised as part of this study. The text included a correlated tape recording of 360 musical examples. The examples ranged from scales to melodies in five part settings. A pre-test post-test research design was used. The performance of the experimental group, as indicated by pre-test post-test gain, was found to be significantly greater than that of the control group. Unsworth concluded that aural and visual recognition of the diatonic modes can be more effectively taught through the use of a programed text than through teacher-oriented instruction.[1] Another project in the theoretical area was conducted by Elrod (1971). This research compared programed instruction and a conventional approach in a college music theory class. Elrod's findings were that no significant differences were determined between the achievements of the programed and control group approaches. The lower ability students, as determined by the pre-test, had superior achievement in the programed method group. No ability by treatment interaction was reported but interaction seems to be indicated in this case.[2] Lanshe (1970) conducted an experiment

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[1]Arthur Emerson Unsworth, "A Comparison of Programed and Teacher-Oriented Instruction in Teaching Recognition of the Diatonic Modes," Dissertation Abstracts, XXXI, 1, (1970), p. 418-A.

[2]Wilburn Thomas Elrod, "The Effects of Programed Instruction on Achievement and Attitude of College Freshmen Music Theory Students," Dissertation Abstracts, XXXII, 2, (1971), p. 998-A.

in music theory at the college level with non-music majors. In this experiment the programed material was used in conjunction with a conventional approach. Lanshe concluded that the combination of the programed instruction approach used in conjunction with conventional methods was better than the conventional approach alone.[1]

VanderArk (1970) conducted a feasibility study in programed instruction of twentieth century music. The programed materials consisted of verbal explanations and taped popular, symphonic and electronic music examples. VanderArk concluded that it is feasible to teach concepts in twentieth century music by means of the programed materials developed for this study.[2] Brown (1971), in a similar study, used a programed format for his study of listening skill development. He compared the effects of "serious" and "popular" music approaches to the development of listening skills. All the materials in the study were programed; there was no comparison of methodology. There were no significant differences in the results of the serious and popular music approaches to listening skill development.[3]

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[1]Richard James Lanshe, "A Programmed Learning Series for the Study of Music Rudiments (Volumes I and II)," Dissertation Abstracts, XXXI, 6, (1970), p. 2959-A.

[2]Sherman Dean VanderArk, "Programmed Instruction in Twentieth Century Music: A Feasibility Study," Dissertation Abstracts, XXXI, 7, (1970), p. 3589-A.

[3]Hubert F. Brown, "A Comparison of the Use of 'Popular' and 'Serious' Music in an Audio-Visual Programmed Method for Teaching Listening Skills," Dissertation Abstracts, XXXII, 4, (1971), p. 2114-A.

Summary

The purpose of this section of the review of literature was to examine the various directions research in programed instruction has taken in the field of music. The reviewed research, although not directly related to this study, had the common goal of improving learning through the use of programed instruction. The inclusion here of a wide variety of research studies provides an overview of programed instruction in music education.

The music research studies reviewed in this section did not include studies at the elementary school level. Some of the comparison studies indicated superior outcomes with the programed material while others reported no differences as a result of programed or conventional treatment. Several studies reported success with low ability students using programed material. Low ability was determined by a pre-test in the studies reporting the findings. In general, the studies that did not compare methodology reported significant gains as a result of the use of programed instruction. Possibilities for further research might be to recast some of the noncomparison studies into comparison studies to determine the merit of the approaches in a more practical manner.

Research Pertinent to This Project

Introduction

Primary interest in this research project is the usefulness of programed materials or procedures for fourth

through sixth grade students. Programed instruction at this level may have many aspects or techniques that differ from successful programed instruction at the secondary or college level. For this reason, the review of literature in this section is limited to middle and upper elementary school level research. Only one research project was found in which the programed material was used as an out-of-class, self-instruction adjunct to classroom procedures. The music research projects usually employ some device for listening or skill training in conjunction with programed materials. Several research projects in academic subject areas will be included because of their similarity to the present research in approach to cognitive achievement.

The most extensive work in elementary programed instruction is in the reading area. Sullivan (1969) stated:

> Programed instruction has had its most dramatic success in the field of reading. Millions of students in all fifty states have learned how to read either from the McGraw-Hill basal reading series, or from the series designed for the educationally disadvantaged or remedial student which is published by Behavioral Research Laboratories.[1]

Both books mentioned above derive from the work of the original Hollins College programming group. They have a prepublication history of fifteen years of developmental testing and

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[1]M. W. Sullivan, "Programmed Learning in Reading," Bold New Venture (Bloomington: Indiana University Press, 1969), pp. 101-137.

revision. They start with the simplest and most common sound-symbol relationships and develop written English step by step through a process of stimulus generalization.

The highly structured character of mathematics has also made this a fertile field for programed instruction. Pikaart (1963), working with eight fourth grade arithmetic classes, conducted an experiment comparing a programed approach with a traditional classroom situation. Various factors such as computation, reasoning and problem solving were examined in the analytical process. In general, there was not a statistical difference in the results of the two groups but certain processes seemed to favor one method over the other.[1] Andrews (1963), also working in the mathematics area, examined the relationships among subject and treatment variables in sixth grade programed mathematics. Two modes of response,overt and covert, were utilized. Other independent variables were sex and intelligence (assessed by the Stanford-Benet Test of Intelligence). Fifty-two sixth graders were grouped according to intelligence and then assigned randomly to the overt or non-overt response mode group. Each response mode group was subsequently subgrouped according to sex. Andrews reported the following conclusions based on a statistical comparison of the two groups:

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[1]Leonard Pikaart, "A Factor Analytic Study of Success in Programed Textbook Instruction in Elementary School Arithmetic," Dissertation Abstracts, XXIV, 6, (1963), p. 2383.

1. A positive relationship exists between intelligence and mathematics achievement during the programed instruction.
2. An interaction effect exists between intelligence and content difficulty during programmed instruction. At lower levels of content difficulty, all subjects perform with similar adequacy. As the content difficulty increases, below-average subjects achieve less adequately than do average and superior subjects, while average and superior subjects achieve with similar adequacy.
3. A relationship exists between sex and mathematics achievement; girls consistently exceed boys in achievement during programmed instruction.
4. Sex and intelligence do not interact to affect mathematics achievement during programmed instruction.
5. No relationship exists between response mode and mathematics achievement during programmed instruction.
6. Response mode and intelligence do not interact to affect mathematics achievement during programmed instruction.
7. Response mode and sex do not interact to affect mathematics achievement during programmed instruction.[1]

Grell (1963) compared the effectiveness and efficiency of the teaching of spelling by use of a programed instruction method and a conventional textbook method. He concluded that the programed textbook method was as effective and more efficient than the conventional textbook method for teaching spelling to fourth grade pupils. He also concluded that provisions for individual differences of fourth grade children learning to spell are accomplished more adequately by the programed method than the conventional method of

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[1]Mary Margaret Andrews, "Programmed Instruction in Elementary Schools: A Study of Variables Associated with Mathematics Achievement," Dissertation Abstracts, XXIV, 6, (1963), p. 2319.

teaching spelling.[1] Plotkin (1963) conducted a similar experiment in fourth grade spelling except that the programed material was devised for use with the Sakoda Punchboard Tutor. Plotkin's conclusions:

> The use of programed materials with a teaching machine device does not demonstrate any marked superiority over textbook instruction. No significant improvement in mastering a list of spelling words was demonstrated from week to week by the control group or either of the two experimental groups. There was no significant difference in the mean scores of the experimental groups or the control group on the delayed test of spelling achievement.
>
> The teaching machine device, along with the programed materials offers an economy of practice time. The use of programed materials in conjunction with a teaching machine device decreases time spent learning to spell.[2]

Gleason (1965) conducted a study to determine some of the effects of self-directed learning in elementary science on fifth grade pupils. The research was designed to measure learning in four areas: fact absorption, general science knowledge, liking for science, learning to generalize. Printed materials instructed pupils in the use of simple apparatus to collect data and solve elementary science problems. The approach was inductive and required making generalizations on observed phenomena. Four

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[1] Lewis A. Grell, "Comparative Effectiveness and Efficiency of the Teaching of Spelling by Use of a Programed Instruction Method and a Conventional Textbook Method," Dissertation Abstracts, XXIV, 12, (1963), p. 1762.

[2] Herbert Plotkin, "The Effectiveness of Programmed Learning in Fourth Grade Spelling," Dissertation Abstracts, XXIV, 6, (1963), p. 2383.

self-directed science studies were presented to 128 students of six classes selected at random from schools of a mixed factory-suburban town. One hundred thirty-two students in seven classes were used as a control group. The study was conducted over a period of six months. Experimental and control groups were equated as to I.Q. ratings and scores on a standardized reading test. Experimental and control groups were also compared in upper and lower I.Q. halves and by sex. Gleason summarized his findings:

> There was no significant difference between the experimental and control groups in gain of factual knowledge, nor was there difference when groups were compared according to sex and I.Q.
>
> The upper I.Q. pupils of the control group enlarged their general science knowledge significantly more than did the experimental group. Between the two main groups there was no significant difference in gain of general science knowledge.
>
> After self-study activities the upper I.Q. groups expressed a liking for science significantly greater than the corresponding control group. There was no significant difference in the scores of the total groups.
>
> There were no significant differences in gains in organizational abilities between the experimental and control groups and none between the sex groups and I.Q. groups.[1]

Dutton (1963) experimented with fourth grade science using programed material to guide the students in their experiments. The sample for this study consisted of 111

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[1]Walter Patterson Gleason, "An Examination of Some Effects of Pupil Self-Instruction Methods Compared with the Effects of Teacher-Led Classes in Elementary Science on Fifth Grade Pupils," Dissertation Abstracts, XXVII, 6, (1965), p. 1656.

fourth grade students. Intact fourth grade classroom groups from two rural elementary schools in central Virginia provided the experimental sample. One classroom group in each school was designated as the experimental group to use the programed materials for instructional purposes. The other classroom group served as the control class in which the classroom teacher taught the same science concepts by any conventional method of instruction desired. The experimental phase of this study was conducted for a period of five weeks. The criterion measure was defined as the final achievement test scores. Dutton concluded:

> Fourth grade students can proceed satisfactorily in science at varying rates when using programed materials.
>
> When programed materials are used, fourth grade students can conduct simple science experiments with limited amounts of teacher supervision.
>
> The utilization of programed materials can accomplish the learning of conventional science concepts more efficiently than some of the more conventional classroom teaching practices.[1]

There are some potential weaknesses in Dutton's research that could have a bearing on the results. No pre-test was given to the groups to determine their initial equality. The activities in the control groups were not well defined. The teacher variable could be an important factor in this research.

The use of programed instruction to learn the cognitive elements associated with beginning music is not common at

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[1]Sherman Sumpter Dutton, "An Experimental Study in the Programming of Science Instruction for the Fourth Grade," Dissertation Abstracts, XXIV, 6, (1963), p. 2382.

the elementary school level. In 1963 two programed texts were published for elementary level students. Music Notation by Batcheller (1963) was recommended for fifth through seventh graders. Music Makers by Winifred Neal is a brief book that presents note values and music symbols intended for the third grade level. These books are not in common use in beginning instrumental music training nor have subsequent publications gained popular acceptance or even knowledge of existence. This situation is common to many areas of learning in the public school. Lysaught (1971) commented on this problem:

> So, here we are today. Programed instruction is no longer a child, but has been operationally alive for more than ten years. Between the laboratory promise and the educational market, some funny and not-so-funny things have happened. We lost, or perhaps more properly are still losing, the opportunity to capitalize on this instructional approach because we have not solved the prior questions of what our educational objectives are, and how they can be arranged and ordered in a sound, articulated curriculum that admits of variation and alternatives but represents a consensual core.[1]

Research in programed instruction at the elementary level has been quite limited. The five studies presented here are among the few available in music at the specified school level. A variety of uses of programed instruction are presented in these research projects. One study is similar to the present research; it will be discussed last.

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[1]Jerome P. Lysaught, "A Funny Thing Happened on the Way to the Market," Music Educators Journal, Vol. LVII, (January, 1971), pp. 55-57.

LaBach (1965), utilizing tape recorders as major components, developed a device to facilitate learning of basic musical skills by providing for replay of recorded segments of practice following the "live" performance and by providing a model performance for comparison. Student use of the device during the limited pilot project indicated that devices of this kind are not only feasible but also have potential for music teaching. As the next step, the investigator recommends controlled experimentation with an emphasis on programed material, various modes of presentation, and long term research designs.[1]

Mandle (1967) experimented with programed instruction in learning music reading skills with the use of the keyboard. The purpose of this study was to initiate a program for teaching music reading skills, using the piano keyboard in combination with programed learning, and to compare it with conventional methods of music instruction. Fourth, fifth, and sixth graders at one Cleveland public school comprised the control group receiving conventional music reading instruction. The same grades at another Cleveland school were the experimental group following the learning procedures developed by the experimenter. The programed aspects of this

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[1]Parker LaBach, Pilot Project for Development of a Device to Facilitate Learning of Basic Musical Skills, U.S. Office of Education Document No. ED 003 450 (Washington, D.C.: Bureau of Research, 1965).

experiment were controlled by the experimenter. The first programed lesson was handed out to the students to work on but the remainder of the programed material was dictated by the instructor. The experiment was performed over two semesters, the second semester repeating the material covered in the first. All groups were tested in five areas of music knowledge. Test results in staff knowledge and knowledge of tonal organization, were significantly higher for experimental students than for control students. Results in the other three areas revealed that typical methods were not successful and that the experimenter's method had potential, though it needed to be further developed.[1]

Puopolo (1970) investigated the feasibility of structured programed practice with tape-recorded materials and its effect upon the performance achievement of beginning elementary cornet and trumpet students. The main purpose of the study was to facilitate the teaching and learning of instrumental performance through the application of programed procedures to individual practice. The central hypotheses was that structured practice with recorded tapes containing programed material would produce a significant difference in performance achievement as compared with unstructured, non-programed practice. The experimental

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[1]William Dee Mandle, A Comparative Study of Programed and Traditional Techniques for Teaching Music Reading in the Upper Elementary Schools, Utilizing a Keyboard Approach, Final Report, U.S. Office of Education Document No. ED 014 212 (Washington, D.C.: Bureau of Research, 1967).

treatment consisted of structured daily practice with ten weekly twenty-minute tapes containing programed material. The control group method consisted of daily twenty-minute practice of the same material in an unstructured manner without tapes. I.Q. scores and social status indicators were additional independent variables. Puopolo submitted the following conclusions.

> In terms of performance achievement, structured practice with programed material produced significantly improved performance achievement as compared with non-programed material.
>
> The performance of the above-average music achievement sub-group was significantly higher than the below average music achievement sub-group performance.
>
> Interaction between music achievement and programed practice, in terms of performance achievement, was not statistically significant.
>
> Performance achievement of the above-average social status sub-group, compared with that of the below-average social status sub-group, did not show a difference which was statistically significant.
>
> Interaction between social status and programed practice, in terms of performance achievement, was not statistically significant.
>
> Performance achievement of the above-average I.Q. sub-group, compared with that of the below-average sub-group, did not show a difference which was statistically significant.
>
> Interaction between I.Q. and programed practice in terms of performance achievement, was statistically significant. Lower I.Q. students benefited more from the programed practice than higher I.Q. students.[1]

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[1]Vito Puopolo, The Development and Experimental Application of Self-Instructional Practice Materials for Beginning Instrumentalists, Final Report, U.S. Office of Education Document No. ED 056 053 (Washington, D.C.: Bureau of Research, 1970).

Rives (1970) conducted a comparative study of traditional and programed methods for developing music-listening skills in the fifth grade. The traditional method consisted of biographical material about the composer, the playing of themes from the music, some discussion of the structure of the music, and three performances of the music. The programed method was divided into thirty-four lessons. Each lesson taught one musical composition, and consisted of three performances of the piece and the programed frames designed to teach it. A four-part listening achievement test, designed to measure content retention and three listening skills, was given at the conclusion of the training. No significant difference in listening achievement due to teaching was found. It is Rives' opinion that certain elements of the traditional and the programed approaches could be combined to construct a method superior to either.[1] Rives' study leaves some important questions unanswered. A course of study presenting thirty-four different music literature segments for fifth graders may be an unreasonable learning goal. The possibility exists that no conceivable treatment would be successful with so much material to be covered. Perhaps a more limited and concentrated course

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[2]James A. Rives, "A Comparative Study of Traditional and Programed Methods for Developing Music Listening Skills in the Fifth Grade," Journal of Research in Music Education, Vol. XVII, No. 2, (Summer 1970), pp. 126-133.

of study would be worth investigating in the experimental situation described by Rives.

The final research project is quite similar in some aspects to the present research. The study by Drushler (1972) is titled "A Study Comparing Programed Instruction with Conventional Teaching of Instrument Fingerings and Music Pitch Notation for Beginning Students of Clarinet, Flute, and Trumpet in a Flexible Scheduled Curriculum." The purpose of this study was to determine if pitch notation and correct instrument fingering could be learned by students using programed texts in conjunction with audio-tape machines. A second objective was to determine if the use of a programed text would allow for better use of teacher-student contact time. The study, using students between the ages of nine and twelve, was conducted at the Center for Innovation in Education of the State University College at Brockport, New York. The school is set up on a flexible scheduled curriculum in which independent study is fostered.

Three programed textbooks, utilizing a card-audio tape machine and designed to teach pitch notation and correct fingerings, were developed by the researcher. The texts, written for clarinet, cornet, and flute, were linear in format. The study was an experimental project with a control and an experimental group. Students in the experimental group worked independently in school and at home with the programed texts. The students

proceeded normally in school lessons with the Breeze Easy[1] method book. However, any material that was covered in the programed text was disregarded in the method book. Students in the control group did not use the programed texts; they proceeded covering pitch notation and instrument fingerings in a conventional manner in the same method book.

The study took place over a five-month period commencing September, 1970. The study population consisted of thirty-two students, sixteen being in each group. An objective test was used as both a pre- and a post-test for students in the two groups to test achievement in the areas of pitch notation and instrument fingerings. The instructor kept a log on each student indicating student-instructor contact time. An analysis of covariance revealed that the mean scores of the students in the experimental group were not significantly different at the .05 level of significance from the mean scores of the students in the control group. This finding indicated that the learning of pitch notation and correct instrument fingerings by students in the experimental group was equal to that by students in the control group. The descriptive report of the instructor indicated less time being spent with students in the experimental group in the areas of

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[1]John Kinyon, Breeze Easy (New York: Warner Brothers Publications, 1958).

instruction dealing with pitch notation and instrument fingerings than with students in the control group.

The greatest similarity of Drushler's study to the present research is the manner in which the programed material is used. The programed texts carried the burden of instruction of fingering and pitch notation, and were used outside of the regular class time. The same basic objective of freeing the instructor to work on essential music and instrumental performance problems underlies the research.

The most important differences in the two projects are in the size of the sample and the school situation and background of the students. Drushler described the situation as follows:

> The concept of individualization controls the flexible curriculum at the Center for Innovation in Education of the State University College at Brockport, New York. Students are active in designing their own course of study for a particular day or week; they proceed primarily through their own interests, often through independent study, with teacher guidance. The flexible scheduling of the instrumental music program at the Center involves students of ages nine through twelve. It allows the student to learn when he is sincerely enthused and interested. A student may have several individual lessons per week or one per month. The student may sign up for a lesson on a schedule sheet posted on the music-suite any time for individual or ensemble practice and a formal or informal lesson from the instructor if the situation permits. Independent

study is employed as students learn technical skills from a programed textbook and card-audio tape machine.[1]

The subject matter presented in Drushler's project and the present study is both similar and different. Both texts present pitch notation but this is the only common material. The texts are both linear but the approaches are quite varied. Drushler's program has very small steps and is used in close conjunction with an audio-tape machine. The format of the text for the present research has larger steps and requires the student to work out problems on each page related to basic music fundamentals.

Summary

Ten elementary level research projects have been reviewed in this section. All but one of the ten studies were comparison studies. Three of the nine comparison studies reported a significant gain as a result of the programed treatment. The studies reporting the gain were more activity oriented than the remaining six studies. Several studies measured the time needed to accomplish a specific goal. Programed instruction was frequently reported as being more economical in time spent learning the material than in the conventional method. Four studies

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[1]Paul F. Drushler, "A Study Comparing Programed Instruction with Conventional Teaching of Instrument Fingerings and Music Pitch Notation for Beginning Students of Clarinet, Flute, and Trumpet in a Flexible Scheduled Curriculum," Dissertation Abstracts, Vol. XXIII, (1972), p. 1185-A.

used standardized test scores (I.Q.) as a basis of matching experimental and control groups. Three of these studies used the I.Q. scores in an analysis of covariance and tested for interaction effects of several variables in relation to programed instruction. The interaction results were too varied to define a particular pattern. Reading skill was not considered a specific variable in any of the ten studies. Reading skill, however, is an important factor in standardized tests which determine I.Q.

The reports of the ten studies commended programed instruction even though significant improvements over conventional procedures were not always present. The overall goal of improving instruction through a variety of approaches and economical use of student time was the justification for the optimistic reports. Another viewpoint, which seems justifiable from the results of the studies, is that programed learning has not proven to be more effective than conventional techniques and that further development of programed materials is not indicated. However, a variety of approaches and economical use of time are important aspects of learning. An experimental technique that equals the effectiveness of a conventional technique may be worth further consideration.

At the 1970 Music Educators National Conference Convention a paper was presented titled "Programed

Instruction in the '60's." This paper outlined the progress of programed instruction and listed published materials in music.[1] Thirty-two titles were listed, three of which were designed for the elementary school age student. One of the elementary books is now permanently out of print. Elementary school music is yet to receive the attention of research and materials development needed to explore the potential of programed instruction.

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[1] David C. McGuire, "Programmed Instruction in the '60's," A paper submitted to the Music Educators National Conference Convention, Chicago, 1970.

CHAPTER III

DESIGN OF THE STUDY

Sample

The Flint School System allows for variety within the general guidelines for elementary instrumental music. Any student may elect to study an instrument in the Flint Schools. Some Flint elementary schools have instruments available while others depend on the students to procure their own. In the larger elementary schools, considerable sharing of instruments is necessary to allow every interested student the opportunity to study an instrument.

Five pairs of elementary school instrumental music programs in the Flint School System were selected for this study. Each met the following criteria: (1) Each school of the pair must be similar in socio-economic background. (2) The size of each school must be roughly equivalent. (3) Each pair of schools must have the same instructor and equal number of class sessions each week. Descriptive data regarding the schools are presented in Table 3.1 on page 59. The figures are extracted from the 1971 Michigan Educational Assessment Program, showing the comparison of the five pairs of schools on several important measurements.

The explanations below pertain to the comparison table on page 59. The information on the comparison table was taken from the Flint Local District Michigan Educational Assessment Program, January, 1971.

(X) and (C) schools:

The pairs of schools on the comparison table are listed as (X) or (C) according to their role in this study. The (X) schools received the experimental treatment (programed text) while the (C) schools received the conventional treatment.

Mean students' estimate of socio-economic status (S.E.S.):

The socio-economic status indicator resulted from a questionnaire, filled out by Michigan elementary school students, which attempted to assess the general socio-economic status of schools in Michigan. The S.E.S. mean for Michigan elementary school students was fifty. Schools with a mean above fifty, according to this measurement, would be in a higher socio-economic bracket than schools below fifty. The Flint schools in this study are about evenly divided above and below the S.E.S. mean for Michigan.

Reading skill mean:

The reading skill indicator is derived from the Science Research Associates battery of tests that are given throughout Michigan elementary schools each year.[1] The mean score for Michigan elementary school students was fifty. A mean higher than fifty for an individual school would indicate above average reading capacity for that school.

Composite skills mean:

The composite skills indicator includes the combination of achievements in reading, mathematics, and language arts. The mean for elementary school students in the State of Michigan was fifty.

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[1] SRA Assessment Survey, Using Test Results (Chicago: Science Research Associated, Inc., 1972).

TABLE 3.1.--Experimental and control group comparison table - General descriptive data.

Schools	Percentage of minority students	Mean students' estimate of S.E.S.	Mean reading skill	Mean composite skills
(X) Pierce	20	60	54.4	57.3
(C) Anderson	0	55.4	55.8	56.6
(X) Coolidge	1	48.1	50.3	50.5
(C) Cummings	1	50.5	52.8	52.6
(X) Pierson	76	41.3	42.8	42.9
(C) Gundry	57	46.2	46.6	46.9
(X) Stevenson	9	41.5	48	46
(C) Lincoln	26	39.8	43.7	43.6
(X) Summerfield	1	52.4	53.2	53.7
(C) Freeman	1	51.1	53.0	53.7

The schools were designated experimental or control in the following manner: Each of the five instrumental music instructors in the study was asked if in his estimate, there were any factors which could possibly favor the cognitive musical achievement in one school (of the pair) over the other school. Three instructors indicated that no known factors were suspected that could differentially affect the achievement in the pair of schools. The three pairs of schools listed below were assigned experimental or control by random selection.

Experimental	Control
Stevenson	Lincoln
Summerfield	Freeman
Pierson	Gundry

The instructors of the remaining two pairs of schools indicated a possible imbalance in cognitive music achievement due to the musical material presented by the vocal music teachers in two of the schools. These two vocal teachers occasionally present the fundamentals of music in somewhat the same manner as the instrumental music teachers. The presentations are not concentrated or intended for student mastery of the fundamentals of music but they do constitute a possible known difference in the learning situation in the pairs of schools. In an attempt to avoid a potential pre-experimental bias in the remaining two pairs of schools, the following assigning procedure was used. In the Anderson and Pierce pair of schools, Anderson was considered to have a more favorable learning situation. From this pair, Anderson was assigned as a control school.

Experimental	Control
Pierce	Anderson (more favorable situation)

In the Coolidge-Cummings pair of schools, Coolidge was considered to have a more favorable learning situation. From this pair, Coolidge was assigned as an experimental school.

Experimental	Control
Coolidge (more favorable situation)	Cummings

The attempt was made to eliminate pre-experimental bias by assigning one favored school as experimental and the other favored school as control. Therefore, strict random assignment procedures were systematically avoided. Table 3.2 on page 62 lists the total number of students by grade level from the ten schools participating in the study.

Design

The proposed statistical analysis required that the corresponding experimental and control groups at each grade level have the same number of participants. The groups were balanced by randomly eliminating six fourth grade experimental participants, four fifth grade control participants and six sixth grade experimental participants. Table 3.3 gives the number of participants at each grade level after the groups were balanced.

The recruiting of beginning instrumental music students for the present experiment began September, 1972. Two pairs

TABLE 3.2.--Numbers of participants in the study by grade level and school.

Experimental Schools		N	N	Control Schools
Pierson	4th	22	18	Gundry
	5th	8	11	
	6th	6	5	
Summerfield	4th	8	10	Freeman
	5th	2	0	
	6th	0	1	
Pierce	4th	17	19	Anderson
	5th	1	4	
	6th	5	1	
Coolidge	4th	23	22	Cummings
	5th	2	0	
	6th	2	2	
Stevenson	4th	8	3	Lincoln
	5th	3	5	
	6th	6	4	
Grade level total of students in the experimental group			Grade level total of students in the control group	
	4th	78	72	
	5th	16	20	
	6th	19	13	
Total students in the experimental group			Total students in the control group	
		113	105	

TABLE 3.3.--Numbers of participants in the study by grade after random group balancing.

	Experimental	Control
4th grade	72	72
5th grade	16	16
6th grade	13	13

of participating schools, Summerfield-Freeman and Anderson-Pierce, have an exploratory program in which all fourth grade classrooms are presented one instrument from each family of instruments. The students have the opportunity to try out the instruments and learn important playing characteristics. This procedure takes a month or two, depending on the teacher's schedule. The remaining schools present the instruments at evening student-parent meetings.

The instrumental classes were formed in late September or October of 1972. The sequence of the experiment was as follows:

Pre-test - Five week Treatment Period - Post-test - Three month Interval - Retention Test

The pre-test was given at the first class meeting. The teachers were instructed to give the pre-, post-, and retention tests to each pair of schools on approximately the same testing schedule. The same test of music fundamentals was used for the pre-, post-, and retention tests.

Each beginning instrumental class had a three or four week period in which the problems of instrument care, tone production, and rote playing of songs were the major

objectives. At the end of this rote period, method books[1] were passed out and students began the study of reading music. For this research project, the final week of the rote period was the beginning of the five or six week period leading to the post-test. During the final week of the rote period, students in the control group were presented the beginning basic music symbols as follows: staff, clefs, position of notes on the staff. The experimental groups, during this week, were given the programed textbooks and shown how to use them. Directions for the use of the texts and a supporting rationale was programed into the texts, but it was considered essential to present the procedure in class also. The experimental groups were assigned the first twenty-four pages of the texts which cover the same material as the control groups were receiving in the last week of the rote instruction period. In the following four or five weeks, the control groups progressed in the usual manner of short informal lectures and home assignments in the study of music fundamentals from their books. The experimental groups were given four weekly assignments designed to bring them to the end of the programed text. The teachers were instructed to have the students bring in their programed texts

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[1]Weber, loc. cit.

every week to check each student's progress. The experimental groups received no formal presentations regarding the fundamentals of music. The teachers proceeded with the problems associated with the playing of the instruments under the assumption that the students knew the requisite cognitive information for beginning music reading. At the end of the four or five week period the post-test was given and the main portion of the project terminated.

The dropout rate in beginning instrumental music in Flint is high. This condition prompted the short term of the present experiment. The residual effects of programed instruction, however, were also of interest in this study. The post-test was given in the fifth or sixth week of the experiment. A test was also administered three months after the post-test to assess the residual effects of the experimental and control treatments. For this study, the additional measurement was designated as the "retention test." Four of the five pairs of schools participated in the retention test; the other pair was involved in concert preparation and chose not to participate. Table 3.4 on page 66 gives the complete sequence of events in the study. The chart approximates the schedule. With five pairs of schools participating, exact placement of events was not possible.

TABLE 3.4.--Sequence of events in the study (1972-73).

1. Throughout September
   Recruiting of instrumental music classes.
2. First week of October
   Formation of instrumental music classes.
   Pre-test of experimental and control groups.
3. The remaining three weeks of October
   Rote instruction period.
4. First week of November
   Control groups - presentation of beginning fundamentals.
   Experimental groups - first assignment in the programed text.
5. Second week of November through the second week of December
   Method books introduced.
   Control groups proceeded in their ususl manner.
   Experimental groups worked through the programed text.
6. Third week of December
   Post-test
7. First week of April
   Retention test

Data Gathering

All the testing in the experiment was conducted by the beginning instrumental music teachers in their regular sessions. The forty-item test had a cover sheet which provided for the student's name, school, grade, and previous musical training. Students taking the test marked multiple choice answers on the test booklet. All information and the multiple choice answers to each item

were then transferred by a team of older students to OpScann 100 scoring sheets for processing and computer card punching at the Scoring Center at Michigan State University.

Student pre-test scores above 70 per cent were eliminated from the analysis. A score this high indicates considerable mastery of the material and would not add useful information to the statistical analysis. Many of the high scoring students had taken a year or more of private piano lessons.

Reading grade-equivalent scores, extracted from the May, 1972, Science Research Associates' measurement, were listed for each student who had taken the pre-test. The final preparation of the data cards included coded identification of the participants' school, grade level, treatment type, reading grade-equivalent scores, pre-test, post-test, and retention test scores.

Analysis

The Jeremy D. Finn (1970)[1] univariate and multivariate analysis of variance and covariance program was used for the statistical analysis in this experiment. The Finn program, developed for use at State University of New York at Buffalo, was modified for Michigan State

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[1]Jeremy Finn, "Multivariance," Version 4 (New York State University at Buffalo, Department of Educational Psychology, 1968), Mimeographed.

University CDC 3600 and 6500 computer systems by Dave Wright, Office of Research Consultation.

An analysis of covariance was used to assess the influence of the reading variable on the programed and control treatments. The main effect of the programed and control treatments, the effect of grade level on cognitive musical achievement, and the interaction effect of the treatments were tested for statistical significance.

The Development of the Text

The programed text, written especially for this study, was develped from a list of music fundamentals extracted from method books in common use in Flint (Michigan) Schools. The most widely used method book was the First Division Band Method written by Fred Weber.[1] Table 3.5 on page 69 lists the music fundamentals presented on the first nine pages of the First Division Band Method.

The music fundamentals listed in Table 3.5 were phrased as objectives for this study. The objectives are stated in Table 3.6 on pages 69 and 70 .

The purpose of the text was to present the music fundamentals to the students approximately as they were needed in class. The fundamentals presentations in each frame were phrased in the style found in the method books. No attempt was made to find a new system for counting rhythmic values or note naming.

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[1] Weber, loc. cit.

TABLE 3.5.--Music fundamentals presented within the first nine pages of the First Division Band Method.

staff	quarter rest
clef	quarter note
barline	repeat dots
measure	dotted half note
double bar	half note
whole note	half rest
$\frac{4}{4}$ meter signature	$\frac{3}{4}$ meter signature
whole note	$\frac{2}{4}$ meter signature
tie	counting rhythmic values in the presented meter signatures

The fingering and staff location of seven notes within each instrument's easiest octave are presented in the nine pages.

TABLE 3.6.--Objectives based on method book music fundamentals

1. The staff:

   Identify the staff by name.

   Describe the staff as having five lines and four spaces.

   Identify a note on the staff as being on a line or space and be able to state the number of the line or space on which the note is located.

   Identify a note as being on the first line or first space above or below the staff.

2. Note identification:

   Identify by labeling the first eight notes presented in the method book.

   State that the direction of the stem of a note (up or down) does not alter the time value or letter name of the note.

TABLE 3.6. (Continued)

3. Double bar:

   State that the double bar is found at the end of a piece. (The method book pages on which these objectives are based do not present other instances of the use of the double bar.)

   Identify the double bar by name.

4. Repeat sign:

   Identify the repeat sign by name.

   Give the function of the repeat sign as used in very simple and short pieces.

5. Barline and measure:

   Identify the barline by name.

   Identify the measure by name.

6. First and second endings:

   Identify by name first and second endings.

   Identify the ending to be played the initial time through a selection containing a first and second ending.

   Identify the ending to be played the repeat time through a selection containing a first and second ending.

7. The tie:

   Identify a tie by name.

   Give the time value of tied notes in simple time.

   State the necessary characteristic of tied notes.

8. Meter signatures:

   Identify a meter signature by name.

   State the function of the top number in the meter signature in $\frac{4}{4}$, $\frac{3}{4}$, and $\frac{2}{4}$.

   State the function of the bottom number in the meter signature in $\frac{4}{4}$, $\frac{3}{4}$, and $\frac{2}{4}$.

9. Time values:

   State the time values in simple time for a whole note, whole rest, dotted half note, half note, quarter note, and quarter rest.

   Identify the symbols for the above time values.

TABLE 3.6. (Continued)

Identify the above time values within a short piece in simple meter.
Identify the beat the above time values start on within a short musical sample.
Identify, within a short musical sample, the beat a quarter note or quarter rest is on, using the common counting system of starting with beat one in each measure and numbering each beat.

The objectives listed above formed the basis for frame construction in the programed text and item construction in the criteria test used in this study.

The creation of the text to be used in the first pilot study took almost a year. Throughout the development period, frame sequences were presented to area fourth graders for the purpose of checking on problems of communication and frame step size. The first pilot study was conducted during the summer of 1972. The Belwin First Division Band Method (cornet book) was used for the playing portion of the lesson. Magnus Organs were the instruments used because they presented a minimum of tone production problems and were easily portable. The students played out of the cornet book using the organ keyboard as if it were a melody line instrument. As the students became proficient in performing simple melodies, chord symbols were written above the melody lines so that chords could be played along with the melodies. Students were selected who did not have any musical background. The breakdown of grade

levels of participants in the pilot study was as follows: three third graders, four fourth graders, two fifth graders and one sixth grader. One junior high and one senior high musician aided in proctoring. The classes met for two 45-minute periods per day with an added playing and written assignment each evening. The class met for two and a half weeks.

Observations of fourth grade level learners during the development of the text for the pilot study prompted this writer to limit the number of pilot participants to ten or twelve so that close surveillance could be maintained during the pilot study. Open communications were fostered between the pilot participants, the proctors and the writer. Every effort was made to observe problems as they occurred and to experiment, at that moment, with different presentations. Hartley recognizes the necessity of such observations in the following statement: "Essentially, what the programmer needs to know is what each student did on each frame, why he did it, how long it took him, and what he feels about it."[1]

The following observations of the text were made subsequent to the first pilot study.

1. The text encompassed too much material for the intended population.

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[1]J. Hartley (ed.), Strategies for Programmed Instruction: An Educational Technology (London: Willmer Brothers Limited, Birkenhead, 1972), p. 150.

2. Gaps existed in the frame sequences.
3. Frames included too much material or material presented in a confusing manner.
4. The young students needed more than just answering a question to learn the material. They needed written exercises to establish the material to be learned.
5. Presentation of new material needed to be very explicit.

A student working in a programed text can easily progress considerably beyond his skill development in the understanding of fundamentals. This seemingly rapid cognitive progress, however, does not make for thorough learning. Gagné stated:

> What kind of decision can be made to support and encourage knowledge transfer? Primarily, the occurrence of transfer seems to be a matter of permitting the student to "think about" and "apply" the knowledge he has acquired."[1]

In the pilot study, an important conclusion was that the student must experience the use of his cognitive learning in order for that learning to be useful and meaningful.

The text was revised according to the findings of the pilot study. The following changes were made:

1. The amount of material presented was reduced.
2. Large step sequences were broken down into smaller steps.
3. Written work problems were included in many frames in order to give additional experience with the material presented in the frame.

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[1]Gagné, op. cit., p. 255.

4. The instructions in each frame were made as explicit as possible.

The second pilot study was conducted in late August and September 1972. The participants were eleven elementary beginning private lesson students in the Flint area. Seven of the elementary students were beginning the study of band instruments and the remaining four students were beginning private piano lessons. The instructors and parents involved in this study agreed to observe and record problems that arose while the student worked with the text. Two areas of frame presentations caused frequent misunderstanding and mistakes in the criteria frames and terminal items. Frame sequences introducing time signatures and first and second endings were revised as a result of this pilot study.

The text as finally developed was divided into four sections. Each section was designed to present the music fundamentals that would be necessary in class the following week. Each weekly assignment was estimated to take between one and two hours of total time for a fourth grader. Students were instructed to work in the text fifteen or twenty minutes a day. The text was supplied to each student free of charge. Three versions of the text were created to account for the differences in clefs and treble range instruments. The text each student used corresponded in clef and range with his

instrument. Appendix C on page 150 contains additional information on the programed text. The complete text is in Appendix C starting on page 155.

The programed text was developed by the writer under the guidance of Dr. Robert Sidnell, Dr. Paul Harder, Dr. Merrell Sherburn, and Dr. Dale Bartlett.

Test Construction

The purpose of the test in this experiment was to measure the achievement of an experimental and a control group in the learning of beginning instrumental music fundamentals. The desired outcome resulting from the learning of the music fundamentals was an increase in communication skills in the classroom setting. The construction of the test was criterion-referenced in the respect that the items were designed to measure the cognitive verbal material as it was presented in the learning process.

The same test was used for the pre-, post-, and retention measurements taken in connection with this experiment. Three necessary aspects of the test guided its development: (1) The test had to be short enough for most fourth graders to complete during their regular half-hour class session. (2) In order to minimize the effect of reading skill on test achievement, only the most essential vocabulary was used in the test. (3) The multiple choice format was used in the test to insure

an equal opportunity for achievement of both the control and experimental groups. The programed text used a linear format with composed answers. The students in the experimental groups may have gained skill in composing answers due to their interaction with the programed text. The multiple choice format, not used in the text, was employed in the test in order to minimize the potential effect of answer-composing skill. The complete test is contained in Appendix B, page 138.

Content Validity

Content validity in criterion-referenced tests is assured because items are derived only from material used in the learning situation. Concerning content validity, Nunnally stated:

> Even though there often are problems with ensuring content validity, inevitably content validity rests mainly on appeals to reason regarding the adequacy with which important content has been sampled and on the adequacy with which the content has been cast in the form of test items.[1]

The test for this study was developed from the objectives based on method book music fundamentals. The method book music fundamentals are listed in Table 3.5 on page 69. The objectives are listed on pages 69 and 70 .

The guiding principle in item construction was to minimize the possibility for misunderstanding of the

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[1]Jum C. Nunnally, Psychometric Theory (New York: McGraw-Hill Book Company, 1967), p. 82.

intent of a question and to maximize the discriminating power of the question. The vocabulary and phraseology use in the construction of each item of the test was taken from the method books. The style of symbol presentation in each item was constructed so as to appear as it would in the method book. Items dealing with the staff, counting and meter signatures were designed to approxmiate the procedures suggested by the method books. Content validity is dependent on the successful combination of the above stated factors. The content of the test is insured by the exclusive use of the material outlined. The remaining question of content validity is in the adequacy with which the content has been cast in the form of test items.

Construct Validity

The construct of this study could be termed "cognitive musical achievement." The test employed in this study was designed to measure a set of observables within the domain of the cognitive musical achievement construct. Ideally, a variety of related measures would aid in establishing the dimensions of the domain and the validity of any one specific measuring device. Nunnally stated:

> Because constructs concern domains of observables, logically a better measure of any construct would be obtained by combining the results from a number of measures of such observables than by taking any one of them individually. Since, however, the work is often tedious enough with one measure, let alone a handful, it sometimes is asking too much of the

> scientist to expect him to employ more than one measure in a particular investigation. Thus any particular measure can be thought of as having a degree of construct validity depending on the extent to which results obtained from using the measure would be much the same if some other measure, or hypothetically, all the measures in the domain had been employed in the experiment.[1]

Test Reliability

The test finally used in this study resulted from a series of developments designed to facilitate the measurement requirements of the study. The first test type experimented with at the beginning of the test development sequence was a combination multiple choice-matching test. The format of the combination form was confusing to the fouth grade level students and was rejected as a result. A multiple choice format test was then employed with some success but which proved to be too time-consuming and difficult for the intended population. Excessively difficult or confusing items were eliminated from the test. The vocabulary of each item was examined and words and phrases eliminated or simplified where possible. The test finally used in the study could be completed by the target population in the allotted time span.

The reliability of the test developed for this study was established by the Kuder Richardson Reliability formula

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[1] Ibid., p. 86.

#20. Several sample populations were measured and reliability coefficients determined. The sample population closest in age and training to the target population was a group of fifty-one students measured in September, 1972, at the beginning of their fifth grade. The students in the tested group had received approximately six months of instrumental music training. The reliability coefficient for the fifty-one students measured was r = .87 (KR #20). Several additional indices are useful in considering the effectiveness of the test. The indices of discrimination and difficulty will be included in this presentation.

The index of discrimination is the difference between 27 per cent of high achieving students who got an item right and 27 per cent of low achieving students who got the item right. This index is dependent upon the difficulty of an item. The index may reach a maximum value of 100 for an item with an index of difficulty of 50, when 100 per cent of the upper group and none of the lower group answer the item correctly. For items of less than or greater index of difficulty than 50, the index of discrimination has a maximum value of less than 100.

The index of difficulty is the proportion of the total group who got the item wrong. A high index indicates a difficult item and a low index indicates an easy item. For achievement tests, most test

constructors desire items with indices of difficulty from 20 to 80, with an average index of difficulty from 40 to 60.[1] Table 3.7 on page 81 gives the indices from the item analysis of the fifty-one student test sample stated above. Appendix B on page 134 contains a discussion of characteristics of the test. The complete test can be found on page 138. The sample test discussed in this section is the final stage of the test development process. The corresponding item analysis for the post-test of this study is in Appendix B, page 131 .

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[1] "Index of Difficulty and Discrimination Bulletin," Office of Evaluation Services, Michigan State University, East Lansing, Michigan, 1965.

TABLE 3.7.--Criterion Test Item Analysis, Pre-experiment Sample.

Item	Index of Difficulty	Index of Discrimination	Point Bi-serial Correlation	Item	Index of Difficulty	Index of Discrimination	Point Bi-serial Correlation
1	(sample item)						
2	22	31	.34	22	49	92	.67
3	71	47	.36	23	84	54	.59
4	78	15	.27	24	55	70	.49
5	55	54	.43	25	57	31	.32
6	33	62	.41	26	65	47	.51
7	37	31	.31	27	39	54	.39
8	73	46	.37	28	67	54	.36
9	59	46	.42	29	49	54	.47
10	27	16	.20	30	61	39	.30
11	63	69	.63	31	65	00	.00
12	53	46	.43	32	55	39	.46
13	59	54	.42	33	18	31	.32
14	39	46	.36	34	45	69	.59
15	49	16	-.03	35	51	46	.37
16	20	46	.47	36	61	46	.40
17	82	46	.52	37	47	70	.54
18	55	47	.30	38	53	70	.65
19	41	46	.37	39	59	47	.45
20	59	69	.50	40	71	54	.39
21	51	84	.57	41	63	54	.56

Kuder Richardson Reliability #20, .87
Mean Item Difficulty, 52
Mean Item Discrimination, 47

The test sample for the item analysis in this table was taken in September, 1972, and included fifty-one instrumental music students at the beginning of their fifth year in school. The students were at a six month level of music training.

CHAPTER IV

FINDINGS OF THE STUDY

Introduction

This research was concerned with establishing the effectiveness of a programed music fundamentals text designed to aid the acquisition of the cognitive elements necessary to facilitate communications in music instruction.

Participating in the study from October, 1972, through April, 1973, were two hundred and two Flint, Michigan, elementary students. Five elementary instrumental music instructors administered the tests and conducted the instructional portion of the study.

The analysis of the data was conducted under the advisement of the Research Consultation Services, Michigan State University. The Michigan State University Computer Center was utilized in the statistical procedures. Hypotheses were tested through an analysis of covariance technique.

Covariance

> One object of experimental design is to ensure that the results observed may be attributed within limits of error to the treatment variable and to no other causal circumstance. For example, the assignment of subjects are experimental procedures the purpose of which is to ensure freedom from bias. Situations arise, however, where one or more variables are uncontrolled, because of practical limitations

> associated with the conduct of the experiment. A statistical, rather than an experimental, method may be used to "control" or "adjust for" the effects of one or more uncontrolled variables, and permit, thereby, a valid evaluation of the outcome of the experiment. The analysis of covariance is such a method.[1]

The above description closely approximates the situation in which this experimental study has been conducted, hence analysis of covariance was used. The following variables have been controlled in the experimental procedure:

1. Teacher: Both experimental and control groups had the same teacher.
2. Grade level: Experimental and control groups had the same number at each grade level.
3. Socio-economic status: Experimental and control groups were selected in which estimates of socio-economic status were similar.
4. Size of schools: Experimental and control schools were selected that compared in size and instructional program.

Two additional variables were considered to have a potentially important influence on the learning of the experimental and control groups. Previous musical training would probably have an effect on the learning potential of the two groups in the study. To account

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[1]George A. Ferguson, Statistical Analysis in Psychology and Education (New York: McGraw-Hill Book Company, 1959), p. 288.

for previous musical training, the experimental and control groups were given a pre-test. The experimental group used a programed text which required that the student possess reading skill. Differences in reading skill of the experimental and control groups could be a potential explanation for differences in their accomplishment in learning the music fundamentals in this study. There was no way possible to assign the experimental and control groups on the basis of reading skill. The reading variable and the previous-musical-training variable could not be controlled within the sampling procedure and therefore were controlled or adjusted for statistically within the analysis of covariance technique. Ferguson stated, "In psychology and education primary interest in the analysis of covariance rests in its use as a procedure for the statistical control of uncontrolled variables."[1] Downie and Heath explained the covariance procedure in the following statement:

> In effect, analysis of covariance adjusts the means for the effect of the uncontrolled variables and makes the necessary modification in sampling error. The corrected sampling error is then used to test for the significance of differences among adjusted means.[2]

Uncontrolled variables in the analysis of covariance

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[1] Ibid., p. 289.

[2] N. M. Downie and R. W. Heath, Basic Statistical Methods (New York: Harper and Row, Publishers, 1959), p. 142.

are termed covariates or concomitant variables. The uncontrolled variables in this study were called "covariates." The pre-test was administered to take into account the previous musical training the students had received. The pre-test results were treated as a covariate because they represented a variable which could not be controlled in the pre-experimental sample. The reading scores likewise were treated as a covariate.

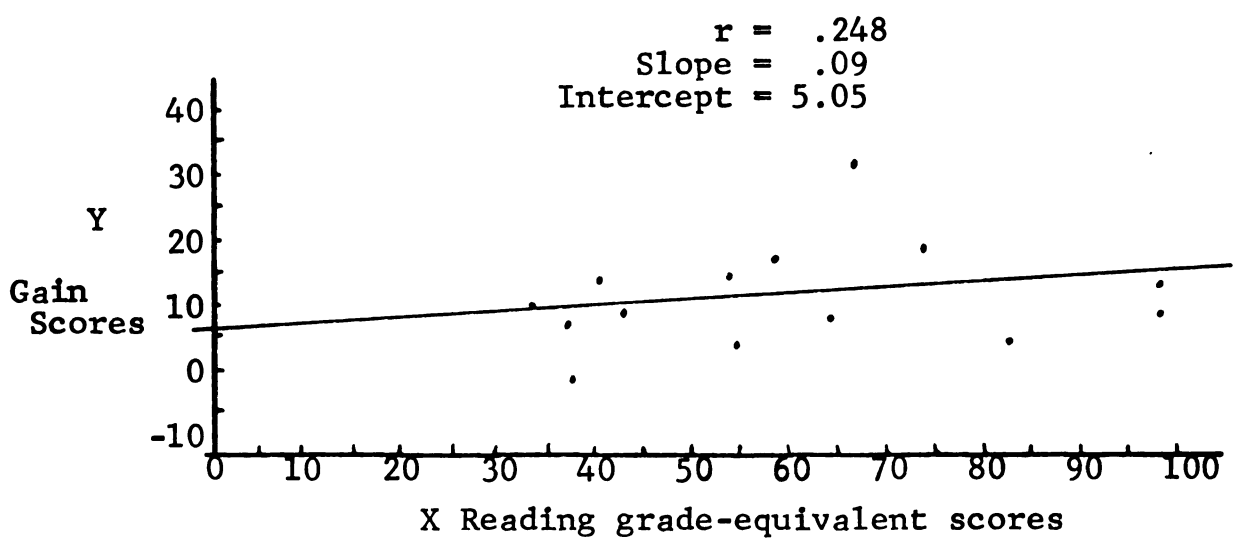
The requirement for the use of analysis of covariance is that there be no significant difference in effect of each covariate on the two treatments. The pre-test covariate was assumed to satisfy the requirement because the pre-test was given before the experimental and control treatments started. No important differential effects were expected. Table 4.9 on page 95 gives the comparison of the experimental and control groups on the pre-test means. The results show little difference in the corresponding groups. The reading covariate could possibly have a differential effect on the treatment types because of the reading skill necessary for the use of the programed texts. If the reading variable were found to have a significant effect on either the experimental or control treatments, this result would be the important finding in the study. There would be little value in testing for significant treatment differences if a significant difference had already been determined in relation to the reading variable. The following statistical

procedure will examine the relationship of the reading variable and the achievement of the experimental and control groups.

Regression Line Slope Analysis

"Regression is defined as the prediction of unknown values of one variable from known values of another variable."[1] Any set of paired observations may be plotted on graph paper to form a scatter diagram. Table 4.1 on page 86, is a scatter diagram of the sixth grade experimental group in this study. The vertical (Y) is used to plot the gain scores (post-test minus pre-test). The horizontal (X) is used to plot the reading grade-equivalent scores.

TABLE 4.1.--Sixth grade experimental group scatter diagram.



[1]Curtis D. Hardyck and Lewis Petrinovich, Introduction to Statistics for the Behavioral Sciences (London: W. B. Saunders Company, 1969), p. 189.

A straight line (linear regression line) has been fitted to the data. This line provides an average statement about the change in one variable with change in the other. The best prediction of an individual gain score from a knowledge of a grade equivalent score would be a corresponding point on the regression line vertical to the grade-equivalent score. The effect of the reading variable is summarized by the linear regression. A significantly different slope of the line would indicate a change in the effect of the reading variable. The near horizontal slope of the regression line fitted to the sixth grade experimental scatter diagram indicates no significant reading variable effect on the gain score.

A straight line cannot be fitted to all types of data but the characteristics of the present data are generally considered appropriate for linear regression. Ferguson states: "In practice, for many of the variables used in psychology and education, the assumption of linearity of regression is in most instances reasonably well satisfied."[1]

Determining the effect of the reading variable on the gain scores at each grade level was accomplished by statistically computing the best fit straight line for each set of data rather than plotting the paired scores as was done in the sixth grade experimental group. The

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[1]Ferguson, op. cit., p. 118.

procedure is called analysis of variance for overall regression and tests for a significant difference of the regression line slope with the horizontal. The significant difference of the regression line slope with the horizontal, however, is not the important information needed in the present discussion. The important information yielded was the regression line intercept and per unit slope values for the experimental and control groups at each grade level. Table 4.2. indicates the intercepts and slopes for all groups.

TABLE 4.2.--Intercepts and slopes for experimental and control groups.

	Experimental	Control	
4th grade	4.116	-1.899	Intercept
	.075	.215	Slope
5th grade	3.494	1.375	Intercept
	.137	.084	Slope
6th grade	5.117	-7.848	Intercept
	.089	.254	Slope

The intercept determines the point at which the regression line intercepts Y.

The slope indicates the per unit slope of the regression line on X.

The tables on pages 89 and 90 show the computed regression lines for the experimental and control groups at each grade level. The correlation coefficient (r) indicates

the correlation of the reading grade equivalent scores and gain scores.

An important question posed in Chapter I was as follows: "Is there a statistically significant relationship between programed cognitive achievement in beginning instrumental music and verbal reading level?" The correlations (gain scores and reading) of the experimental groups were not significant at the .05 level of confidence, hence no statistically significant relationship exists.

The slopes of the regression lines at the fourth and sixth grade levels indicate that experimental treatment students with lower reading scores achieved almost as well as students with higher reading scores.

TABLE 4.3.--Fourth grade experimental and control regression line diagram.

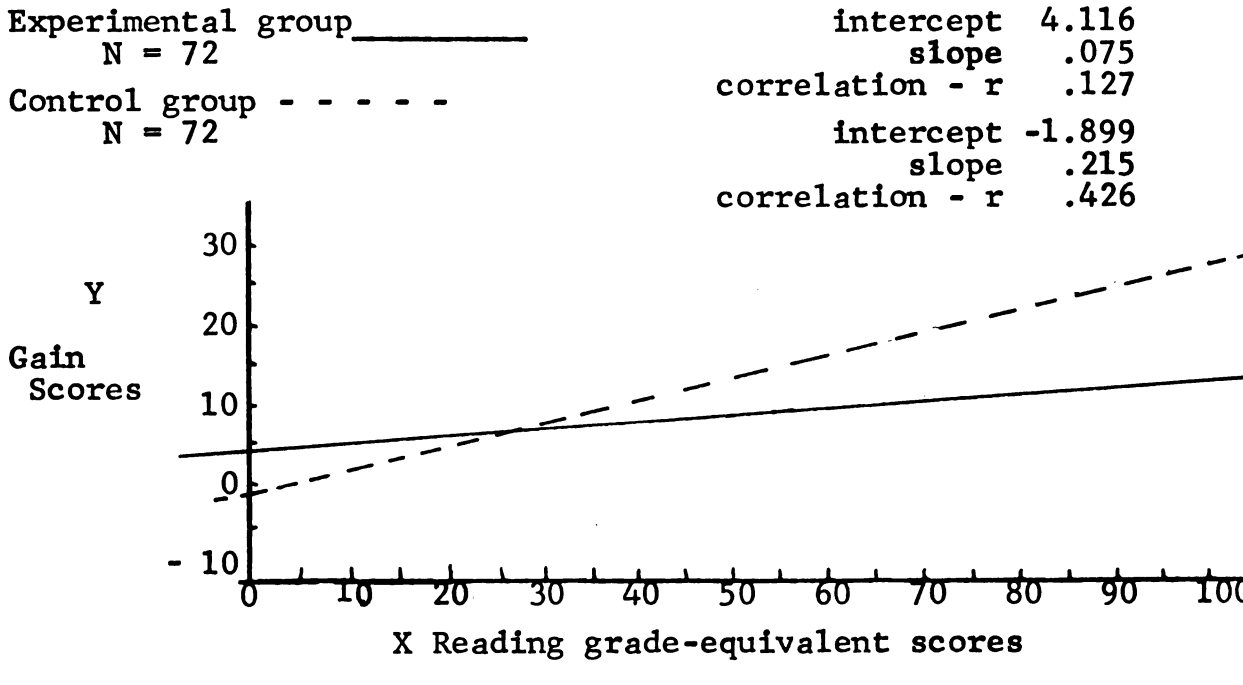


TABLE 4.4.--Fifth grade experimental and control regression line diagram.

Experimental group _____
N = 16
Control group - - - - - - -

intercept	3.494
slope	.137
correlation - r	.219
intercept	1.375
slope	.084
correlation - r	.133

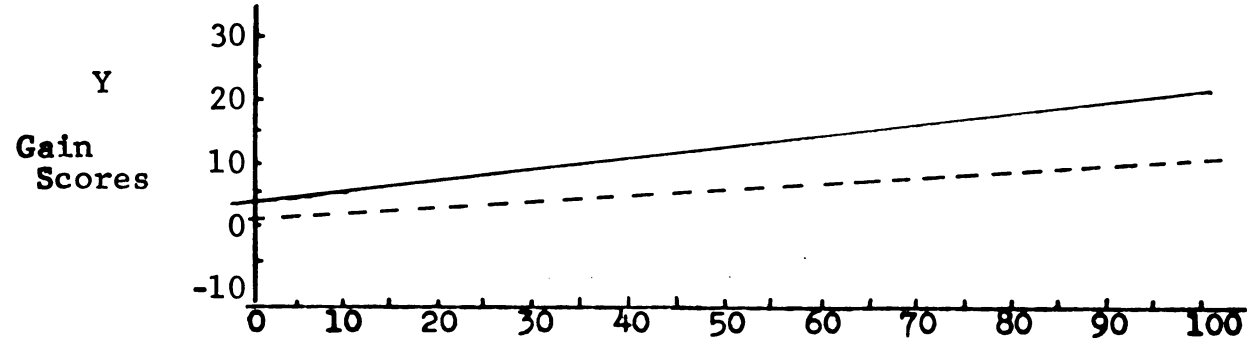
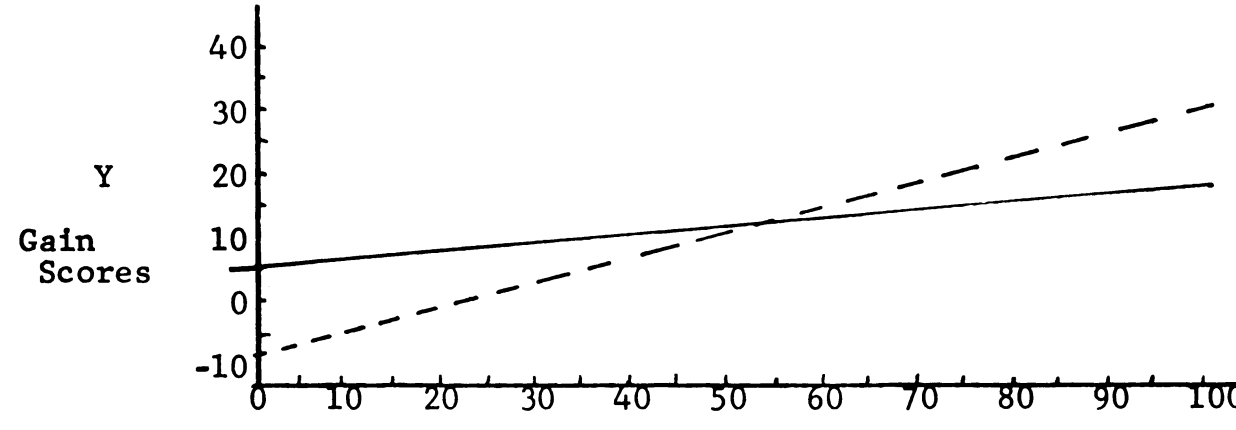


TABLE 4.5.--Sixth grade experimental and control regression line diagram.

Experimental _____
N = 13
Control - - - - - - - -
N = 13

intercept	5.117
slope	.089
correlation - r	.242
intercept	-7.848
slope	.254
correlation - r	.579



The fifth grade regression line slopes indicate that the reading variable had a similar effect on the gain scores of both treatment groups. The slopes of the regression lines, in general, do not have a large vertical direction indicating that the reading variable had only minimal effect on the gain score. The correlation for combined groups (N = 202) in the study was .284 which, although a small correlation, is significant at the .01 level of confidence.

The purpose of the previous procedure was to determine the regression lines for all groups in the experiment using the reading grade equivalent scores and gain scores. The use of the reading variable as a covariate was dependent upon its not having a significantly different effect on corresponding experimental and control groups at each grade level. The following statistical procedure was employed to determine if the slopes of the regression lines at each grade level were significantly different. The testing of the hypothesis below was only a preparatory procedure necessary for the use of analysis of covariance.

H_o = There is no significant difference (.05) in the slopes of the regression lines of the experimental and control groups at the fourth grade level. (The same hypothesis was tested at the fifth and sixth grade levels.)

The obtained F values at each grade level indicated an acceptance of the null hypothesis. There is no significant difference in the regression line slopes at the three grade levels. A significant difference in the regression line slopes of the experimental and

control groups would have indicated that the reading variable had a different effect on each treatment. Such an outcome would have constituted an important finding in the study. Analysis of covariance would have been inappropriate with an inequality of effect of the reading covariate on the two treatments.

Tables 4.6, 4.7 and 4.8 contain the results of the regression line slope analysis at each grade level.

TABLE 4.6.--Regression line slope analysis of variance for grade four.

Source	SS	df	MS	F
Between groups	115	1	115	2.453
Within groups	6609	141	46.87	
Totals	6724	142		

The critical F value for 1 and 141 degrees of freedom at the .05 level of significance is 3.92. The hypothesis of no difference in regression line slopes at the fourth grade level is accepted.

TABLE 4.7.--Regression line slope analysis of variance for grade five.

Source	SS	df	MS	F
Between groups	62.36	1	62.36	1.01
Within groups	1781.36	29	61.43	
Totals	1843.72	30		

The critical F value for 1 and 29 degrees of freedom at the .05 level of significance is 4.28. The hypothesis of no difference in regression line slopes at the fifth grade level is accepted.

TABLE 4.8.--Regression line slope analysis of variance for grade six.

Source	SS	df	MS	F
Between groups	8	1	8	.188
Within groups	977	23	42.4	
Totals	985	24		

The critical F value for 1 and 23 degrees of freedom at the .05 level of significance is 4.28. The hypothesis of no difference in regression line slopes at the sixth grade level is accepted.

The previous two statistical procedures have determined that the reading variable did not have a differential effect on the experimental and control treatments. The slopes of the regression lines of corresponding groups were not significantly different. The reading variable satisfies the requirement for its use as a covariate in the analysis of covariance.

Table 4.9 on page 95 gives the cell means and standard deviations of the variables associated with this study.

Analysis of Covariance

The procedure in the analysis of covariance is to determine the extent of the influence of the covariates

(reading and pre-test) on the dependent variable (post-test) before assessing the effect of the independent variables (treatment and grade levels). The method employed adjusts the post-test means of the two groups for the effect of the covariates and makes the necessary modifications in sampling error. The corrected sampling error is then used to test for the significance of differences among adjusted means. The adjustments made in analysis of covariance are based on the application of regression analysis to the data. The regression analysis determines the portion of the post-test scores predicted by the two covariates and subtracts the predicted portion from the post-test scores. The following regression analysis indicates the extent of the influence of the covariates.

The null hypothesis of the procedure was as follows:

H_o = There is no multiple correlation between pre-test scores, reading grade-equivalent scores and post-test scores.

The importance of this hypothesis is that a significant multiple correlation must exist in order to necessitate the adjustment of the post-test means for reading and pre-test sampling error. If the hypothesis of no multiple correlation were accepted, a straight analysis of variance would be sufficient to establish results.

TABLE 4.9.--Means of cells of the dependent variable and two covariates.

Grade Level	4th	4th	5th	5th	6th	6th
N	72	72	16	16	13	13
Treatment	X	C	X	C	X	C
Covariates						
1. Reading means	42.99	42.54	47.00	42.31	62.00	55.00
SD	11.91	14.20	14.38	11.37	22.01	15.66
Variance	141.85	201.64	206.78	129.28	484.44	245.24
2. Pre-test means	9.99	9.08	11.38	10.44	13.15	14.92
SD	6.82	6.22	6.89	6.69	7.56	6.57
Variance	46.47	38.74	47.48	44.75	57.21	43.15
Dependent Variable						
Post-test means	17.34	16.33	21.31	15.38	23.85	21.08
SD	8.34	7.49	8.91	7.10	10.79	6.82
Variance	69.56	56.10	79.39	50.41	116.42	46.50

N = Number of participants in each group

X = Experimental treatment group

C = Control treatment group

SD = Standard Deviation

Reading mean = The reading mean was derived from grade equivalent scores listed for each group.

TABLE 4.10.--Regression analysis with two covariates, reading and pre-test.

Variable	Square Multiple Regression	Multiple Regression	F	
Post-test	.38	.62	59.78	P < .000

The hypothesis was rejected. The probability value .000 indicates that there is little chance that reading and pre-test scores are not correlated with post-test scores. The multiple regression value .62 is the correlation between the actual value of the post-test scores and the predicted value of the post-test scores based on the reading and pre-test regression lines. If reading and pre-test scores were not factors in the prediction of the post-test scores, the correlation would have been negligible and the hypothesis of no multiple correlation accepted. The square multiple regression value .38 indicates that roughly 38 per cent of the variance of the post-test scores is explained by the variation of the pre-test and reading scores. Previous investigation of the effect of the reading variable indicated a minor influence on the post-test scores. The larger portion of the square multiple regression value .38 must be attributed to the pre-test covariate.

The regression analysis made the adjustment in the post-test means accounting for the influence of the pre-test and reading covariates. The following hypotheses

testing procedure utilized values adjusted in the regression analysis.

Hypotheses Testing

The statistical procedures employed up to this point were preparatory for the final testing of the hypotheses stated for this study. The .05 level of confidence was selected for the testing of the following main hypotheses.

Hypothesis I:

There is no significant difference in cognitive achievement as a result of treatment of beginning instrumental music students grades four through six.

The obtained F value indicates that the hypothesis is accepted. The F value has a chance occurrence of up to 14 per cent, which is not significant. There is no significant difference in the effect of the treatments on cognitive musical achievement of beginning instrumental music students grades four through six.

TABLE 4.11.--Treatment effects, analysis of variance on adjusted post-test means.

Source	df	MS	F	
Between groups	1	89.62	2.196	P < .14
Within groups	194	40.82		
Total	195			

The first step in testing for treatment differences was to pool the effects of each treatment across the three

grade levels. The pooled effects for the experimental and control groups were then examined for a significant difference.

Hypothesis II:

There is no significant interaction of treatment and grade level in cognitive achievement of beginning instrumental music students, grades four through six.

The obtained F value has a chance occurrence of up to 24 per cent. The hypothesis of no grade level interaction was accepted.

TABLE 4.12.--Grade level interaction analysis of variance on adjusted post-test means.

Source	df	MS	F	
Between groups	2	58.77	1.44	P < .24
Within groups	194	40.82		
Total	196			

Interaction in the above hypothesis was concerned with determining the differential effects of the adjunct programed text on the three grade levels.

Hypothesis III:

There is no significant difference in cognitive achievement as a result of grade level of beginning instrumental music students, grades four through six.

The obtained F value indicates that the hypothesis is accepted. The F value has a chance occurrence of up to 95 per cent. There is no significant grade level effect on cognitive achievement of the experimental and control groups.

TABLE 4.13.--Grade level effects, analysis of variance on adjusted post-test means.

Source	df	MS	F	
Between groups	2	2.016	.049	P < .95
Within groups	194	40.82		
Total	196			

The procedure for testing Hypothesis III was to average the adjusted means of the experimental and control groups at each grade level and then compare the grade level averages for significant difference.

Retention Test

A retention test of the experimental and control groups was given in April, 1973, four to five months after the post-test. The same test of music fundamentals was used as in the pre- and post-testings. The purpose of the retention test was to determine if there were any differences in the residual effects of the treatments.

Four pairs of schools participated in the retention test. The other pair had concerts or other activities which precluded their participation. Absenteeism and mortality caused an imbalance in the numbers of participants at the fifth and sixth grade levels which prompted the writer to combine the data from those grade levels into one combined level. In the statistical analysis of the retention test results, two grade levels were considered

instead of three. The experimental and control groups at the fourth grade level had forty-three participants and the combined fifth and sixth grade level had twenty-two participants. The justification for combining the fifth and sixth grade groups into one level is in the post-test results which indicated no effects due to grade level. The cell means for the variables are given in Table 4.14 on page 101.

The retention test analysis used the same Finn program as the post-test analysis except that the retention scores were considered the dependent variable. The outline of variables is as follows:

Dependent variable, retention test scores

Covariates, (1) reading grade-equivalent scores
(2) pre-test scores

Independent variables,

(1) treatments
(2) fourth grade level
(3) fifth and sixth grade levels

Analysis of Covariance: Retention Test

The initial procedure in the covariance analysis is to determine the extent of the influence of the covariates and to adjust the means of the samples. The estimation of the influence of the covariates is based on the application of regression analysis to the data. The null hypothesis of the regression analysis was:

H_o = There is no multiple correlation between pre-test scores, reading grade-equivalent scores, and post-test scores.

TABLE 4.14.--Means of cells of the dependent variable and two covariates for the retention test.

Independent Variables		Covariates		Dependent Variable
Grade Level	Treatment	Reading G-E* Means	Pre-test Means	Retention Test Means
4th Grade N = 43	Experimental	44.07	11.28	22.44
4th Grade N = 43	Control	42.72	10.06	22.18
5th and 6th N = 22	Experimental	54.41	13.36	25.41
5th and 6th N = 22	Control	42.81	12.50	19.86

*G-E, Grade-equivalent

The null hypothesis was rejected. A multiple correlation was determined between the two covariates and the dependent variable.

TABLE 4.15.--Regression analysis with two covariates, reading and pre-test, retention test.

Dependent Variable	Square Multiple Regression	Multiple Regression	F	
Retention Test	.30	.55	27.17	P < .00

The multiple regression value .55 gives the correlation between the actual value of the retention test scores and the predicted value of the retention test scores based on the reading and pre-test regression lines. The squared multiple regression value .30 indicates that 30 per cent of the variance of the retention test scores is explained by the variation of the pre-test and reading scores.

The portion of the retention scores predicted by the covariates through the regression analysis has been subtracted from the group means in the following analysis. The values are adjusted.

Hypothesis I:

There is no significant difference in cognitive achievement as a result of treatment of beginning instrumental music students.

The obtained F value indicates that the hypothesis is accepted. The probability of the F value occurring is

less than .56. No significant differences in cognitive achievement as a result of treatment were found.

TABLE 4.16.--Treatment effects, analysis of variance on adjusted retention test means.

Source	df	MS	F	
Between groups	1	14.05	.335	P < .56
Within groups	124	41.94		
Total	125			

Hypothesis II:

There is no significant interaction of treatment and grade level in cognitive achievement of beginning instrumental music students.

The obtained F value indicates that the hypothesis is accepted. The probability of the F value occurring is less than .22. No significant treatment by grade level interaction in cognitive achievement was found.

TABLE 4.17.--Grade level interaction analysis of variance on adjusted retention test means.

Source	df	MS	F	
Between groups	1	64.59	1.54	P < .217
Within groups	124	41.94		
Total	125			

Hypothesis III:

There is no significant difference in cognitive achievement as a result of grade level of beginning instrumental students.

TABLE 4.18.--Grade level effects, analysis of variance on adjusted retention test means.

Source	df	MS	F	
Between groups	1	58.12	1.39	P < .24
Within groups	124	41.94		
Total	125			

The outcomes of the retention test analysis reveal no significant changes from the post-test results. No residual effects were found that favored either treatment. Table 4.19 gives the post-test retention test gain.

TABLE 4.19.--Post-test retention test gain in mean scores.

Grade	Treatment	Post-test Means	Retention test Means	Gain
4th grade	Experimental	18.58	22.44	3.86
4th grade	Control	17.42	22.18	4.76
5th and 6th	Experimental	24.09	25.41	1.32
5th and 6th	Control	17.27	19.86	2.59

The post-test means for table 4.19 were recomputed to allow for changes in the sample population of the retention test.

The three or four months of additional study after the post-test did not result in large gains. Part of the explanation for the lack of cognitive achievement during this period is that the instrumental music students were preparing for their first concert to be given in the spring. Emphasis in the class sessions was on performance.

CHAPTER V

SUMMARY AND CONCLUSIONS

Purpose

This research was concerned with establishing the effectiveness of a programed music fundamentals text designed to aid the acquisition of the cognitive elements necessary to facilitate verbal communication in music. The text was used as a home-study adjunct for beginning fourth, fifth, and sixth grade instrumental music students.

Outline of the Study

Five pairs of elementary school instrumental music programs in the Flint School System were selected for this study. Each met the following criteria: (1) Each school of the pair must be similar in socio-economic background. (2) The size of each pair of schools must be roughly equivalent. (3) Each pair of schools must have the same instructor and equal number of class sessions each week. The schools were assigned as control or experimental in a stratified random manner. There were one hundred and one subjects in each group. A pre-test was given each group prior to a five-week period in which the experimental

group students had homework assignments from an adjunct programed music fundamentals text while the control group students proceeded in the usual manner of short presentations of music fundamentals in class and study assignments from a method book. Class work, including method books, was the same for both groups except that the experimental groups were to receive no presentations of the music fundamentals. At the close of the five-week period a post-test was administered using the same music fundamentals test. The time period of the study ended with the post-test, however a retention test was administered three months after the post-test using the same measuring instrument. Reading grade equivalent scores (Science Research Associates Series) were listed for each student in the study. All the data were put on computer cards and an analysis of covariance employed to test for significant differences between groups.

Conclusions

The public school setting for this study is common to many Michigan schools. The conditions associated with the study could easily be approximated in many elementary school situations. The results of the study are of importance because of the relationship of the study to school music as it actually exists. The conclusions of this study are therefore offered as an addition to that body of knowledge that is concerned with the development of efficient music learning in elementary children.

Hypotheses

This study tested three hypotheses which were phrased in null form for statistical convenience. Regression analysis preceded the hypotheses testing in the statistical procedure. The results of the regression analysis are presented first to maintain the statistical sequence.

Regression Analysis

The regression analysis revealed that an estimated 38 per cent of the variance in the post-test scores was attributed to the reading and pre-test (previous musical training) variables. The grade level regression line slope analysis indicated that reading had a lesser influence on cognitive achievement than previous musical training. The correlation between the reading variable and the gain score for combined experimental and control groups was .28. Other variables accounted for the major portion of post-test achievement.

Hypothesis I:

There is no significant difference in cognitive achievement as a result of treatment of beginning instrumental music students grades four through six. The hypothesis was accepted.

Hypothesis II:

There is no significant interaction of treatment and grade level in cognitive achievement of beginning

instrumental music students, grades four through six. The hypothesis was accepted.

Hypothesis III:

There is no significant difference in cognitive achievement as a result of grade level of beginning instrumental music students, grades four through six. The hypothesis was accepted.

Summary of Conclusions

1. The results of the programed and conventional treatments at the fourth grade level were nearly equal. The use of the texts in the fifth and sixth grades resulted in greater gains than the conventional method but the difference in gains was not statistically significant.
2. Music fundamentals achievement at the three grade levels, fourth, fifth, and sixth, was not significantly different.
3. No grade level interaction effects were detected as a result of the programed or conventional treatments.
4. Previous musical training, determined by the pre-test, and reading skill accounted for approximately 38 per cent of the variance in cognitive achievement in this study. Reading skill was found to have less effect on cognitive achievement than previous musical training.

Discussion

The treatment groups using the programed text in this study failed to show a significant improvement in

music fundamentals achievement over the control groups using conventional procedures. The factors contributing to these results are of critical interest to this study and to elementary instrumental music education in general.

The first consideration is the manner in which the students used the text. Three of the participating teachers reported that only two or three of their students failed to finish the text. The two teachers from the larger elementary schools reported five and nine students failing to complete the text. Teaching instructions for the experimental groups stated that class was to be conducted under the assumption that the students knew the necessary cognitive information for beginning music reading. Three teachers reported that no serious difficulties were encountered with this approach. The two remaining teachers indicated that some students occasionally did not complete the text assignments and were not prepared for classroom communications on the music fundamentals. During the five-week experimental period these students missed the presentations of music fundamentals if they did not do their text assignments.

A sample of thirty-five texts were examined at the end of the study to determine the kinds of problems students had with the texts. Most of the texts contained some degree of erasing which indicated that the students responded to the questions before checking the answer on the following page. There were a few instances in almost every book

where work problems were not completed even though the corresponding question was answered. The students either overlooked the work problem or did not consider it necessary to the understanding of the material. Most wrong responses to questions were corrected in each book but the incorrectly finished work problems were occasionally left with errors. In many of the reviewed texts a page was occasionally skipped without causing interference with the student's progress in the text. A few texts of the sample were obviously completed by students with little understanding of the material. The responses of these few students were incorrect and no organized manner of correcting the responses was evident. The evidence indicates that the students, in general, worked through the text in approximately the prescribed manner. Student misuse of the text, therefore, is not considered a major factor in the explanation of the achievement results of the experimental group.

Another possible factor relating to the outcome of this study was the effectivenss of the test used to measure achievement. A test too easy or too difficult would have a tendency to obscure the difference in achievement of the experimental and control groups. The post-test difficulty index of the text used in the study was .55. This index is well within the fifty to sixty recommended range

for difficulty.[1] The test as a data gathering instrument, therefore, cannot be considered as the explanation for the lack of significant difference in the achievement of the experimental and control groups. Additional test information can be found in Appendix B, page 131.

Reading skill, examined in the study, had only a minor influence on the post-test results. The pilot studies indicated that the students could comprehend the meaning of the material presented in each frame well enough to answer the questions and work out the problems. The concentrated sessions and the sample of the pilot studies were factors in the success of the text in those studies. The newness of the abstract terms and symbols, characteristic of music fundamentals, however, seems to demand more than a book presentation in actual practice. Reading skill does not appear to be the specific problem but, rather, it is related to the necessity of creating experience with which to cement the verbal cognitive facts into the student's useful repertoire. This conclusion is supported by the regression analysis in the study which determined that previous musical training had a much greater effect on the gain scores than the reading variable. Pages 89 and 90 contain the regression line diagrams for reading

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[1] "Item Analysis, Prepared by the Office of Evaluation Services," Michigan State University, East Lansing, Michigan, 1965, p. 4.

and gain scores. Reading skill cannot be considered as an important factor influencing achievement in this study.

The reasons for the achievement levels of experimental and control groups may be found in the more basic questions of why the students, in general, did not learn more completely the terms and symbols seemingly essential to successful classroom communications.

A review was made of the most difficult and the easiest questions as indicated by the post-test item analysis. Some of the item difficulty indices are inconsistent and inexplicable. Items which appear to draw from the same level of understanding have varying difficulty indices. In general, however, the items with the lowest difficulty indices are associated with the most basic playing and music reading skills. The students, in general, learned the music fundamentals associated with the operation of the instrument in the musical setting at the level of their playing ability. This result could be interpreted two ways. The experimental group text presentations and the control group classroom presentations had approximately the same effect on cognitive achievement. The other possibility was that neither the text nor the classroom presentations had much effect on cognitive achievement. Evidence seems to indicate that cognitive achievement was integrated within the experience of manipulating the instrument in a musical setting. The students learned the location of notes on the staff because of the

necessity of that knowledge in playing a song or exercise. The attempts of the experimental and conventional treatments to advance this knowledge through written or lecture presentations appear to have had, at best, a minor effect.

The experimental approach to cognitive achievement in this study, on the basis of the results, did not prove to be more effective than the conventional method. Neither approach was successful in raising the test achievement mean to a level much beyond 50%. A comparison of the means is contained in Table 4.9 on page 95. Several possible causes for the lack of a higher level of achievement of the two groups can be recognized. A student who decides to study an instrument is primarily interested in the manipulation and sound of the instrument. Learning about the fundamentals of music, at least to some students, is of much less interest than the actual playing of the instrument. Some students may not be convinced of the usefulness of the music reading process and thus give little attention to this aspect of their instruction. Another possible explanation for the achievement level is the length of time of the experimental period. Five weeks in an elementary student's schooling is perhaps too short a period of time for the new musical terms and symbols to become a part of the student's thought processes and vocabulary. Considering the situation of the study and the background of the students, the achievement level may have been as high as could be expected.

The final factor considered to be limiting achievement is concerned with the student's lack of ability to grasp and retain the names and meaning of the terms and symbols constituting music fundamentals. The conventional method classroom presentations and the experimental method programed text contained the same material to be learned. In both methods the students were to learn terms and symbols for which they had little corresponding musical experience. The music fundamentals were not learned thoroughly and remembered because of this lack of musical experience to relate to the music fundamentals learning. The students learned most efficiently those aspects of music fundamentals closely related to their immediate performing experiences. Improvements in music fundamentals learning and in communication skills appear to be sought most advantageously within these active musical experiences.

The three recognized factors which have been considered as possible influencing achievement were: (1) lack of student interest in music fundamentals learning, (2) length of the experimental period, and (3) insufficient musical experiences for the student. These factors appear to have affected the experimental and conventional treatments in an equal manner.

In the review of the literature, Chapter II of this study, six research papers were examined in which fourth and fifth grade students worked from written programed texts or materials. The six studies are as follows:

(1) Pikaart, arithmetic, page 41, (2) Grell, spelling, page 42, (3) Plotkin, spelling, page 43, (4) Gleason, science, page 43, (5) Rives, music, page 50, (6) Drushler, music, page 51. The similar characteristic of each of these six studies was that the cognitive material to be learned was contained in the programed presentations. The authors of these research papers commend various aspects of programed instruction but the results of these studies indicated that the groups using the programed materials did not have significantly improved achievement over the conventional groups. The present study is similar in approach and results to the six research studies discussed.

Three studies were also reviewed in which programed materials were used to guide the activities of fourth, fifth, and sixth grade level students. In Puopolo's study (page 48) programed materials guided students in their individual music practice. Dutton (page 44) used programed materials to guide fourth grade science students through simple experiments. Mandle (page 47) employed dictated programed materials at the keyboard to facilitate cognitive achievement. In each of these experiments the programed materials were used to guide and to organize the students in the actual manipulation of the materials associated with the desired learning goals. Each of these three studies reported a significant gain through the use of the programed materials.

The nine studies reviewed plus the results of the present study point to the conclusion that students at age nine through eleven, in general, are not able to use the programed text approach more effectively than a conventional approach. Experience seems to be the vital factor in successful learning.

The assumption of this study stated in Chapter I, page 10, is as follows: "Fourth, fifth, and sixth grade students can use advantageously a programed text as an adjunct to elementary instrumental music study." The students using the programed text achieved at the same level as the students using the conventional approach. There was no advantage in using the programed text, thus the assumption must be considered false. Evidence from the study suggests that achievement was more closely related to the active musical experiences in which all students participated than to either approach employed.

Suggestions for Future Research

1. The results of this study suggest an experiment which would provide an ample opportunity for the development of music performance experiences prior to the introduction of music reading. The experiment could include fourth or fifth graders and span one and one-half years of music training. A control group would function in the usual manner as described in the present study. The experimental group would spend the entire first year of study in a program that developed musical performance through aural

techniques. During the first half of the second year the experimental group would begin the development of music reading through the usual method book approach aided by classroom music fundamentals presentations and programed materials for home study. At the end of the one and one-half year period the control group would have had about one and one-quarter years experience in performing and reading music. The experimental group would have had equal performing experience but only the one-half year of music reading experience. The testing procedures terminating the study could examine student attitudes towards instrumental study, performance and music reading achievement, and knowledge of music fundamentals. The possibility exists that elementary instrumental music teachers focus on music reading before the student is ready to absorb efficiently the necessary information required in the music reading process. A beginning instrumental music program which emphasized an aural approach to performance might have some musical by-products that are beneficial in the development of the student's pleasure and success in music. A student who initially learns to play an instrument through the aural approach may develop a more acute sense of pitch and a better awareness of musical phrasing than the student who begins instrumental study through the note reading process. The outcomes of the performance and music reading achievement would be of particular interest in this suggested study.

2. A promising use of programed instruction in elementary school music, as revealed by the review of literature, is in the area of organizing and guiding the performing activities of young students. The several studies of this type which were reviewed reported successful results. This particular use of programed instruction needs to be more fully examined in research studies.

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APPENDICES

APPENDIX A

RAW DATA

APPENDIX A

Fourth Grade Control Group Raw Data.

Subject #	Reading	Pre-test	Post-test	Gain Score	Subject #	Reading	Pre-test	Post-test	Gain Score
1	32	8	23	15	37	44	10	21	11
2	55	10	14	4	38	40	12	11	- 1
3	56	0	4	4	39	43	10	15	5
4	73	5	24	19	40	41	6	23	17
5	56	1	13	12	41	42	3	9	6
6	49	6	14	8	42	43	1	13	12
7	51	10	12	2	43	43	2	19	17
8	51	6	12	6	44	45	0	15	15
9	51	21	26	5	45	45	8	19	11
10	49	13	22	9	46	45	7	12	5
11	47	20	14	- 6	47	45	6	11	5
12	55	24	29	0	48	43	10	30	20
13	60	18	28	10	49	39	19	28	9
14	55	18	22	4	50	39	8	18	10
15	62	15	26	11	51	16	9	6	- 3
16	55	7	14	7	52	25	15	11	- 4
17	52	7	12	5	53	37	12	10	- 2
18	67	2	13	11	54	19	7	11	4
19	52	0	11	11	55	19	15	11	- 4
20	56	2	34	32	56	34	22	24	2
21	65	3	23	20	57	29	5	17	12
22	65	4	23	19	58	19	5	9	4
23	53	3	4	1	59	31	4	14	10
24	80	16	23	8	60	31	6	17	11
25	65	6	20	14	61	37	19	22	3
26	47	16	20	4	62	36	8	12	4
27	41	11	12	1	63	35	7	12	5
28	43	11	18	7	64	19	1	2	1
29	44	2	5	3	65	19	5	7	2
30	44	11	21	10	66	31	1	12	11
31	40	0	23	23	67	12	4	10	6
32	42	9	10	1	68	32	13	12	- 1
33	40	17	22	5	69	16	4	4	0
34	45	18	23	5	70	36	10	14	4
35	45	22	31	9	71	21	13	9	- 4
36	45	15	29	14	72	24	10	9	-1

Fourth Grade Control Group Raw Data.--(Continued)

The reading scores, listed in grade equivalent form, were taken from the Flint Local District Michigan Educational Assessment Program, May, 1972.

The gain score is derived by subtracting the pre-test score from the post-test score.

Fourth Grade Experimental Group Raw Data.

Subject #	Reading	Pre-test	Post-test	Gain score	Subject #	Reading	Pre-test	Post-test	Gain score
1	38	12	11	- 1	37	32	5	3	- 2
2	39	7	15	8	38	32	6	11	5
3	47	13	20	7	39	18	3	23	20
4	47	10	15	5	40	33	12	15	4
5	41	15	19	4	41	35	14	15	1
6	43	22	25	3	42	35	13	20	7
7	45	21	16	- 5	43	23	2	3	1
8	37	18	20	2	44	33	4	8	4
9	41	1	21	20	45	19	9	12	3
10	45	24	35	11	46	31	16	7	- 9
11	40	11	19	8	47	34	5	9	4
12	42	0	5	5	48	36	1	17	16
13	40	1	5	4	49	51	12	22	10
14	44	7	13	6	50	49	13	16	3
15	40	11	17	6	51	67	15	20	5
16	39	22	35	13	52	67	20	33	13
17	45	16	17	1	53	67	25	34	9
18	43	15	16	1	54	73	10	16	6
19	40	3	6	3	55	56	17	22	5
20	42	6	11	5	56	51	24	31	7
21	37	21	34	13	57	56	15	32	17
22	37	7	36	29	58	60	11	22	11
23	40	0	19	19	59	58	16	34	18
24	37	0	10	10	60	52	0	4	4
25	31	9	19	10	61	60	0	27	27
26	35	11	20	9	62	49	0	16	16
27	35	21	26	5	63	56	5	20	15
28	37	12	23	11	64	53	7	10	3
29	34	3	17	14	65	51	15	12	- 3
30	32	4	14	10	66	79	9	11	2
31	32	16	17	1	67	53	10	13	3
32	29	7	6	- 1	68	53	19	19	0
33	36	7	15	8	69	49	1	12	11
34	35	3	10	7	70	47	13	21	8
35	33	11	18	7	71	47	13	13	0
36	25	10	9	- 1	72	47	3	12	9

Fifth Grade Experimental and Control Group Raw Data.

Experimental Group					Control Group				
Subject #	Reading	Pre-test	Post-test	Gain Score	Subject #	Reading	Pre-test	Post-test	Gain Score
1	64	20	22	2	1	67	24	31	7
2	62	21	26	5	2	32	14	14	0
3	45	6	13	7	3	42	2	17	15
4	58	6	28	22	4	61	4	10	6
5	45	15	16	1	5	51	9	8	- 1
6	29	11	17	6	6	51	9	11	2
7	27	9	12	3	7	27	0	12	12
8	39	3	9	6	8	28	16	18	2
9	45	7	34	27	9	48	4	29	25
10	27	7	9	2	10	34	16	21	5
11	25	3	20	17	11	41	16	14	- 2
12	60	27	31	4	12	42	6	14	8
13	51	20	31	11	13	35	13	14	1
14	61	10	17	7	14	38	10	11	1
15	67	8	37	29	15	33	4	3	- 1
16	47	9	19	10	16	16	47	21	1

Sixth Grade Experimental and Control Group Raw Data.

Experimental Group					Control Group				
Subject #	Reading	Pre-test	Post-test	Gain Score	Subject #	Reading	Pre-test	Post-test	Gain Score
1	43	18	26	8	1	39	21	22	1
2	65	16	24	8	2	77	1	27	26
3	66	6	37	31	3	63	19	28	9
4	54	5	19	14	4	51	23	32	9
5	83	0	4	4	5	69	26	29	3
6	37	6	12	6	6	55	15	20	5
7	55	19	22	3	7	65	11	17	6
8	34	5	15	10	8	37	9	8	- 1
9	59	18	34	16	9	47	8	18	10
10	74	16	34	18	10	33	16	17	1
11	38	14	13	- 1	11	54	16	19	3
12	99	23	37	14	12	83	18	24	6
13	99	25	33	8	13	42	11	13	2

APPENDIX B

ITEM ANALYSIS

TEST DEVELOPMENT INFORMATION

THE TEST

TABLE 6.--Item Analysis, Post-test. Output Data From IBM 360. Data Processing Department, Michigan State University.

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40 Items 218 Students

Mean Item Difficulty 55

Mean Item Discrimination 51

Kuder Richardson Reliability #20 .8901

Standard Error of Measurement 2.7612

Distribution of Item Difficulty Indices

	Number of Items	Percentage
91 - 100		0
81 - 90	1	2
71 - 80	6	15
61 - 70	10	25
51 - 60	6	15
41 - 50	12	30
31 - 40	4	10
21 - 30		0
11 - 20	1	2
00 - 10		0

Distribution of Discrimination Indices

	Number of Items	Percentage
91 - 100		0
81 - 90		0
71 - 80	2	5
61 - 70	6	15
51 - 60	15	38
41 - 50	11	27
31 - 40	4	10
21 - 30	1	2
11 - 20		0
00 - 10	1	2
Less than 00		0

Post-test Raw Score Distribution

RAW SCORE	FREQUENCY	CUMULATIVE FREQUENCY	PERCENTILE RANK	STANDARD SCORE
37	3	3	99	73.0
36	2	5	98	71.8
35	2	7	97	70.6
34	6	13	95	69.4
33	4	17	93	68.2
32	2	19	91	67.0
31	4	23	90	65.8
30	3	26	88	64.6
29	3	29	87	63.4
28	4	33	85	62.2
27	2	35	84	61.0
26	6	41	82	59.8
25	1	42	80	58.6
24	5	47	79	57.4
23	9	56	76	56.2
22	11	67	71	55.0
21	7	74	67	53.8
20	11	85	63	52.6
19	12	97	58	51.4
18	5	102	54	50.2
17	13	115	50	49.0
16	7	122	45	47.8
15	9	131	41	46.6
14	11	142	37	45.4
13	9	151	32	44.2
12	15	166	27	43.0
11	14	180	20	41.8
10	7	187	15	40.6
9	8	195	12	39.3
8	3	198	9	38.1
7	3	201	8	36.9
6	5	206	6	35.7
5	3	209	4	34.5
4	4	213	3	33.3
3	3	216	1	32.1
2	1	217	0	30.9
0	1	218	0	28.5

MEAN 17.83
STANDARD DEVIATION 8.33
VARIANCE 69.45
STANDARD SCORE HAS MEAN OF 50 AND STANDARD DEVIATION OF 10

Post-test Item Analysis, Item Statistics

Item Number	Mean Score-Wrongs	Mean Score-Rights	Students T for Point Biserial Correlation	Point Biserial Correlation	Biserial Correlation	Discriminating Efficiency	Maximum Discrimination	Index of Discrimination	Index of Difficulty
1	Sample question								
2	10.7	19.6	6.94	.437	.593	91	49	45	20
3	15.7	21.4	5.15	.331	.424	54	74	40	64
4	15.3	22.1	6.33	.395	.508	51	87	45	63
5	14.5	20.0	5.07	.326	.410	38	95	37	40
6	13.7	21.0	7.13	.436	.546	60	86	52	44
7	14.8	21.4	6.30	.394	.494	44	93	41	55
8	17.3	20.5	2.11	.142	.221	23	42	10	84
9	14.2	21.4	7.02	.431	.539	62	91	57	50
10	13.7	20.8	6.83	.421	.529	59	84	50	41
11	13.8	21.9	8.34	.493	.617	59	95	57	50
12	14.4	24.8	10.8	.592	.767	76	84	64	67
13	15.4	23.7	7.66	.462	.620	65	69	45	71
14	14.8	20.8	6.82	.421	.529	62	85	53	43
15	14.4	20.7	5.95	.376	.470	47	100	48	46
16	12.4	22.1	10.4	.578	.722	80	93	75	44
17	15.7	23.3	6.69	.414	.553	82	58	48	72
18	14.8	20.3	5.21	.334	.419	40	94	38	45
19	13.0	21.8	9.19	.530	.663	73	90	66	45
20	15.2	23.3	7.59	.459	.595	70	81	57	67
21	14.3	22.3	8.00	.478	.601	59	95	57	56
22	11.8	21.4	9.45	.561	.711	92	77	71	38
23	15.5	24.8	8.01	.478	.662	79	67	53	75
24	15.3	23.3	7.39	.449	.584	59	83	49	68
25	14.8	22.4	7.37	.448	.570	61	88	54	60
26	14.4	21.8	7.37	.448	.562	57	99	57	54
27	13.3	21.2	7.83	.470	.590	69	79	55	43
28	16.1	22.4	5.23	.335	.449	57	66	38	73
29	15.5	21.9	5.89	.372	.478	49	83	41	64
30	12.8	20.9	7.95	.476	.602	64	96	62	39
31	15.5	21.6	5.59	.355	.454	59	83	49	62
32	13.5	20.7	6.81	.421	.531	74	71	53	49
33	13.2	21.8	8.82	.515	.643	73	91	67	46
34	14.8	22.9	7.96	.476	.609	74	77	57	62
35	14.9	22.7	7.39	.449	.578	64	80	52	63
36	14.3	21.0	6.54	.406	.508	51	98	50	47
37	13.7	22.3	8.87	.516	.647	65	100	66	52
38	14.9	22.6	7.46	.453	.577	64	80	52	61
39	14.9	21.9	6.65	.412	.521	63	87	55	58
40	16.5	21.2	3.88	.255	.341	34	64	22	72
41	14.9	25.5	10.3	.572	.774	85	71	61	72

TEST DEVELOPMENT INFORMATION

The forty questions on the test can be separated into three general categories. The first category, identification of musical symbols, has twenty-one items and requires the test taker to choose the name of the presented musical symbol from the four options. The second category, interpretation of rhythmic symbols, has fourteen items and requires the test taker to select the option that describes the rhythmic function of the symbol. An example in this category is item 32.

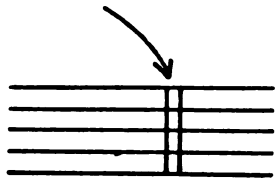
This note will be held

32

1 ____1 beat.
2 ____2 beats.
3 ____3 beats.
4 ____4 beats.
5 ____I don't know.

The third category, interpretation of musical symbols, has five items and requires the test taker to select the option that describes the function of the symbol. Item 4 is an example in this category.

The sign is used



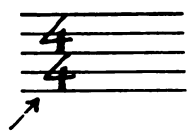
4

1 ____when a song is to be repeated.
2 ____at the end of a song or section of a song.
3 ____to tell the number of beats in each measure.
4 ____to repeat a measure.
5 ____I don't know.

The index of difficulty in the item analysis indicated that questions dealing with the interpretation of symbols were somewhat more difficult to answer than the identification questions. The most difficult questions on the test as indicated by the index of difficulty are given below.

The bottom 4 in the time signature tells you that

Index of difficulty, 84
Discrimination, 54



23

1 _____ a quarter note will be held 1 beat.

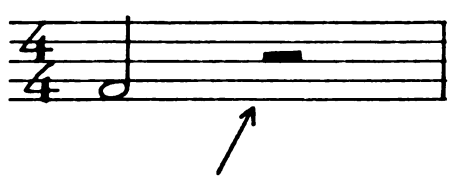
2 _____ a half note will be held 1 beat.

3 _____ a whole note will be held 1 beat.

4 No 4th answer

5 _____ I don't know.

Index of difficulty, 82
Discrimination, 46



You will rest for

17

1 _____ 1 beat.

2 _____ 2 beats.

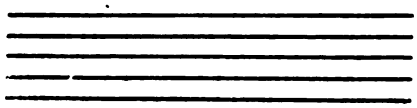
3 _____ 3 beats.

4 _____ 4 beats

5 _____ I don't know.

The questions formed a continuum of difficulty from the two questions given above to the two easiest questions indicated below.

Index of difficulty, 22
Discrimination, 31

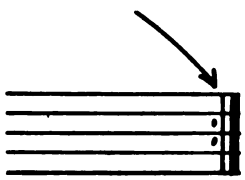


2

1 ___staff
2 ____clef
3 ____signature
4 ____barline
5 ____I don't know.

Index of difficulty, 18
Discrimination, 31

The sign on the staff below is called a

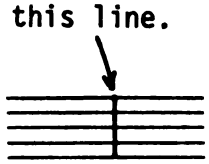


33

1 ____clef sign.
2 ____measure sign.
3 ____repeat sign.
4 ____tempo sign.
5 ____I don't know.

Eight identification questions used words only in the multiple choice answers. Most of the questions used only four or five words. A typical question is given below"

Name this line.



5

1 ____tempo line
2 ____meter line
3 ____counting line
4 ____barline
5 ____I don't know.

The fifth option in every question was always, "I don't know." This option was included for students who were certain they did not know the answer. Test instructions included the following statement, "Check the answer you think is right even if you are not sure it is right." The statement was designed to encourage students to use their learning as completely as possible.

Seven note identification questions on the test were designed specifically for bass clef instruments, high treble instruments, and low treble instruments. Three forms of the test were provided to allow for these categories of instruments.

A MULTIPLE CHOICE TEST

for

ELEMENTARY SCHOOL MUSIC STUDENTS

In 3 versions

High treble clef - Flute - Saxophone - Oboe - Bells

Treble clef - Cornet - Clarinet - Horns - Violin
Treble baritone - Treble voices

Bass clef - All bass clef instruments and voices

Student's name_____

Name of school_____

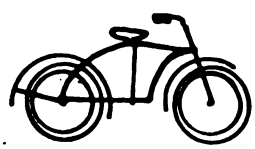
Instrument the student plays at school_____
(Leave this blank if you don't play an instrument)

Check the blank below that tells about your study of the piano.	Check the blanks below that tell about your study of music at school.
_____I have never taken private piano lessons.	_____I am in a singing class at school.
_____I have taken private piano lessons for about 6 months.	_____I am just starting on a band or orchestra instrument at school.
_____I have taken private piano lessons for a year or longer.	_____I have taken a band or orchestra instrument at school for 1 year or longer.

Put a check ✓ beside the word that is the name of the musical sample or that answers a question about the musical sample.

Check the answer you think is right even if you are not sure it is right.

If you don't know the answer, check the blank 5. ✓ I don't know.

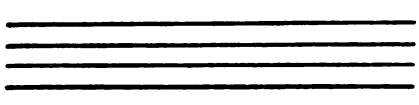


1

1 ____wagon
2 ____scooter
3 ✓ bicycle
4 ____skate
5 ____I don't know.

The answer to question 1 is 3 ✓ bicycle. On your answer sheet, fill in the 3rd little block in answer 1 [1] [2] [■] [4] [5]

Use pencil only. Erace when necessary. Make your marks dark and neat.

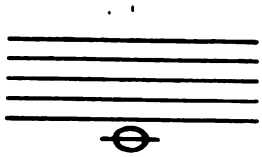


2

1 ____staff
2 ____clef
3 ____signature
4 ____barline
5 ____I don't know.

1

The note is on the



3

1____1st space below the staff.

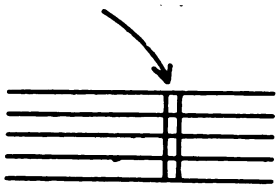
2____1st space on the staff.

3____1st leger line below the staff.

4____1st line on the staff.

5____I don't know.

The sign is used



4

1____when a song is to be repeated.

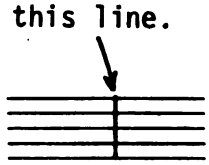
2____at the end of a song or section of a song.

3____to tell the number of beats in each measure.

4____to repeat a measure.

5____I don't know.

Name this line.



5

1 ____tempo line

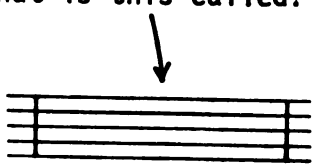
2 ____meter line

3 ____counting line

4 ____barline

5 ____I don't know.

What is this called?



6

1 ____measure

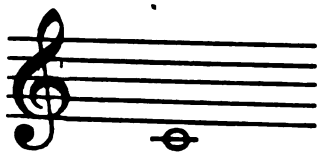
2 ____time signature

3 ____clef

4 ____unit

5 ____I don't know.

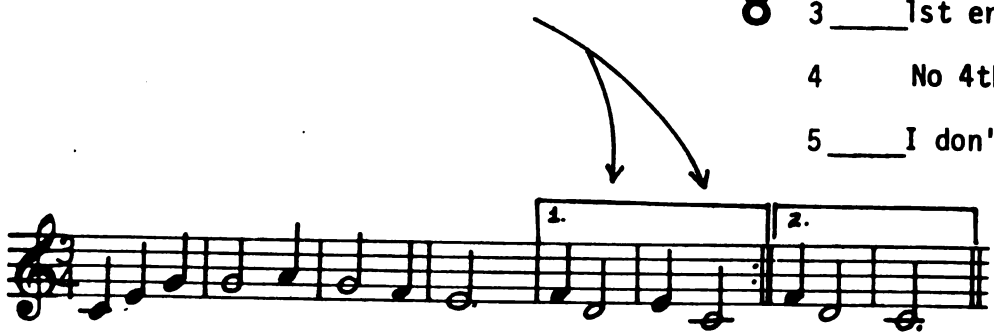
The letter name of the note is



7

1.____C
2.____E
3.____D
4.____F
5.____I don't know.

These 2 measures are called the



8

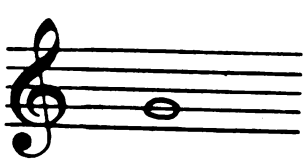
1____2nd ending.
2____double measures.
3____1st ending.
4 No 4th answer.
5____I don't know.

9

1____bass clef sign
2____key signature
3____treble clef sign
4____measure
5____I don't know.

3.

The letter name of the note is



10

1____A
2____D
3____G
4____C
5____I don't know.

The note is on the

11

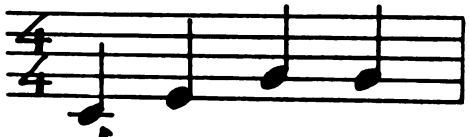
1 _____1st space below the staff.

2 _____1st line on the staff.

3 _____1st space on the staff.

4 _____1st line below the staff.

5 _____I don't know.



This note will be held

12

1 _____1 beat.

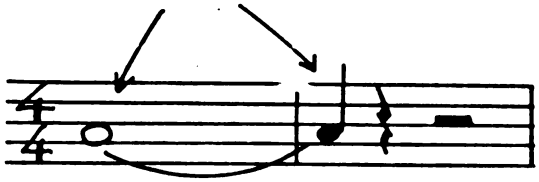
2 _____2 beats.

3 _____3 beats.

4 _____4 beats.

5 _____I don't know.

These two notes will be played as



13

1 _____one tone held 5 counts.

2 _____two tones, one held 4 counts, the other held 1 count.

3 _____two tones of equal length.

4 _____one tone held 7 counts.

5 _____I don't know.

14

1 _____quarter note

2 _____half note

3 _____dotted half note

4 _____whole

5 _____I don't know.

The note is on the

15

1 ____1st leger line above the staff.

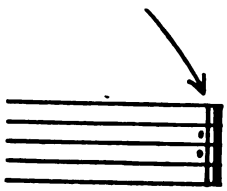
2 ____5th line on the staff.

3 ____1st space above the staff.

4 ____4th space on the staff.

5 ____I don't know.

The sign is used



16

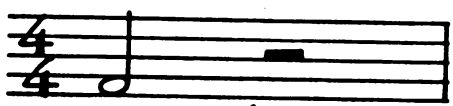
1 ____when a song or section of a song is to be repeated.

2 ____to tell the number beats in each measure.

3 ____to slow down the beat.

4 ____to speed up the beat.

5 ____I don't know.



You will rest for

17

1 ____1 beat.

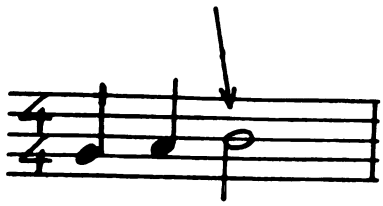
2 ____2 beats.

3 ____3 beats.

4 ____4 beats

5 ____I don't know.

What beat of the measure does this note start on?



5.

18

1 ____1st beat.

2 ____2nd beat.

3 ____3rd beat.

4 ____4th beat.

5 ____I don't know.

19

1 _____The note with the upward stem is held longer.

2 _____The note with the downward stem is held longer.

3 _____Both notes are held the same length of time.

4 No 4th answer

5 _____I don't know.

You will rest for

20

1 _____1 beat.

2 _____2 beats.

3 _____3 beats.

4 _____4 beats.

5 _____I don't know.

How many beats are there in each measure in the song below.

21

1 _____1 beat

2 _____2 beats

3 _____3 beats

4 _____4 beats

5 _____I don't know.

22

1 _____quarter note

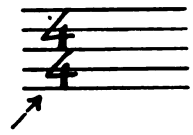
2 _____half note

3 _____dotted half note

4 _____whole note

5 _____I don't know.

The bottom 4 in the time signature tells you that



23

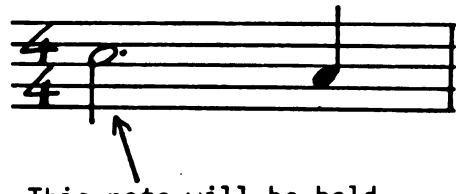
1 _____a quarter note will be held 1 beat.

2 _____a half note will be held 1 beat.

3 _____a whole note will be held 1 beat.

4 No 4th answer

5 _____I don't know.



This note will be held

24

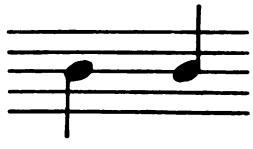
1 _____1 beat.

2 _____2 beats.

3 _____3 beats.

4 _____4 beats.

5 _____I don't know.



25

1 _____The note with the upward stem sounds higher.

2 _____The notes sound the same.

3 _____The note with the downward stem sounds higher.

4 No 4th answer

5 _____I don't know.

The note is on the

26

1 _____4th space on the staff.

2 _____3rd line on the staff.

3 _____2nd line on the staff.

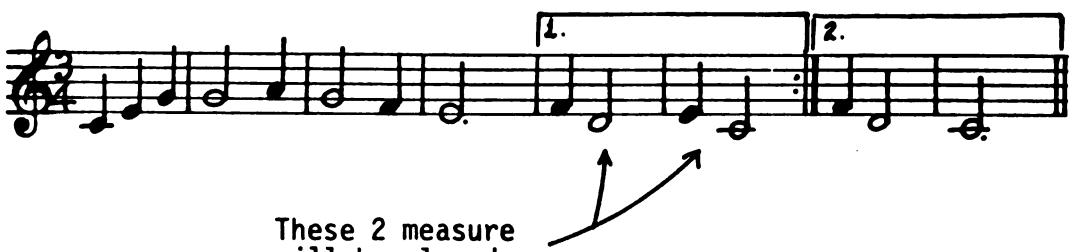
4 _____3rd space on the staff.

5 _____I don't know.

The letter name of the note is

27

1 ____C
2 ____F
3 ____G
4 ____B
5 ____I don't know.

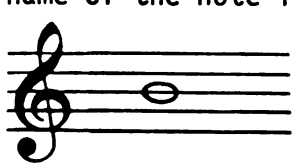


These 2 measure will be played

28

1 ____both the first time and the second time through the song.
2 ____only the second time through the song.
3 ____only the first time through the song.
4 No 4th answer.
5 ____I don't know.

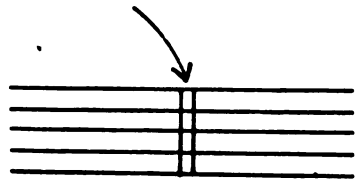
The letter name of the note is



29

1 ____D
2 ____C
3 ____A
4 ____B
5 ____I don't know.

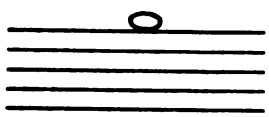
The sign on the staff below is called a



30

1 ____tempo sign.
2 ____double bar.
3 ____double measure.
4 ____repeat sign.
5 ____I don't know.

The note is on the



31

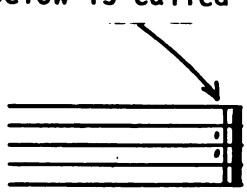
1 ____4th space on the staff.
2 ____5th line of the staff.
3 ____1st leger line above the staff.
4 ____1st space above the staff.
5 ____I don't know.

This note will be held

32

1 ____1 beat.
2 ____2 beats.
3 ____3 beats.
4 ____4 beats.
5 ____I don't know.

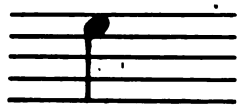
The sign on the staff below is called a



33

1 _____clef sign.
2 _____measure sign.
3 _____repeat sign.
4 _____tempo sign.
5 _____I don't know.

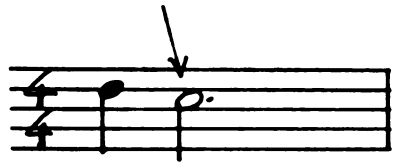
9.



34

1 ____quarter note
2 ____half note
3 ____dotted half note
4 ____whole note
5 ____I don't know.

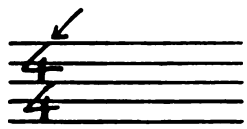
What beat of the measure does this note start on?



35

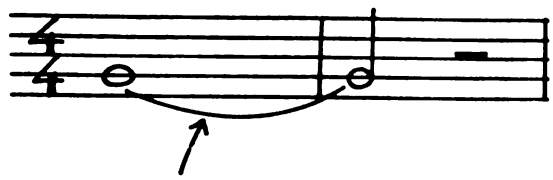
1 ____1st beat.
2 ____2nd beat.
3 ____3rd beat.
4 ____4th beat.
5 ____I don't know.

The top 4 in the time signature tells you that there will be



36

1 ____4 measures in the song.
2 ____4 beats in each measure.
3 ____4 notes in each measure.
4 No 4th answer.
5 ____I don't know.



The curved line is called a

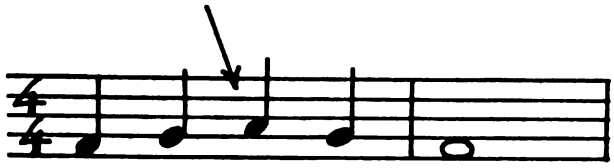
37

1 ____bracket.
2 ____tie.
3 ____note line.
4 ____stem.
5 ____I don't know.

38

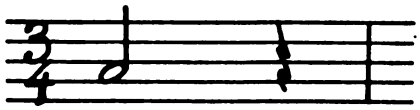
1 ____quarter note
2 ____half note
3 ____dotted half note
4 ____whole note
5 ____I don't know.

What beat of the measure is this note on?



39

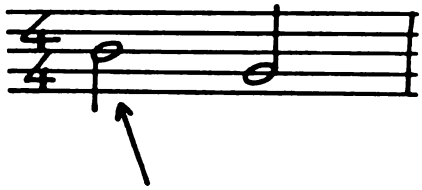
1 ____1st beat.
2 ____2nd beat.
3 ____3rd beat.
4 ____4th beat.
5 ____I don't know.



40

1 ____1st beat.
2 ____2nd beat.
3 ____3rd beat.
4 ____4th beat.
5 ____I don't know.

The rest in the measure above is on the



41

1 ____1 beat.
2 ____2 beats.
3 ____3 beats.
4 ____4 beats.
5 ____I don't know.

This note will be held

11.

APPENDIX C

PROGRAMED TEXT DEVELOPMENT INFORMATION

THE COMPLETE TEXT

APPENDIX C

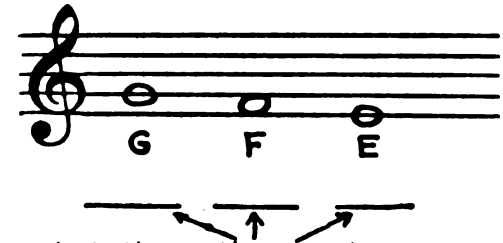
PROGRAMED TEXT DEVELOPMENT INFORMATION

The format of the text, using one problem to a page, gives the impression of quite large steps. Actually the steps are quite small but are supplemented with written work problems. Below is a typical page which combines a question with a work problem.

20

One note lower than G is F.

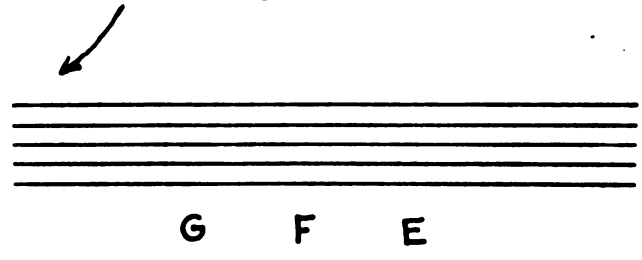
One note lower than F is E.



Question 20. Write in the number of the line or space that these three notes are on.

Use L for line and S for space.

Work Problem 20. On the staff below put in a treble clef sign and write the note above each letter.



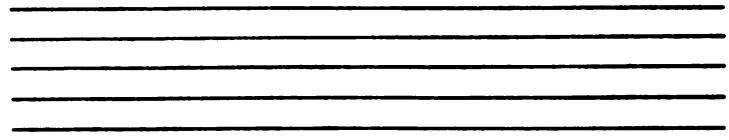
For the fourth grade student, every new term or symbol must first be presented in the most obvious manner and coupled with exercises to reinforce the item to be learned. Frame fourteen is a good example of the style of presentation in the text.

14 Example 14.
There are 4 spaces on the staff.

A note has been placed in each space.

Work Problem 14.

Number the spaces and put a note on each space of the staff just like in Example 14.



The answer to each question and work problem solution in the text was given at the top of the following page. The decision to retain this format, used in the pilot study, was largely determined by the collective opinion of the participants and proctors in the pilot study. The opinion expressed was, "they will just copy if the answer is below the question." Whether or not it is actually true that many students would copy and whether or not copying would be detrimental to learning remains to be determined.

Several short tests were spaced throughout the text. The composed answer format was retained for these tests. The test below terminates the first week of home-study and represents from one to two hours of work on the student's part.

24

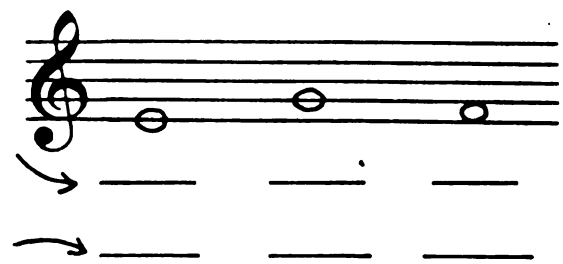
A SHORT TEST

1. Musical notes are written on the _____.

2. What clef does the trumpet and clarinet use? _____.

3. How many lines does the staff have? _____.

4. Write below each note, the name of the note and where it is on the staff.



Put the name of the note here

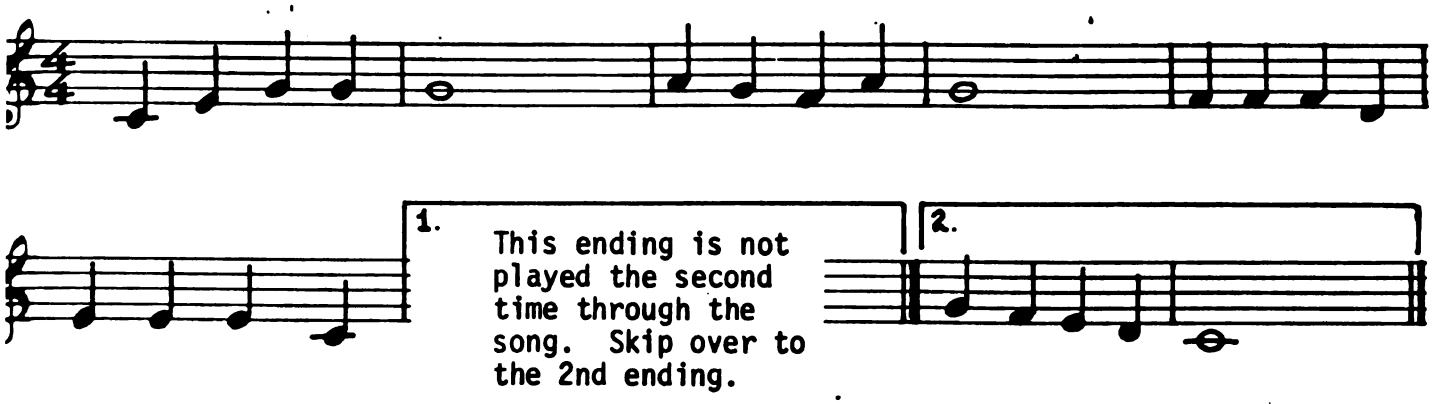
Put the number of the line or space here.

The text to be used for the experiment was published for three categories of instruments: bass clef, high treble and low treble. The rationale behind creating such specific texts was to try to build an immediate relationship between the cognitive material and the playing of the instrument. Every example in each book was written in the instrument range the student was learning in his school method book. The following two pages show a sample page from each of the three texts.

Low treble text

53 This is the same song as on page 52.

The second time through the song you will skip over the 1st ending and play the 2nd ending.

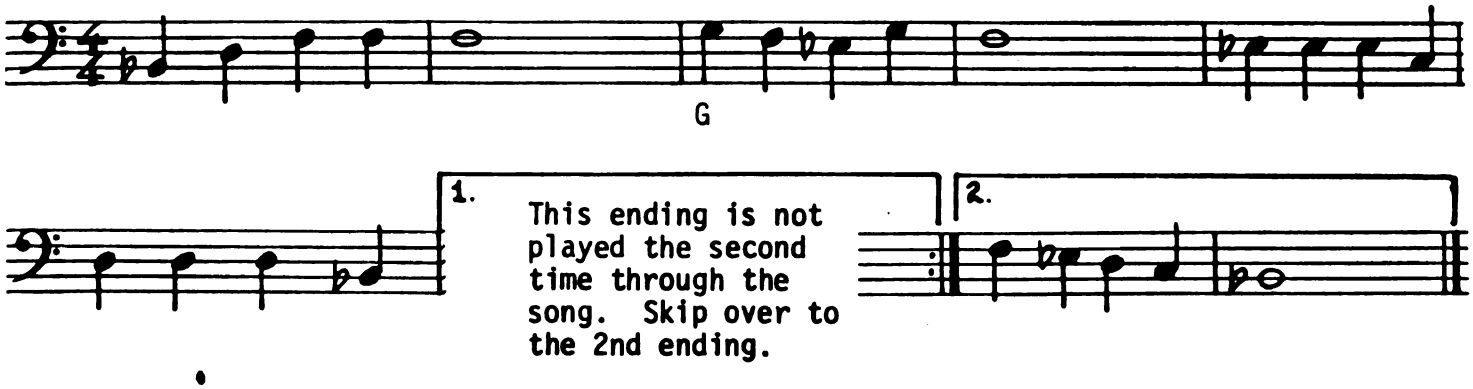


Question 53. Is the 1st ending played the second time through the song?_____

Bass clef text

53 This is the same song as on page 52.

The second time through the song you will skip over the 1st ending and play the 2nd ending.

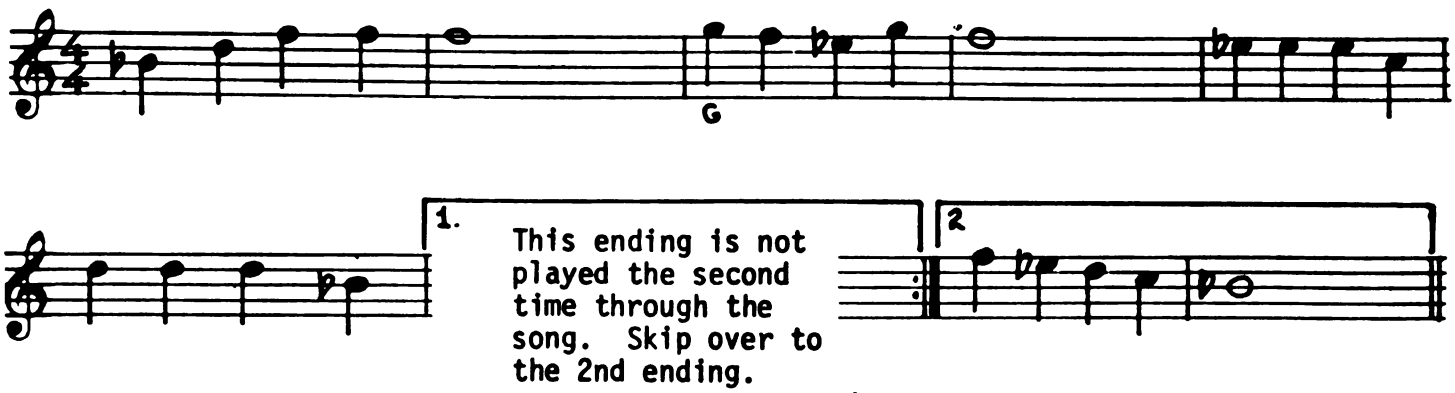


Question 53. Is the 1st ending played the second time through the song?_____

High treble text

53 This is the same song as on page 52.

The second time through the song you will skip over the 1st ending and play the 2nd ending.



This ending is not played the second time through the song. Skip over to the 2nd ending.

Question 53. Is the 1st ending played the second time through the song?_____

The examples in the texts could be played by most beginning students. Students on the uncommon beginning instruments, such as oboe or tenor sax, might have some difficulty with the range of the examples.

A Guide To Music

by

Lloyd D. Miller

A Self-Instruction Text for the Beginning Music Student.

INDEX

1

To The Teacher

This book is designed for the students home study of basic knowledge associated with beginning instrumental music. The material presented should reinforce school work and provide a background of knowledge for the student as he begins an instrument. The proper time for the presentation of this book is when the student actually begins the study of reading music from a method book. There are several tests contained in each book. These tests can be used in conjunction with school class work if convenient.

Your emphasis and encouragement in the use of the book should help facilitate the student's acquisition of this basic knowledge.

To The Student

The purpose of this book is to help the music student understand how written music is used by the musician.

Work in the book 15 or 20 minutes each night before or after you practice your instrument. Try to work on the same problems in the book that you are working on in your practicing.

2

INSTRUCTIONS

In a self-instruction book you learn by yourself.

On each page there will be a work problem or a question or both.

On the following page you will find the correct work problem and the correct answer to the question.

Here is an example of how this book is used.

Question 1.

What are the 2 most common house pets? _____ and _____

Put your answers in the blanks and then look on the top of page 3 for the correct answer.

3

Answer 1. What are the 2 most common house pets? dogs and cats.

In a self-instruction book you need to use an answer-cover-sheet.

As you are working on page 4, the answer-cover-sheet is used to cover the answer on page 5 so that you won't see it. The answer-cover-sheet for this book is the page following page 4.

Question 2. What is an answer-cover-sheet used for? _____

_____

Look on the top of page 4. for the correct answer.

4

Answer 2. What is an answer-cover-sheet used for? -to cover the the answer on the following page. (or your words meaning the same)

To copy an answer doesn't take much thinking; you won't learn much from copying.

Use the following step by step plan for working on each page.

1. Read the page.
2. Read the question.
3. Think the answer.
4. Write the answer.
5. Check the answer with the following page.

Question 3. Why shouldn't you copy the correct answer from the following page?

_____

_____

(After you have answered the question, lift up the answer-cover-sheet and check your answer with the correct answer on page 5.)

Answer 3.

Why shouldn't you copy the correct answer from the next page? Because you won't learn much from copying. (or your words meaning the same)

5

Cut the answer-cover-sheet along the dotted line.

Put the answer-cover-sheet between pages 6 and 7.

If your answer is wrong on any page, go back and read the page again. You must do more than just correct the answer, you must correct your thinking.

Question 4. If you give the wrong answer to a question you should_____

Look on the top of page 6. for the answer.

6

Answer 4. If you give the wrong answer to a question you should go back and read the page again.

Be sure to check your work problems closely with the correct way given on the following page.

If you read a page 2 or 3 times and still can't answer the question, look at the correct answer on the following page. Seeing the correct answer may help you understand the problem.

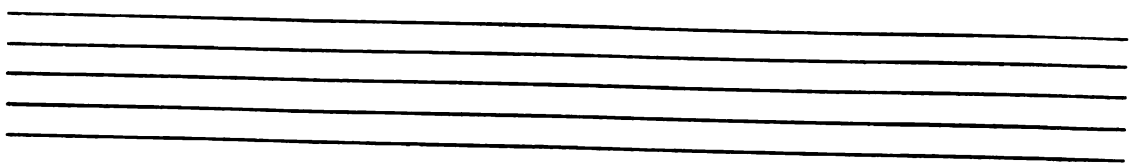
Now you may start on your study of music.

Put your answer-cover-sheet between pages 8 and 9.

7

THE STAFF

The 5 lines below are called a staff. Music is written on a staff.



Question 7.

The 5 lines that music is written on are called a _____.

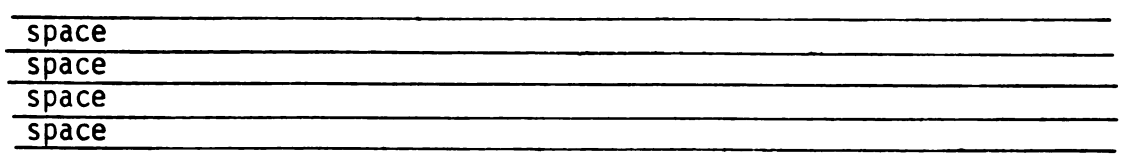
(Check your answer with the answer on page 8.)

Answer 7. The 5 lines that music is written on are called a staff.

8

The staff has 5 lines.

Between the 5 lines are 4 spaces.



Music is written on both lines and spaces.

Question 8.

How many spaces are there between the 5 lines of the staff?_____

(Check your answer with page 9.)

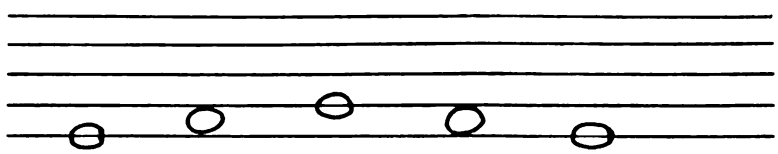
Answer 8.
How many spaces are there between the 5 lines of the staff? 4 spaces

9

MUSICAL NOTES

 These are musical notes.

Music is written on the staff by using notes.



Question 9. Music is written on the staff by using _____.

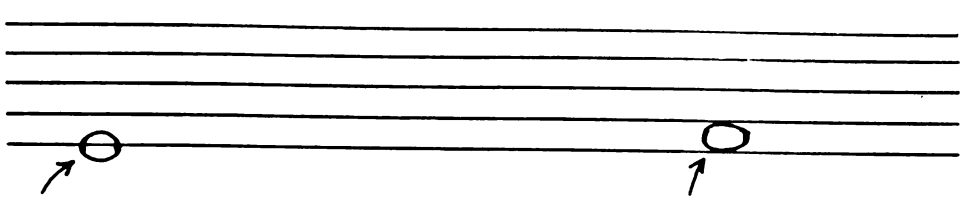
Check your answer with page 10.

10

LINES
and
SPACES

Answer 9. Music is written on the staff by using notes.

Notes on the staff are on a line or space.



This note is said to be "on a line."
The line goes through the note.

This note is said to be "on a space."
A line does not go through the note when it is on a space.

Question 10.
When a note is on a space of the staff,

does a line go through the note? _____yes _____no

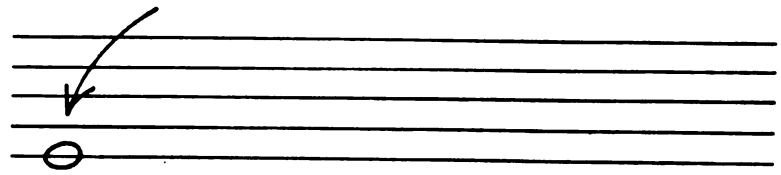
11

Answer 10. When a note is on a space of the staff, does a line go through the note? ✓ no

Work Problem 11.

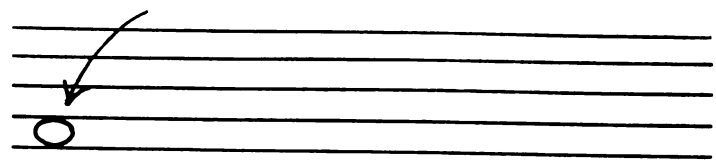
Write 4 or 5 notes just like the first note.

Example A. These notes are on a line.



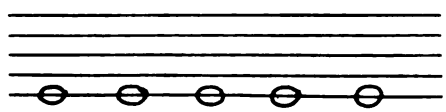
Write 4 or 5 notes like the first note.

Example B. These notes are on a space



Work Problem 11.

Example A.

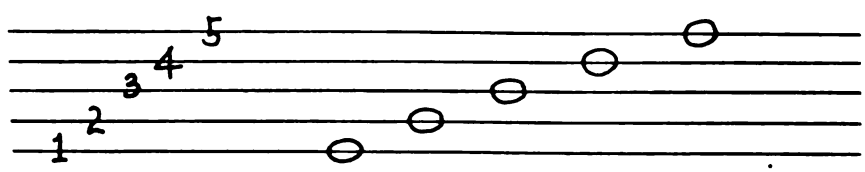


Example B.

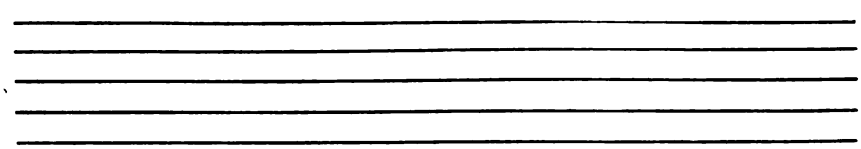
12

There are 5 lines on the staff. A note has been placed on each line.

Example 12.

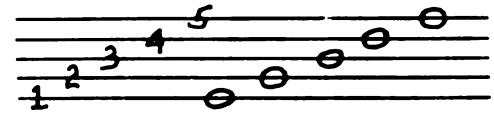


Work Problem 12. On the staff below, number the lines and put a note on each line just like in Example 12. Always number the lines and spaces starting at the bottom of the staff.

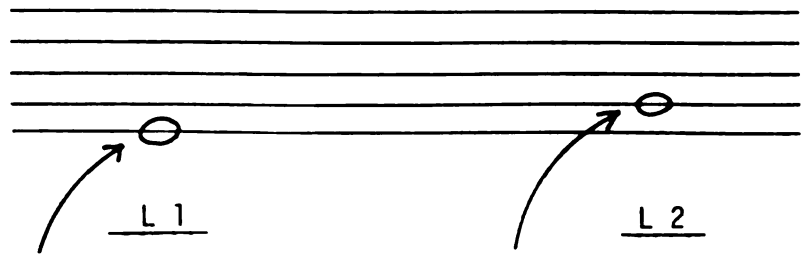


13

Work Problem 12.

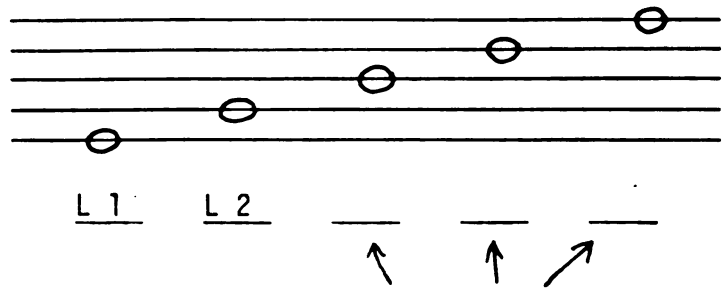


Use "L" to mean "Line"



This note would be on Line 1 or L 1.

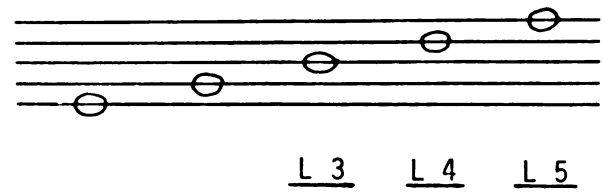
This note would be on Line 2 or L 2.



Question 13. What would these be?

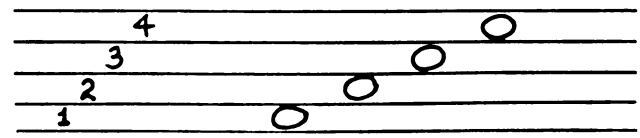
14

Answer 13.



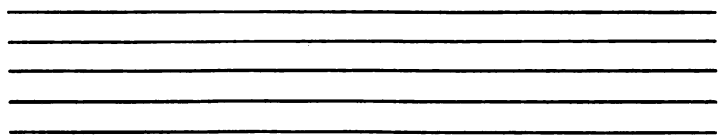
Example 14.
There are 4 spaces on the staff.

A note has been placed in each space.



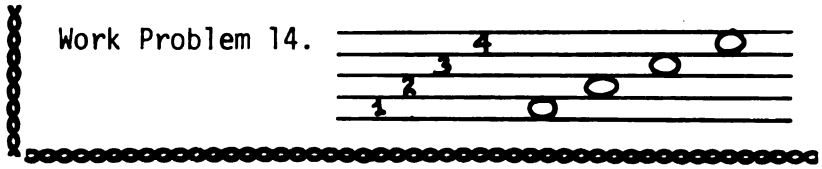
Work Problem 14.

Number the spaces and put a note on each space of the staff just like in Example 14.



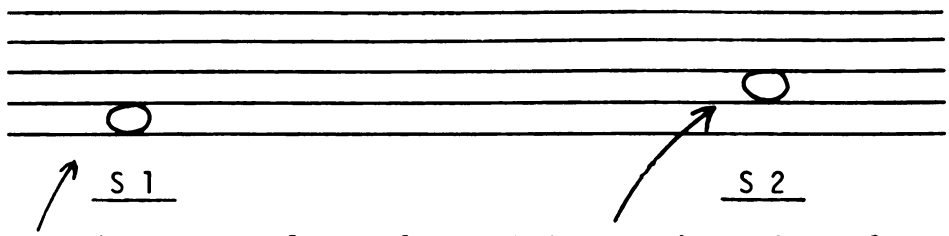
15

Work Problem 14.



Example 15.

Use "S" to mean "space"



This note is on Space 1 or S 1

This note is on Space 2 or S 2

S 1 S 2

Question 15.

Write in what these should be.

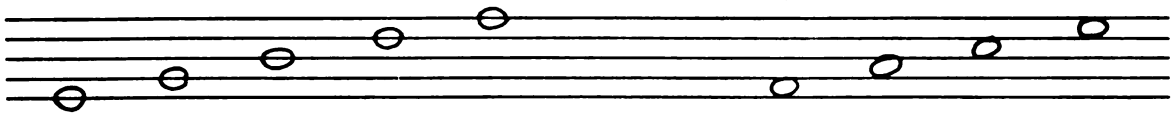
16

Answer 15.

S 3 S 4

Notes on lines

Notes on spaces

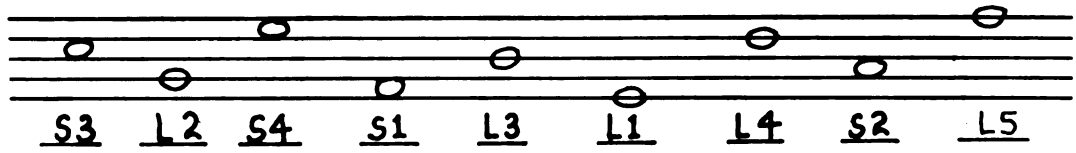


L 1 L 2 L 3 L 4 L 5 S 1 S 2 S 3 S 4

Work Problem 16. Put below each note the line or space the note is on.
Use S for space - L for line

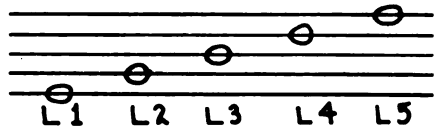
S 3 L2 S 4 ___ ___ ___ ___ ___ ___

Work Problem 16.

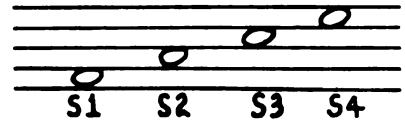


17

Notes on lines

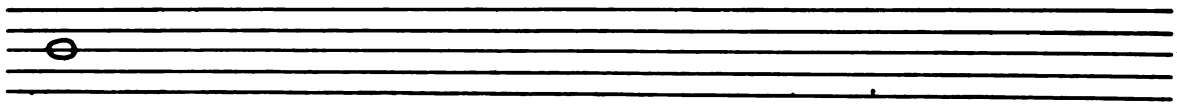


Notes on spaces



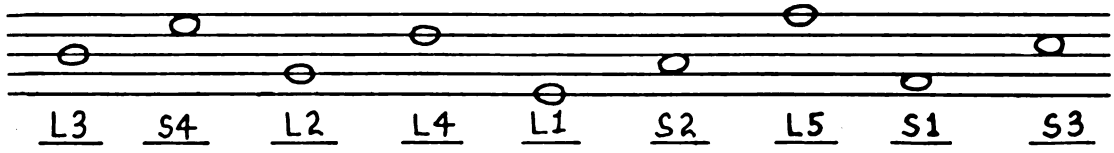
Work Problem 17.

Put the notes on the lines or spaces as called for on the blank below.



L 3 S 4 L 2 L 4 L 1 S 2 L 5 S 1 S 3

Answer 17.



18

High sounding instruments read music using the treble clef sign.

TREBLE AND BASS CLEF

Low sounding instruments use the bass clef sign.

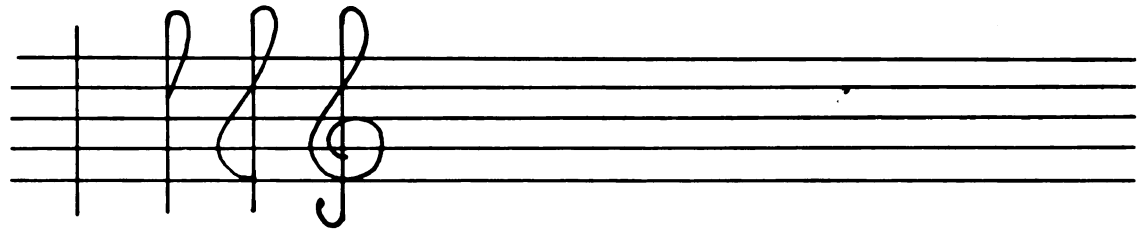
Question 18. The cornet and clarinet are high sounding instruments. Write the word which is the correct clef for cornet and clarinet.

_____

Answer 18. Which clef sign would you use for the cornet and clarinet? treble

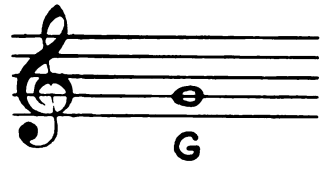
19

Work Problem 19. Write several treble clef signs.



From now on every staff will start with the treble clef sign.

The notes in music are lettered A B C D E F G.
On the treble clef staff, one of the easiest notes for many instruments to play is G.

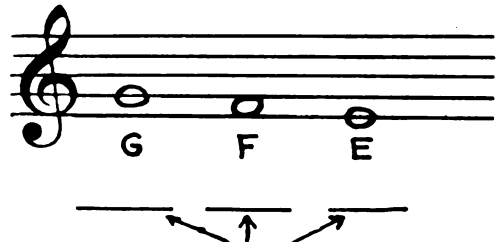


Question 19. What line or space is this G on?_____

Answer 19. What line or space is G on? L 2

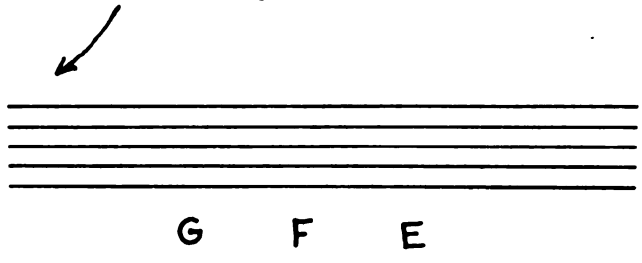
20

One note lower than G is F.
One note lower than F is E.



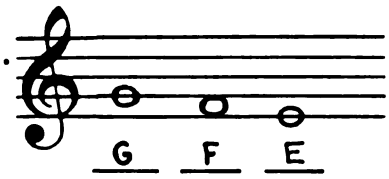
Question 20. Write in the number of the line or space that these three notes are on.
Use L for line and S for space.

Work Problem 20. On the staff below put in a treble clef sign and write the note above each letter.

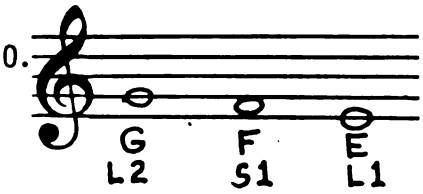


21

Answer 20.

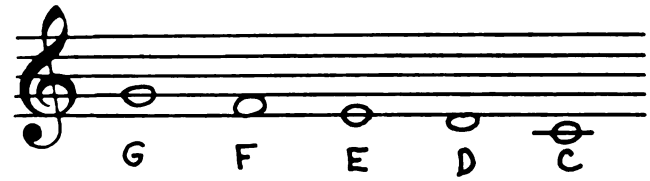


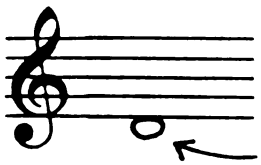
Work Problem 20.



Not all musical notes are on the staff.

Some notes are below or above the staff.

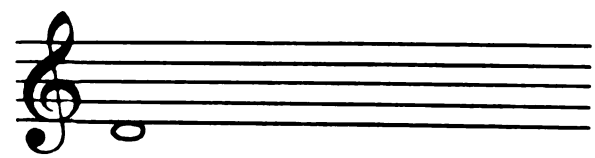




D is on the 1st space below the staff.

Work Problem 21.

Write 4 more D notes like the first one.

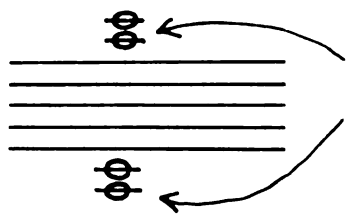


22

LEGER LINES

Work Problem 21.

Notes can be written above or below the staff by adding leger lines.



These short lines are called leger lines. They are written with the same space as is used on the staff.

Question 22. The short lines used when writing notes above or below the staff are called _____.

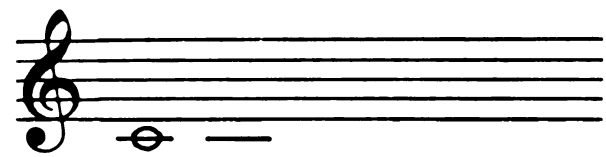
23

Answer 22. The short lines used when writing notes above or below the staff are called leger lines.

C is on the 1st line below the staff.

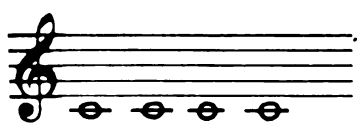
Work Problem 22.

Write 4 more C notes - make the leger lines first.



Question 23. In treble clef, the note on the first line below the staff is _____.

Work Problem 23.



Answer 23. In treble clef, the note on the first line below the staff is C.

24

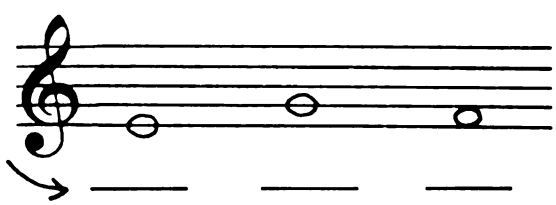
A SHORT TEST

1. Musical notes are written on the _____.

2. What clef does the trumpet and clarinet use? _____.

3. How many lines does the staff have? _____.

4. Write below each note, the name of the note and where it is on the staff.



Put the name of the note here → _____ _____ _____

Put the number of the line or space here. → _____ _____ _____

Answers to 24. 1. staff 3. 5 lines
2. treble 4. E G F
L1 L2 S1

25 THE BEAT IN MUSIC

Most music has a regular beat.

1. When students march, their feet hit the ground on the beat.
2. When someone claps their hands to music, the clapping is usually on the beat.
3. Automobile windshield wipers give a regular beat.

In the 3 examples above, the beat is said to be regular.

Question 25. Put a check beside the 2 examples below that have a regular beat.

1._____A clock that ticks.

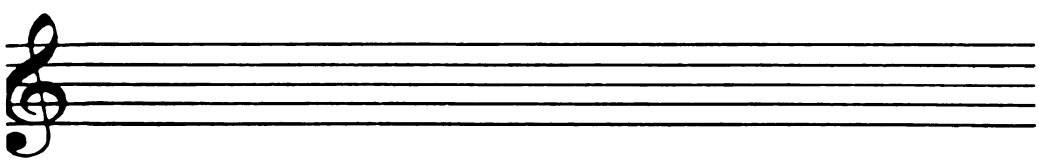
2._____The beating of your heart.

3_____The sound of raindrops on the roof.

Answer 25.
1. ✓
2. ✓
Raindrops hitting the roof do not make a regular beat.

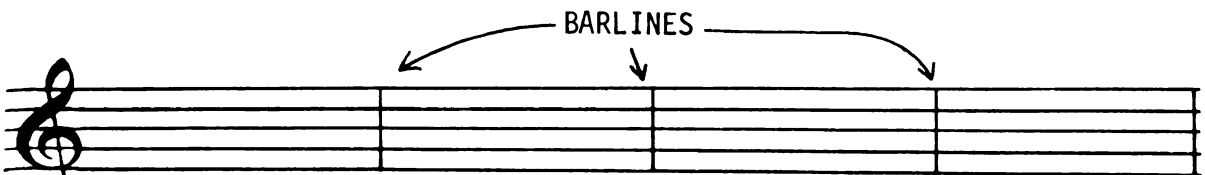
26

To learn a song, musicians sometimes have to count the beats. This is called counting.



1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

To keep the number of counts small, musicians put a barline every few beats to divide the counting into small groups.



1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4

Question 26. A. The beats are now in groups of _____.

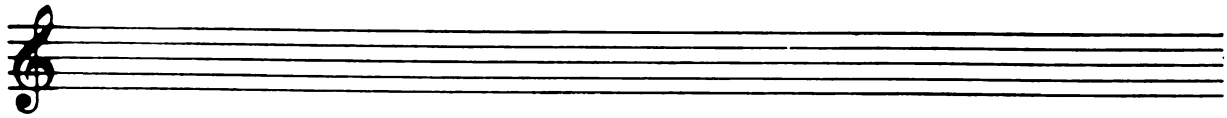
B. The line that divides the beats into groups is called a _____.

Answer 26. A. The beats are now in groups of 4 .
B. The line that divides the beats into groups is called a barline .

27

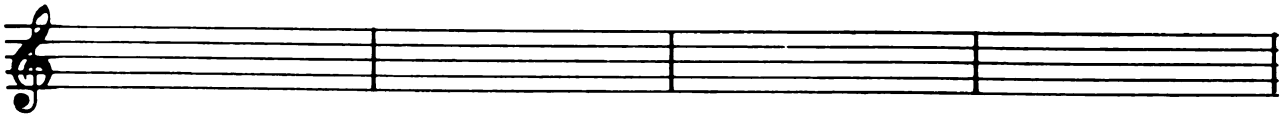
Work Problem 27.

A. Put the barlines on the staff below. (There will be 4 barlines to write in.)



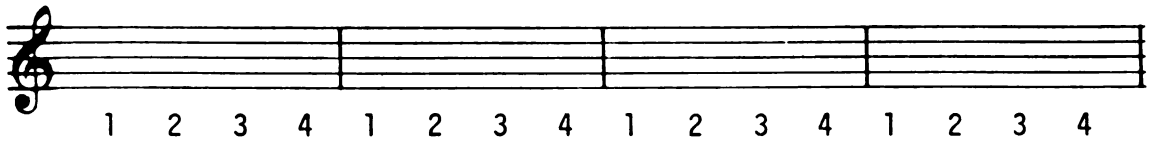
1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4

B. Finish the counting below the staff. Use 4 counts for each measure.



1 2 3 4

Work Problem 27.



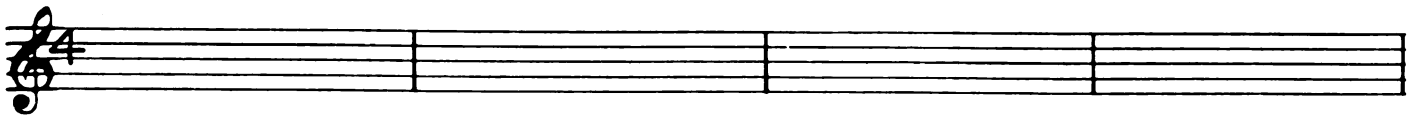
1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4

Problem A. and B. should look the same when they are finished.

28

There are several ways to show that the beats will be in groups of 4.

One of the most common ways is to put a 4 at the beginning of the staff.
Learn this way first.
The other ways of showing the beats grouped in 4 you will learn later in your musical studies



1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4

Question 28.

A. The 4 at the beginning of the staff shows that the beats will be in groups of _____

B. Is there more than 1 way to show that the beats will be grouped in 4?_____

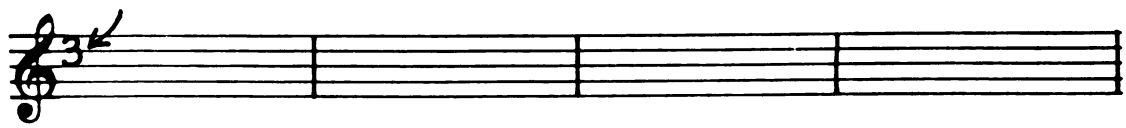
Answer 28.
A. The 4 at the beginning of the staff shows that the beats will be in groups of 4.
B. Is there more than 1 way to show that the beats will be grouped in 4? yes

29

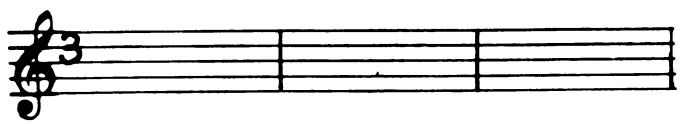
Beats may also be counted in groups of 3.

There are several ways to show that the beats will be in groups of 3.

One of the most common ways is to put a 3 at the beginning of the staff. Learn this way first.



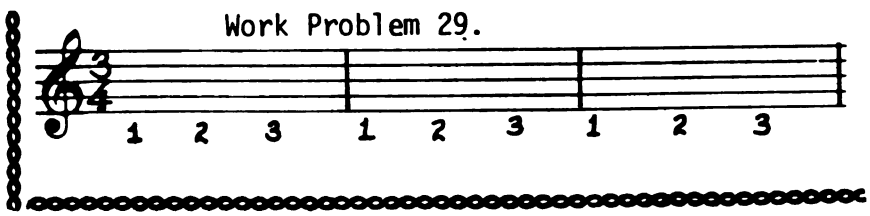
Work Problem 29.
Write the counting below the staff. Start each measure with "1".



30

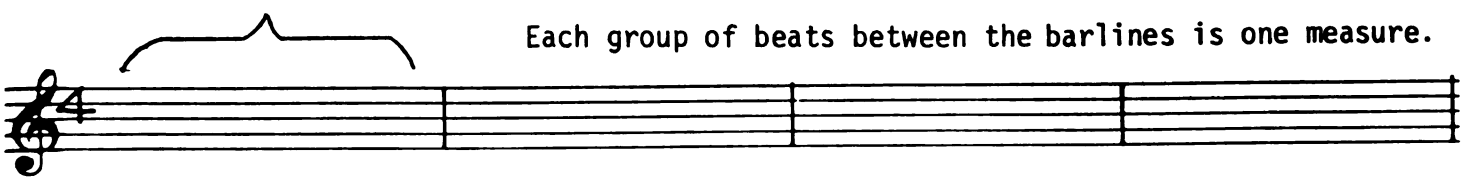
MEASURE

Work Problem 29.



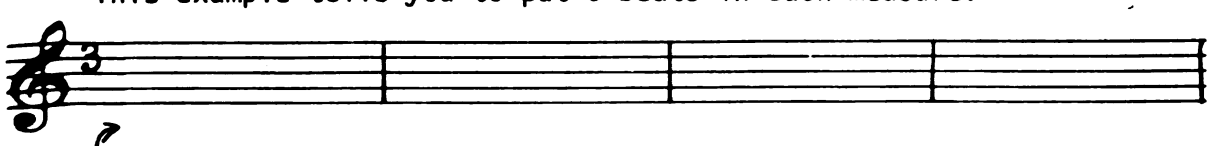
This is a measure.

Each group of beats between the barlines is one measure.



Work Problem 30.

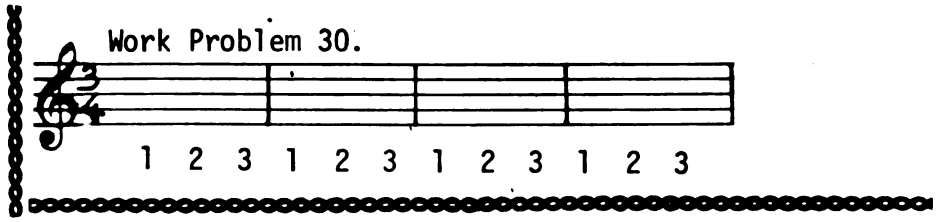
This example tells you to put 3 beats in each measure.



Write the counting in each measure.

31 TIME SIGNATURE

Work Problem 30.



In your music you will always find 2 numbers at the beginning of a song.

The two numbers at the beginning of a song are called the time signature or meter signature. Either name is correct; in this book time signature will be used.

In your first few months of music study you will learn three time signatures, $\frac{4}{4}$ - $\frac{3}{4}$ - and $\frac{2}{4}$. In these time signatures the top number tells you the number of beats in each measure of a song.

You will learn about the bottom number later in your music study.

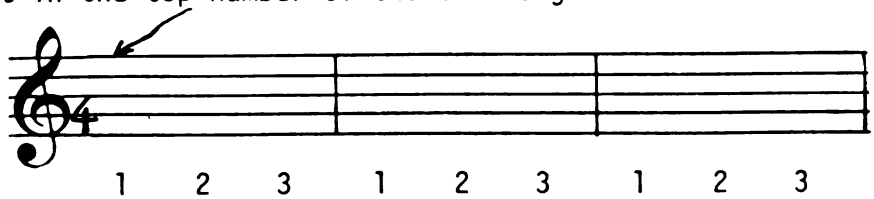
Question 31. The two numbers at the beginning of a song are called the _____.

32

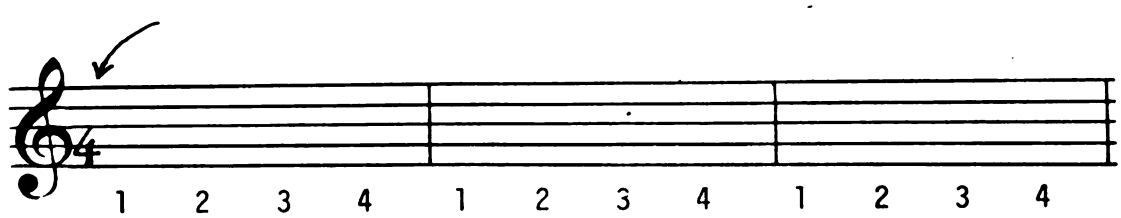
Answer 31. The two numbers at the beginning of a song are called the time signature or meter signature.

Put in the top number of the time signature in the two staffs below.

A.



B.

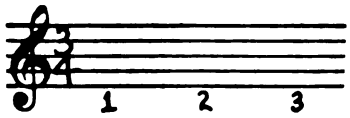


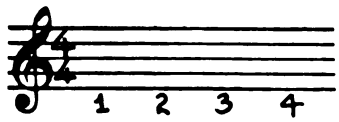
Question 32.

In example A. There are _____ beats in each measure.

In example B. There are _____ beats in each measure.

Work Problem 32.

A. 

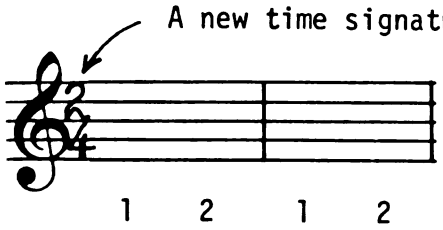
B. 

Answer 32.

In example A. There are 3 beats in each measure.

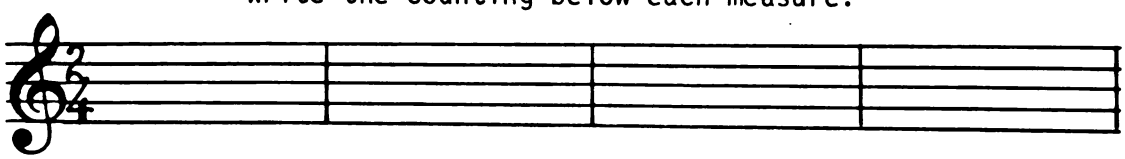
In example B. There are 4 beats in each measure.

33



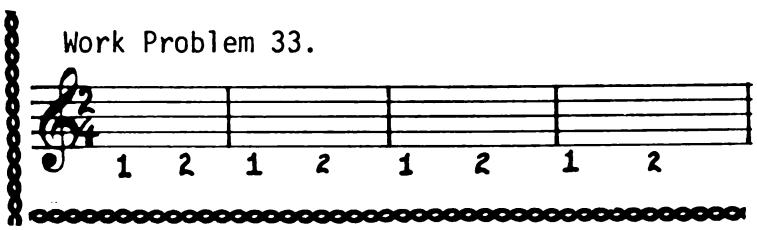
Work Problem 33.

Write the counting below each measure.



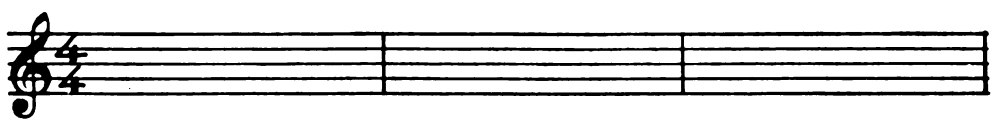
34

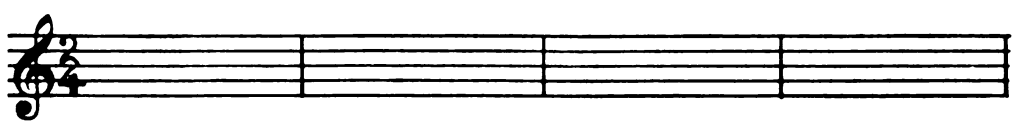
Work Problem 33.

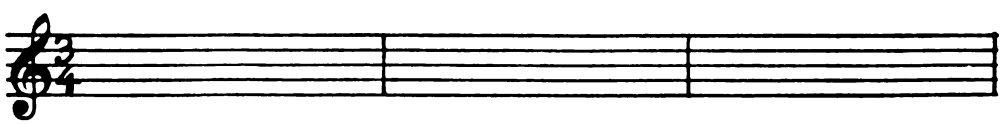


Work Problem 34.

In the examples below, write the counting below each measure, Be sure to check the time signature.

Example A. 

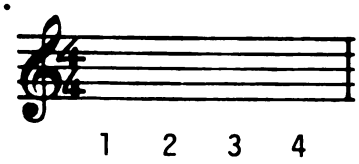
Example B. 

Example C. 

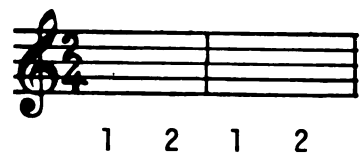
Work Problem 34.

The other measures in each example are the same as the first measure.

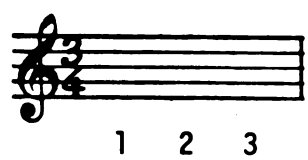
Example A.



Example B.



Example C.



35

THE TIME VALUE OR TIMING OF NOTES

The time value of a note is the number of beats that a note is played without stopping the tone.

When you first start working on an instrument, you play each tone many beats to help make a nice sounding tone.

One of the first time values you will use is the whole note. o

The whole note sounds without stopping for 4 beats. This is called holding the note for 4 beats.

Question 35. A. What is the note called that is held through 4 beats?_____

B. What is the time value of a note?_____

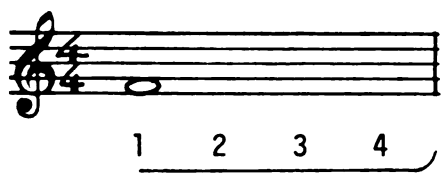
_____

Answer 35. A. What is the note called that is held through 4 beats? whole note

B. What is the time value of a note? the number of beats that note is played without stopping the tone.

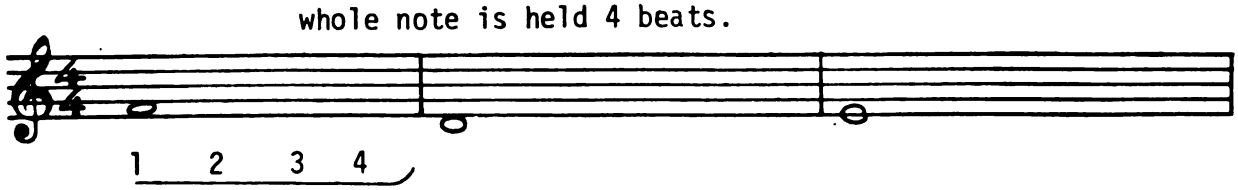
36

A whole note is held for 4 beats without stopping the tone.



The line under the counting shows that the whole note is held all 4 beats. Put this line in your work too.

Work Problem 36. Finish the counting below each whole note. Write the line under the counting to show that each whole note is held 4 beats.



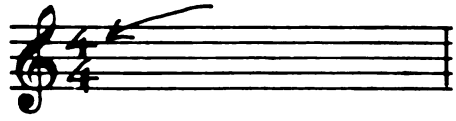
37

Work Problem 36.

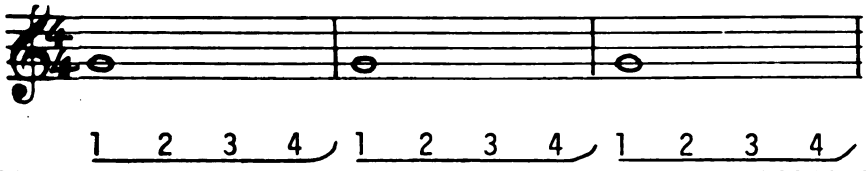
When there are 4 beats in each measure and the time signature is $\frac{4}{4}$, the whole note takes up the whole measure. This is an easy way to remember how many beats the whole note gets.

Work Problem 37. Put a whole note at the beginning of each measure like in the first measure. Write the counting below each note.

Question 37. Does the whole note take up the whole measure with this time signature? _____



Work Problem 37.



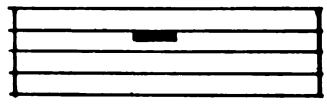
Answer 37. Does the whole note take up the whole measure with this time signature? yes

38

Music sometimes does not need all the instruments playing at once. When an instruments is not to play, it is called a rest.

WHOLE REST

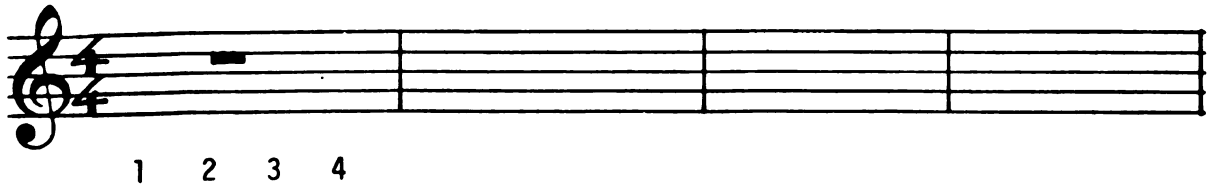
A whole rest looks like this.



The whole rest hangs below the 4th line.

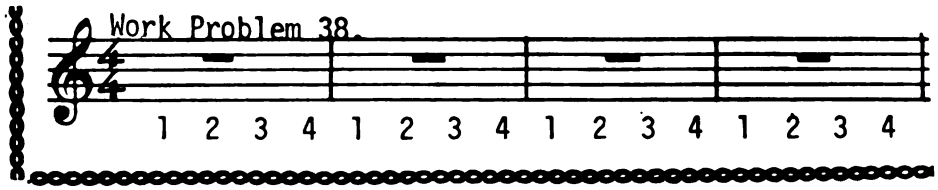
In $\frac{4}{4}$ time the whole rest calls for 4 beats rest. You will not play your instrument for 4 beats.

Work Problem 38. Make a whole rest in each measure - just like in the first measure.

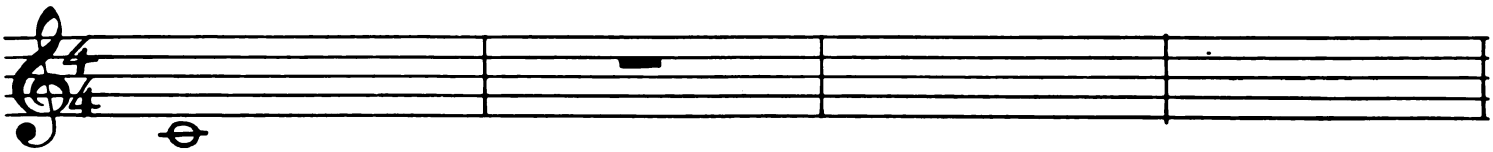


39

Work Problem 38.



Work Problem 39.



1 2 3 4 1 2 3 4

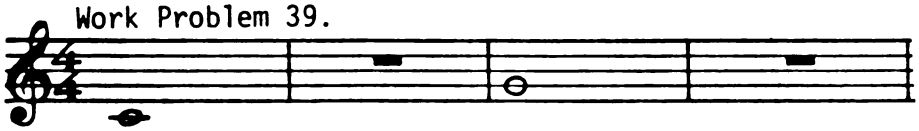
C whole note whole rest G whole note whole rest

These 2 measures are finished.

Finish the last 2 measures. Be sure to write a G whole note.

Question 39. Does the whole note and whole rest have the same time value?_____

Work Problem 39.



1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4

C whole note whole rest G whole note whole rest

Answer 39. Does the whole note and whole rest have the same time value?

yes

40

QUARTER NOTE

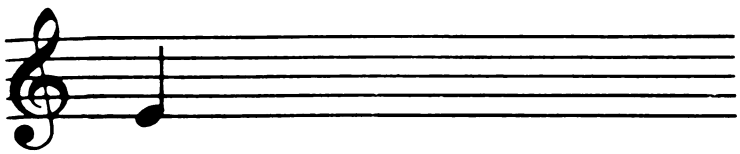
You have learned that the whole note is held through 4 beats, and the whole rest you don't play for 4 beats.

This is a quarter note.  It has a stem.

It is a filled-in or black note.

The quarter note is held only 1 beat.

Work Problem 40. Make 7 or 8 more quarter notes like the 1st note.



Question 40.

A. How many beats is the quarter note held?_____

B. Is the quarter note a filled-in note?_____

C. Does the quarter note have a stem?_____

Work Problem 40. (not shown on page 41.)

41

Answer 40. A. How many beats does a quarter note get? 1 beat

B. Is the quarter note a filled-in note? yes

C. Does the quarter note have a stem? yes

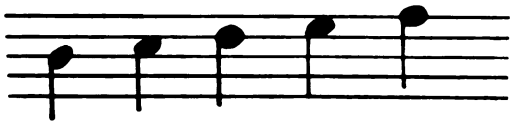
THE STEM

The whole note does not have a stem but all other time value notes do have a stem.

The stem being up or down does not change the time value of the note or its letter name.

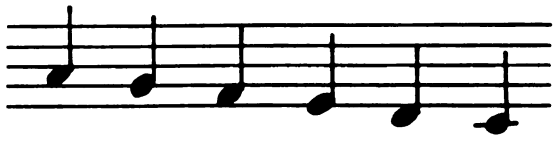
Example A.

All stems on notes on and above the 3rd line go down the left side of the note.



Example B.

All stems on notes below the 3rd line go up the right side of the note.



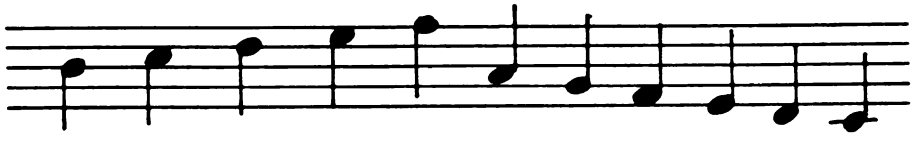
(Once in a while the stem on a 3rd line note goes up instead of down.)

Question 41. Does the stem being up or down change the time value of the note?_____

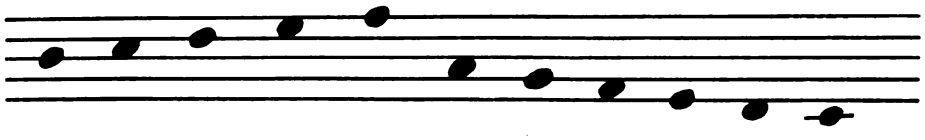
Answer 41. Does the stem being up or down change the time value of the note? no

42

Example 42.



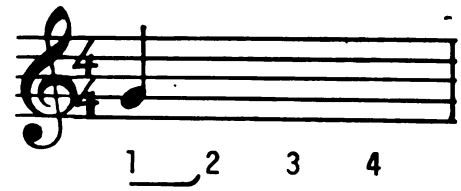
Work Problem 42. Put stems on the quarter notes below. Look at Example 42. if you can't remember if the stem goes up or down.



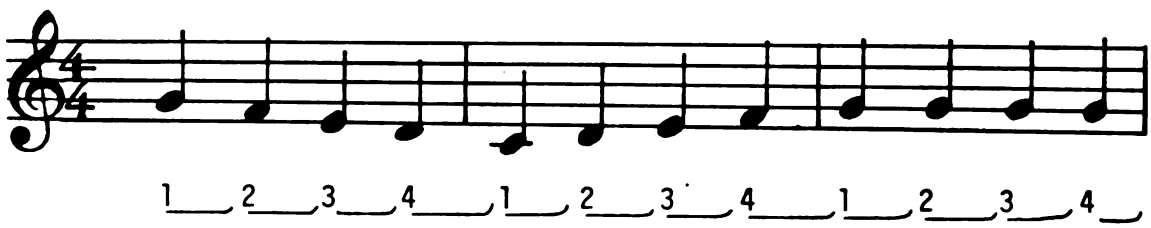
Work Problem 42. (not shown on page 43.)

43

In $\frac{4}{4}$ time the quarter note is held 1 beat.

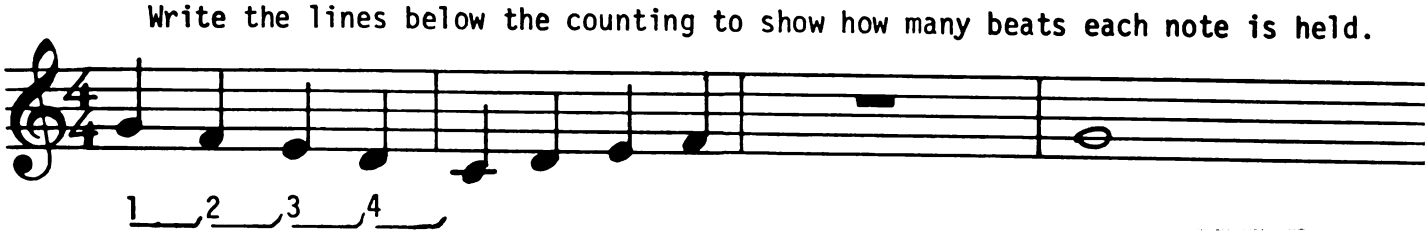


Notice that there is a quarter note for each beat in the example below.

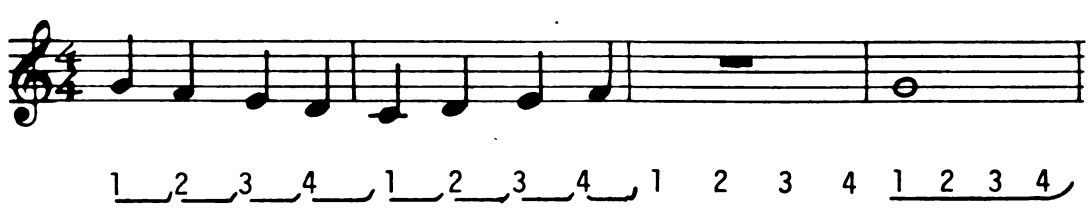


Work Problem 43. Finish the counting below the notes.

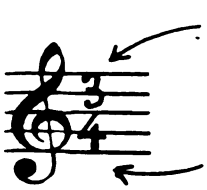
Write the lines below the counting to show how many beats each note is held.



Answer 43.

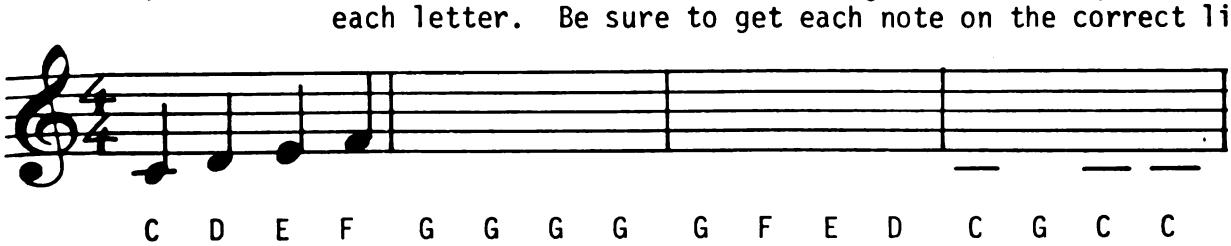


44



The 3 in the time signature tells you that there will be 3 beats in each measure.
The bottom 4 of the time signature tells you that a quarter note has the time value of 1 beat. a quarter note = 1 beat

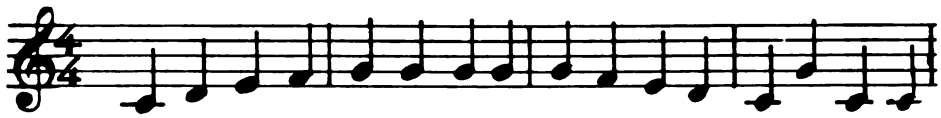
Work Problem 44. On the staff below, finish writing the correct quarter note above each letter. Be sure to get each note on the correct line or space.



Question 44. The bottom 4 of the time signature tells you that _____

_____

Work Problem 44.



C D E F G G G G G F E D C G C C

Answer 44. The bottom 4 of the time signature tells you that a quarter note has the time value of 1 beat.

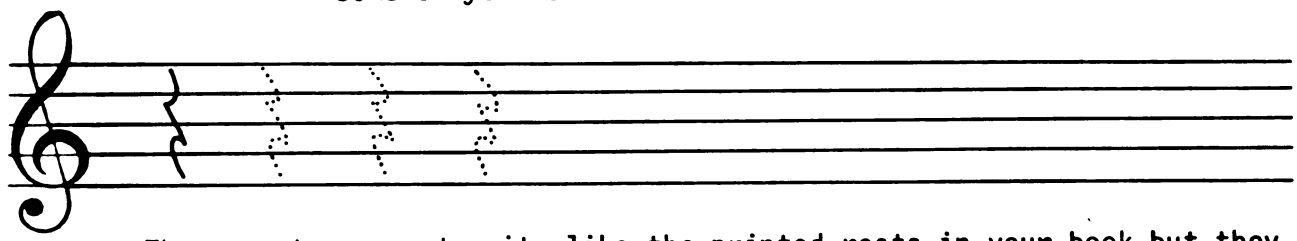
45

THE QUARTER REST

This is a quarter rest.
When you come to a quarter rest in $\frac{4}{4}$ - $\frac{3}{4}$ or $\frac{2}{4}$ time,

you will not play for 1 beat.

Work problem 45. Copy the dotted line to make some quarter rests and then make some of your own.



These rests are not quite like the printed rests in your book but they are close enough.

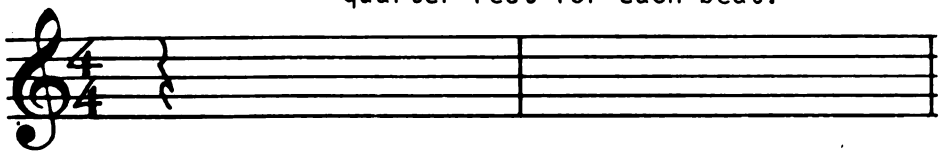
Question 45. What is the time value of a quarter rest in $\frac{4}{4}$ time?_____

Answer 45. What is the time value of a quarter rest in $\frac{4}{4}$ time? 1 beat

46

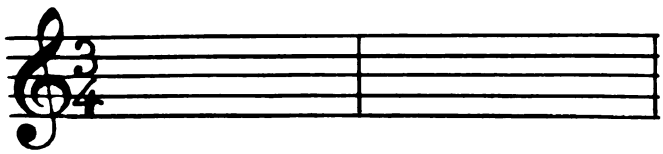
The quarter rest gives the player just 1 beat of not playing.

Work Problem 46. Fill in each measure with quarter rests. There should be a quarter rest for each beat.

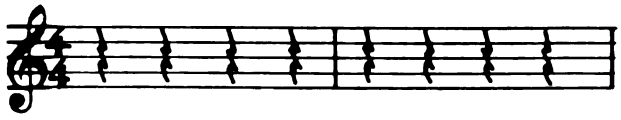


1 2 3 4 1 2 3 4

Question 46. How many quarter rests would you need to complete each measure below?_____



Work Problem 46.

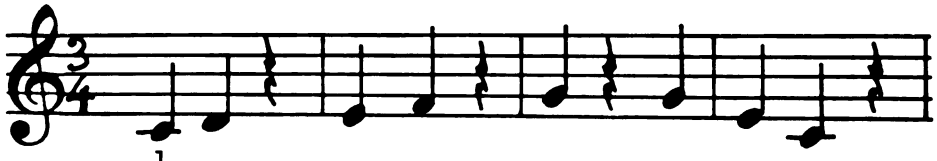


1 2 3 4 1 2 3 4

Answer 46. How many quarter rests would you need to complete each measure below? 3

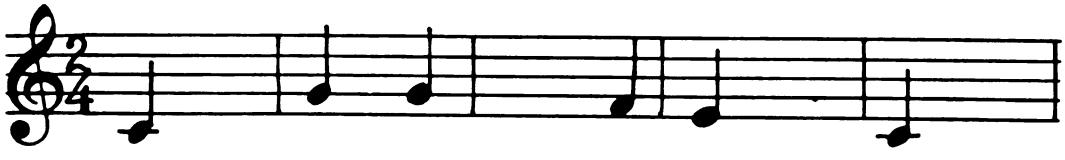
47

Rests often are mixed in with notes.



1 2 3 1 2 3 1 2 3 1 2 3

Work Problem 47. Write in rests above the beats that don't have a note.



1 2 1 2 1 2 1 2 1 2

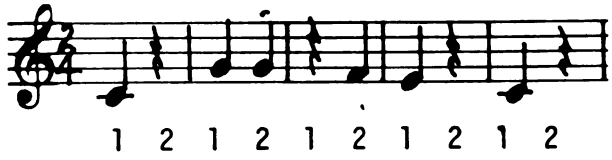
48

You have learned 2 time values.

whole note and whole rest = 4 beats

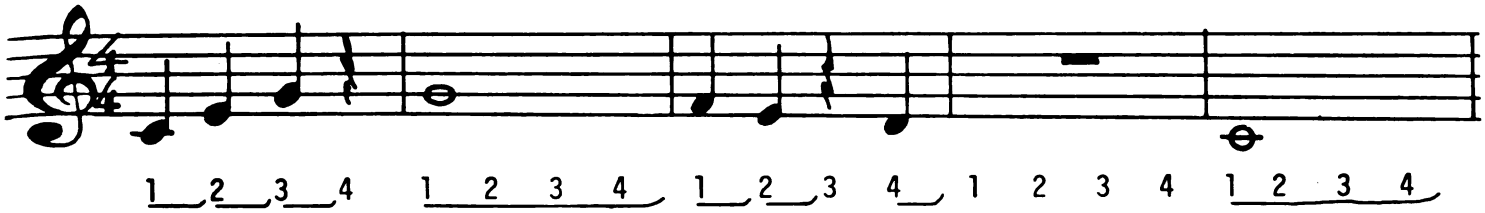
quarter note and quarter rest = 1 beat

Work Problem 47.



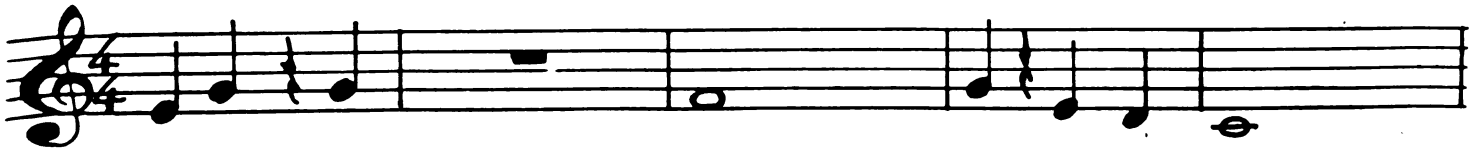
1 2 1 2 1 2 1 2 1 2

A song may use them all.

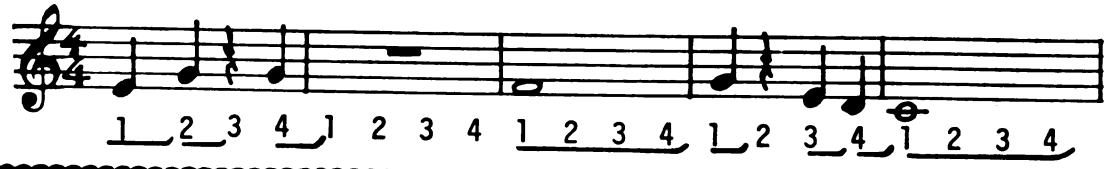


1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4

Work Problem 48. Write the counting below each note. Put the lines below the counting to show how many beats each note is held



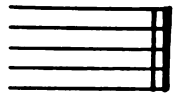
Work Problem 48.



49

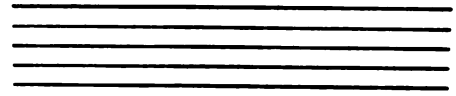
THE DOUBLE BAR

At the end of each song you will find a double bar.

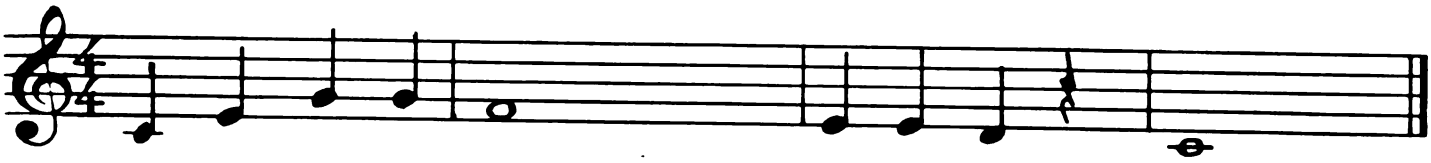


Work Problem 49.

Make a double bar on this staff.



Example 49.



Question 49.

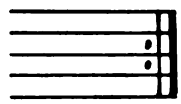
Does Example 49. end with a double bar?_____

50

Answer 49. Does Example 49. end with a double bar? yes

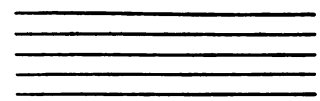
THE REPEAT SIGN

If the song is to be repeated two dots are placed by the double bars. This is called a repeat sign.

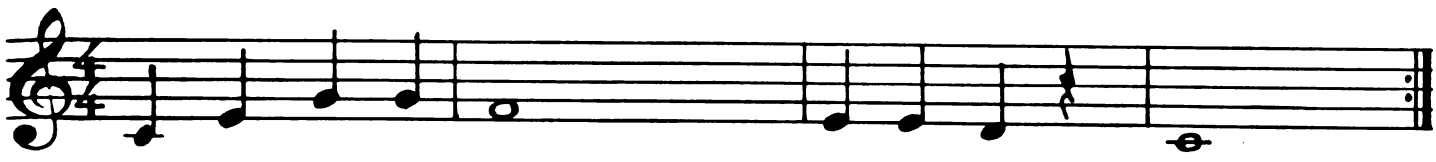


In your first 2 or 3 months of playing the repeat sign will send you back to the beginning of the song. As you become more advanced the repeat sign will be used in other ways.

Work Problem 50. Make a repeat sign on the staff below.



Example 50.

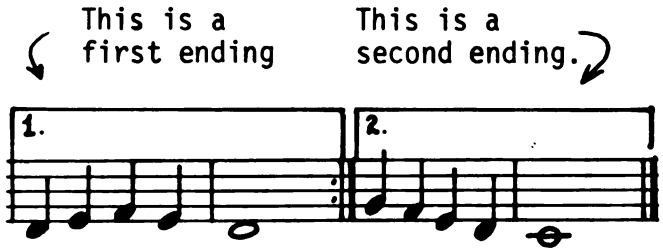


Question 50. Does Example 50. repeat?_____

51 FIRST AND SECOND ENDINGS

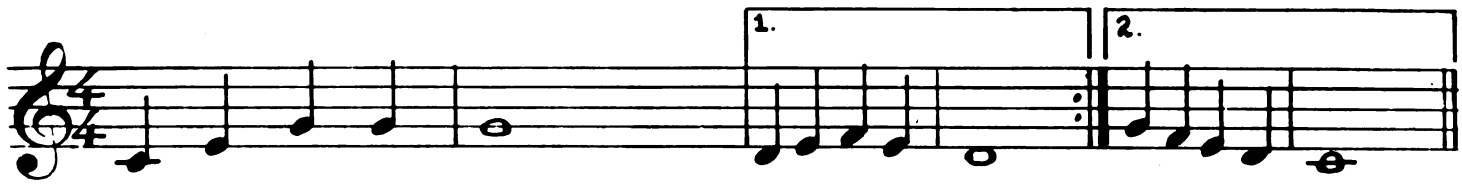
Answer 50. Does Example 50. repeat? yes

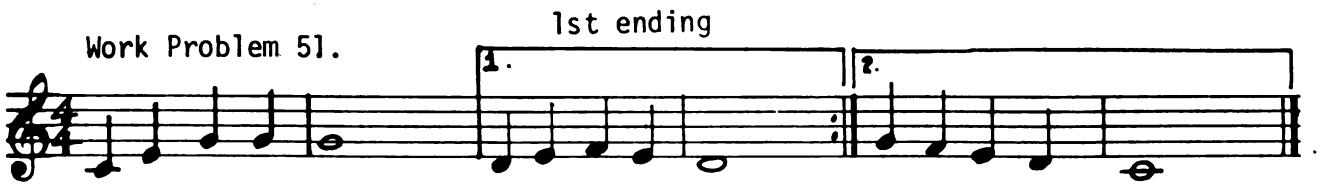
Sometimes a composer will want a song to repeat but he wants the song to end differently the second time.



The first time you play the song, you play the 1st ending and go back to the beginning. The second time you play the song, you don't play the measures in the 1st ending but play the measures in the 2nd ending instead.

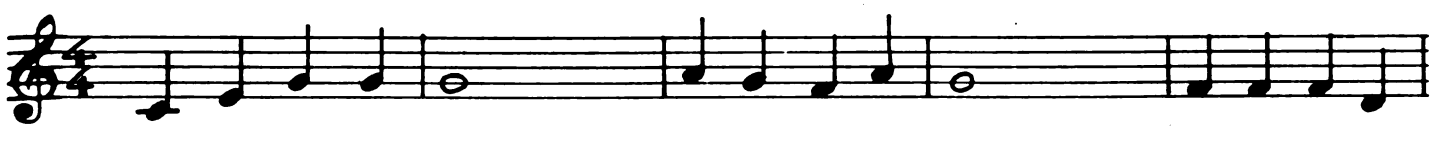
Work Problem 51. Write - 1st ending - above the 2 measures that make up the 1st ending.

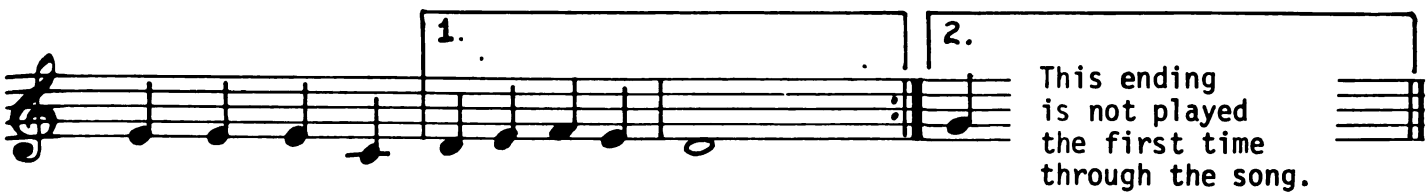




52

The song below has a 1st and 2nd ending. The first time through the song you would play until the repeat sign and then return to the beginning.





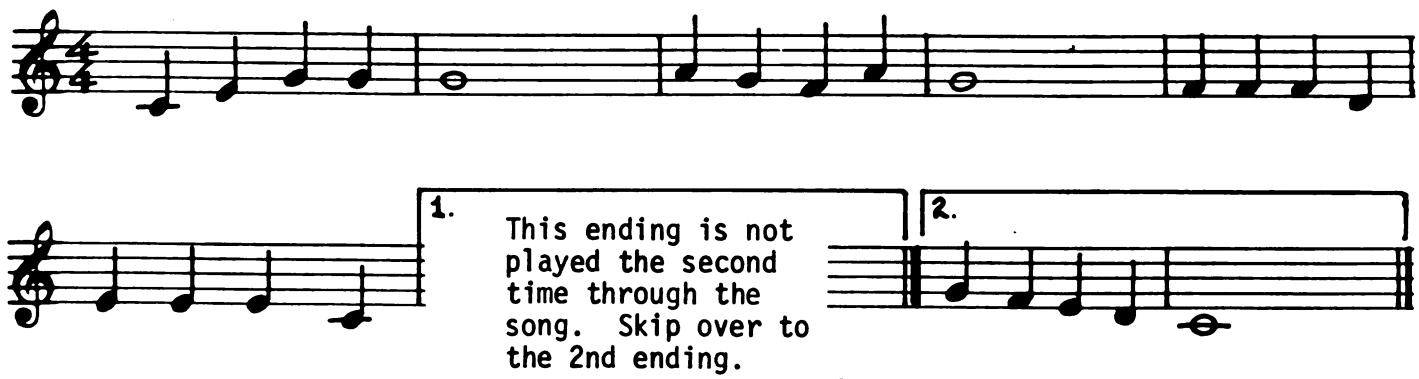
Question 52. Is the 2nd ending played the first time through the song?_____

Answer 52. Is the 2nd ending played the first time through the song? no

53

This is the same song as on page 52.

The second time through the song you will skip over the 1st ending and play the 2nd ending.



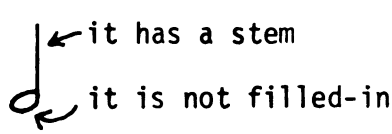
Question 53. Is the 1st ending played the second time through the song?_____

54

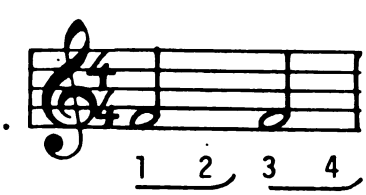
HALF NOTE

Answer 53. Is the 1st ending played the second time throught the song? no

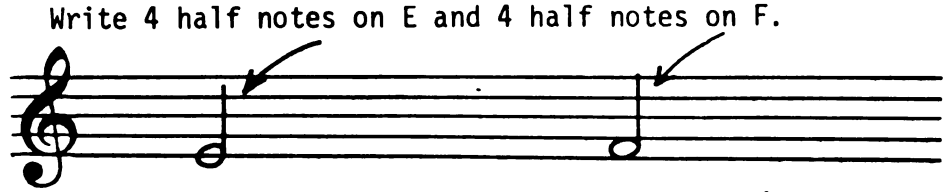
This is a half note



In $\frac{4}{4}$ time the half note is held 2 beats.

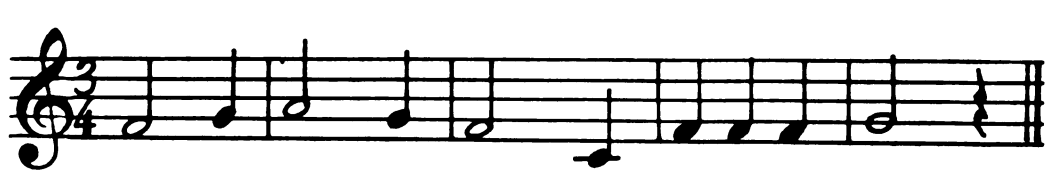


Work Problem 54. Write 4 half notes on E and 4 half notes on F.



Work Problem 54. (not shown on page 55.)

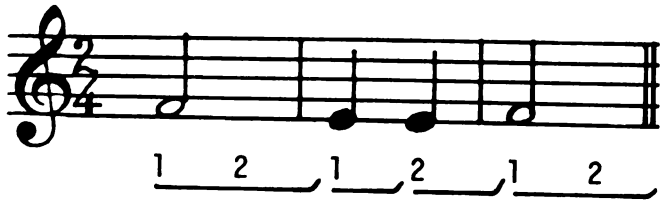
Question 54. How many half notes are there in the song below?_____



Answer 54. How many half notes are there in the song below? 4 .

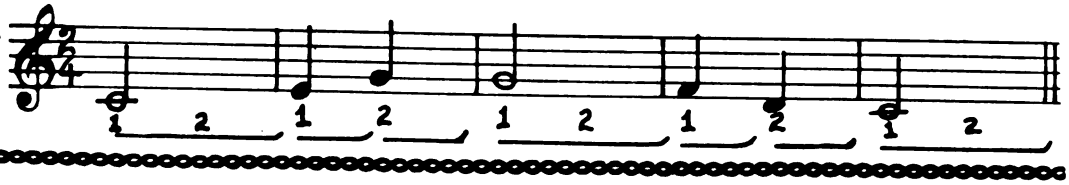
55

In $\frac{2}{4}$ time, the half note takes up the whole measure.



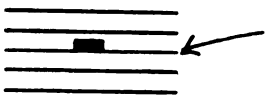
Work Problem 55. Put the counting below each note. Write the lines below the counting to show how many beats each note is held.

Work Problem 55.



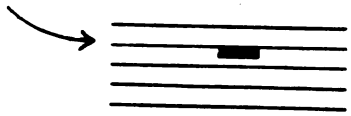
56

THE HALF REST

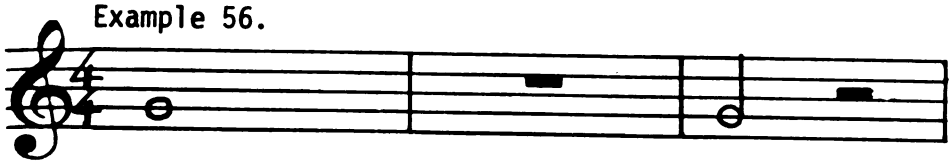


This is a half rest. It sits on the 3rd line. In $\frac{4}{4}$ time it has a time value of 2 beats

The whole rest hangs from the 4th line. These two rests look quite a bit the same.

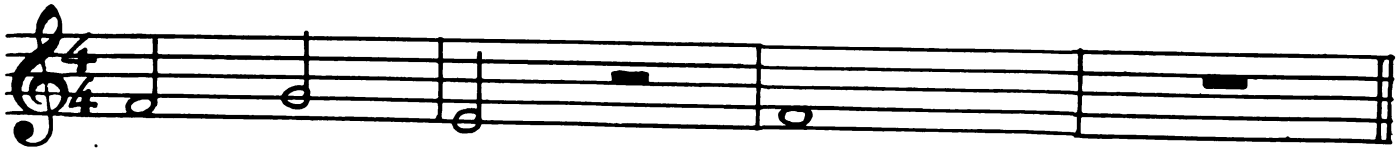


Example 56.

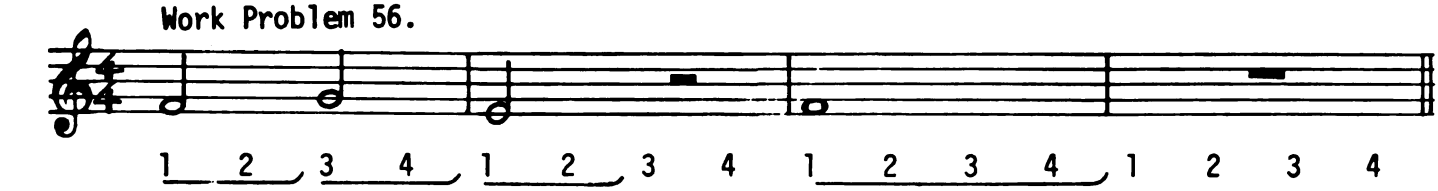


1 2 3 4 1 2 3 4 1 2 3 4

Work Problem 56. Put the counting below the notes and rests.

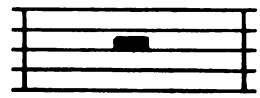


Work Problem 56.

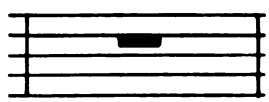


57 USING RESTS

The half rest sits on the 3rd line and has a time value of 2 beats.



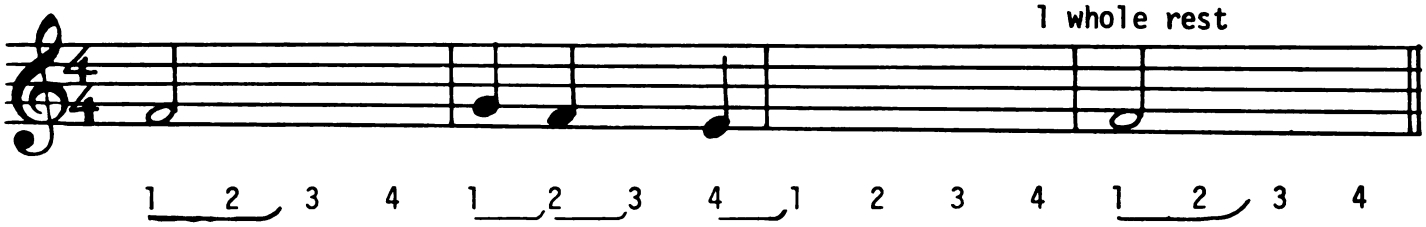
The whole rest hangs below the 4th line and has a time value of 4 beats.



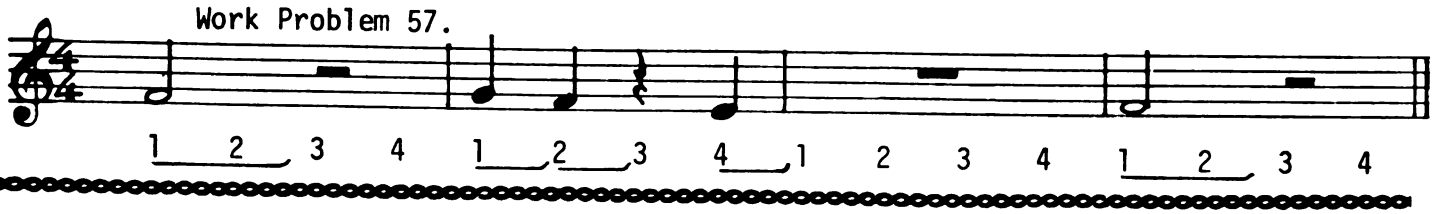
The quarter rest has a time value of 1 beat.

Work Problem 57.

In the measures below, add the rest that completes each measure. Each measure can have only 4 beats. You will need to use 1 quarter rest
2 half rests
1 whole rest



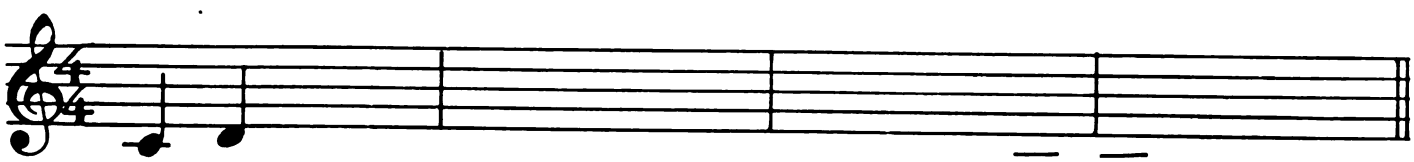
Work Problem 57.



58

Work Problem 58.

Write the note with the correct time value above each letter.



Finish writing quarter notes in measure 1.

Write half notes in this measure.

Write quarter notes in this measure.

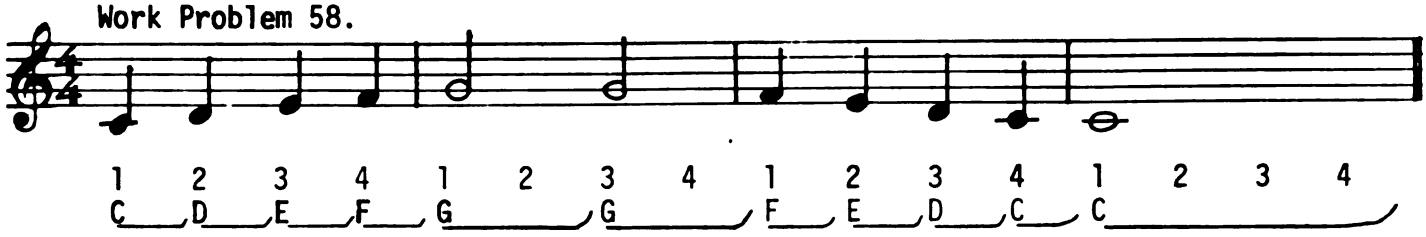
Write a whole note in this measure.

Question 58.

A. Does Work Problem 58. have a double bar at the end?_____

B. Does Work Problem 58. repeat?_____

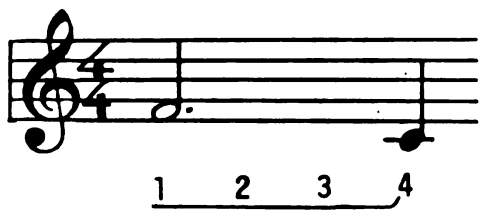
Work Problem 58.



Answer 58. A. Does Work problem 49. have a double bar at the end? yes
B. Does Work problem 49. repeat? no

59

THE DOTTED HALF NOTE



This is a dotted half note.

It has a stem.

It has a dot beside it.
It is not filled-in.

In $\frac{4}{4}$ time, the dotted half note has a time value of 3 beats.

A dot beside a note makes the note longer by adding half the value of the note.

In $\frac{4}{4}$ time a $\mathbf{d.}$ = $\mathbf{d}$ + 1 extra beat

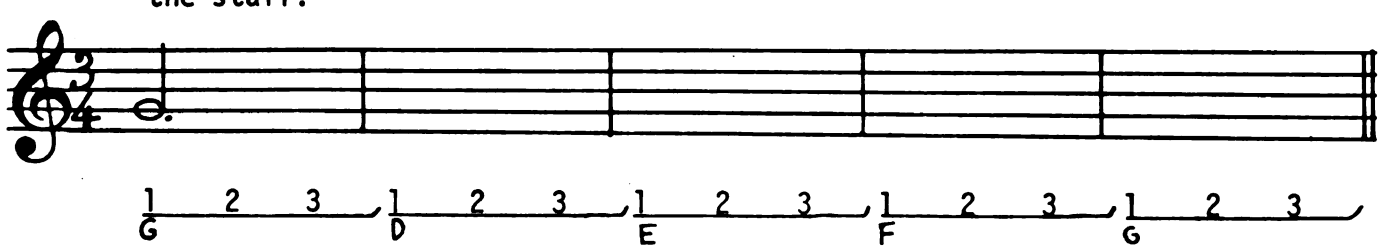
Question 59. In $\frac{4}{4}$ time, what is the name of the note that is held 3 beats?_____

Answer 59. In $\frac{4}{4}$ time, what is the note called that is held 3 beats? dotted half

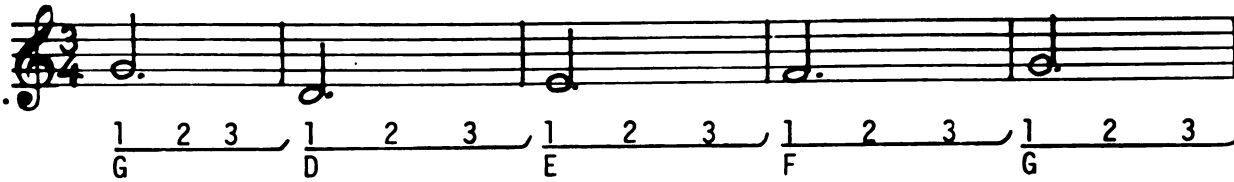
60

In $\frac{3}{4}$ time the dotted half takes up the whole measure.

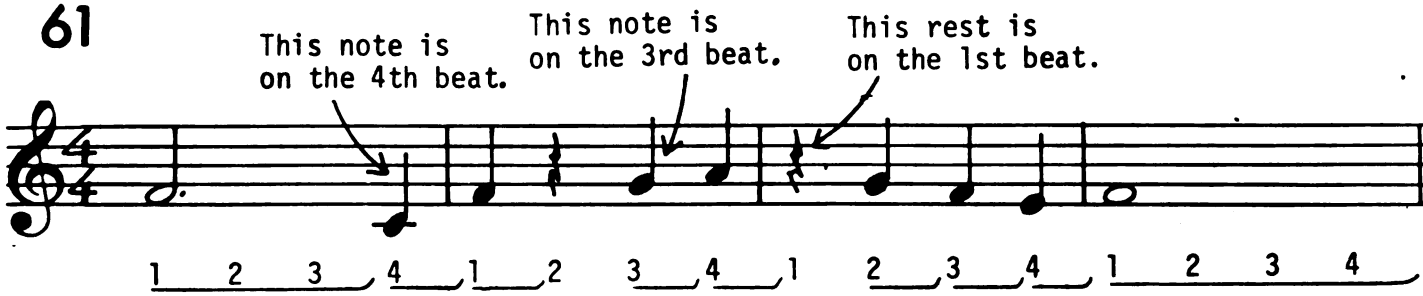
Work Problem 60. Put a dotted half note in each measure as called for by the letter below the staff.



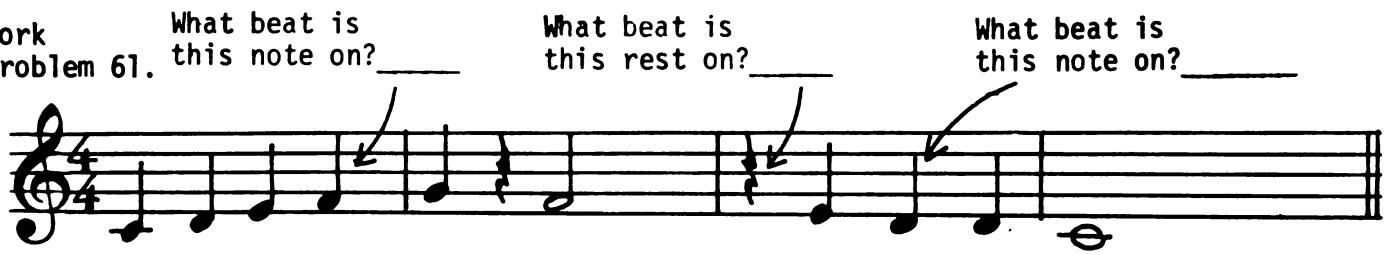
Work
Problem 60.



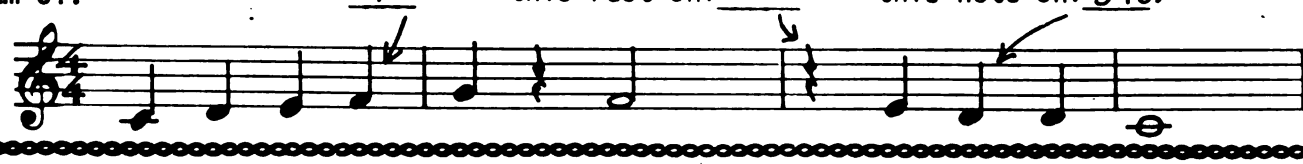
61



Work
Problem 61.



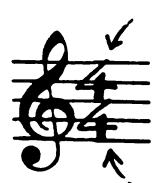
Work
Problem 61.



A SHORT TEST

62

1. The top 4 of the time signature tells you _____

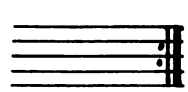


_____

2. The bottom 4 tells you that _____

_____

3. In $\frac{4}{4}$ time, how many beats does a whole note get? _____

4. If you came to this  at the end of a song, what would you do? _____

_____

63

Answers to 62. A SHORT TEST

1. The top 4 of the time signature tells you that there will be 4 beats in each measure. (or that the beats will be grouped in fours)

2. The bottom 4 tells you that a quarter note will have the time value of 1 beat (or the quarter note will get one beat)

3. In $\frac{4}{4}$ time, how many beats does a whole note get? 4 beats

4. If you came to a repeat sign at the end of a song, what would you do? go back to the beginning and start again.

64

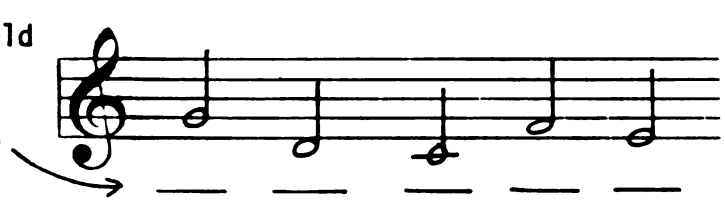
A SHORT TEST
(page 2)

5. A. Does a half note have a stem?_____

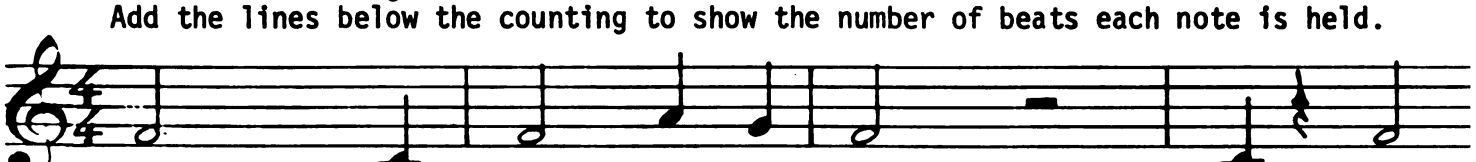
   B. Is the half note a filled-in note?_____

6. In $\frac{4}{4}$ time, the dotted half note is held _____beats

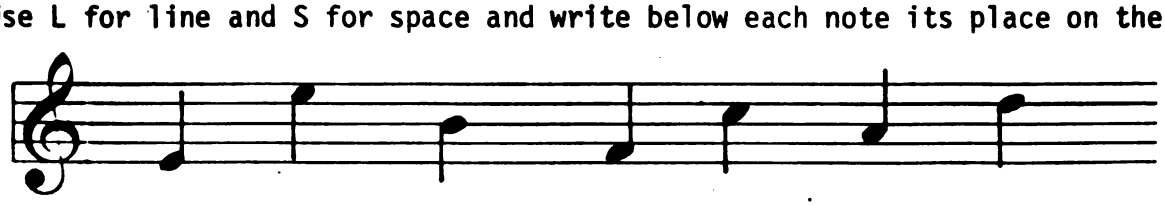
7. Write below each note, its letter name.



8. Write the counting below each note.
   Add the lines below the counting to show the number of beats each note is held.



9. Use L for line and S for space and write below each note its place on the staff.



65

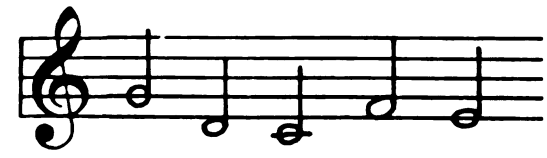
Answers to 64.

A SHORT TEST

5. Does the half note have a stem? yes
   Is the half note a filled-in note? no

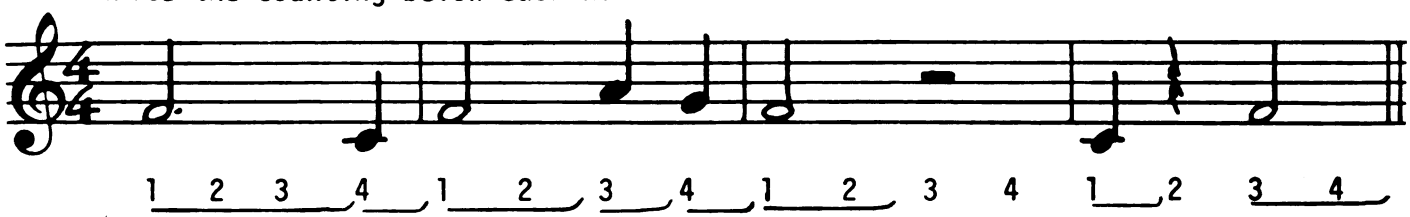
6. In $\frac{4}{4}$ time, the dotted half gets 3 beats.

7. Write below each note, its letter name.



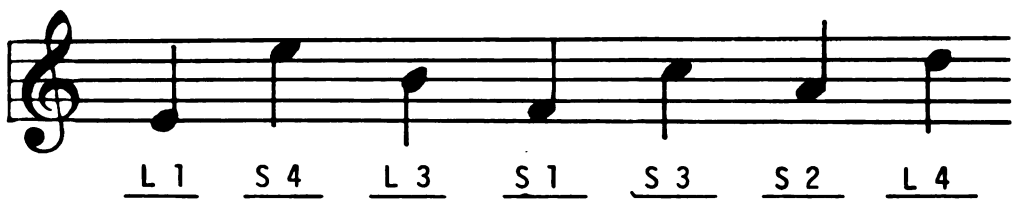
G D C F E

8. Write the counting below each note.



1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4

9. Use L for line and S for space and write below each note its place on the staff.



L 1 S 4 L 3 S 1 S 3 S 2 L 4

66

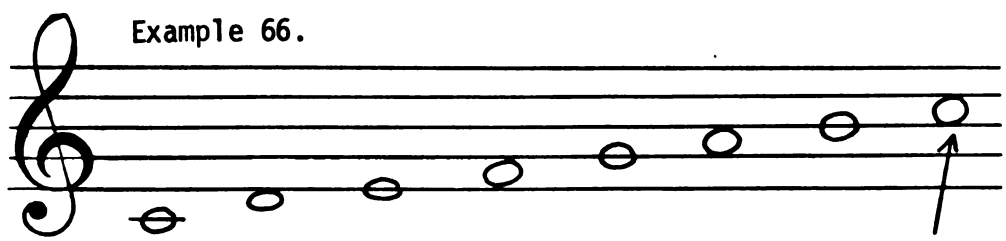
THE MUSICAL ALPHABET

The musical alphabet uses only the 7 letters from A through G and then starts with A again. - A B C D E F G A B C D E F G A and so on.

The notes in Example 66. are placed next to each other line, space, line, space, line space and so on.

Notice that the notes are in alphabetical order when placed this way.

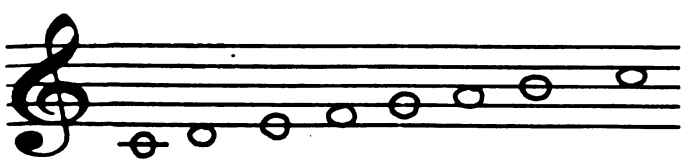
Example 66.



C line D space E line F space G line A space B line space

Work Problem 66.

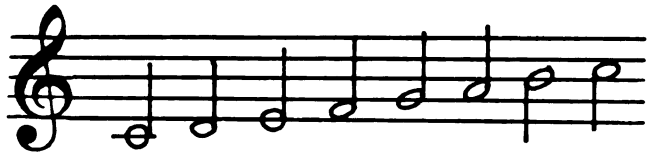
Write in the missing note names.



C ___ E ___ G ___ B ___

Question 66. What would you say the last note should be? _____

Work Problem 66.



C D E F G A B C

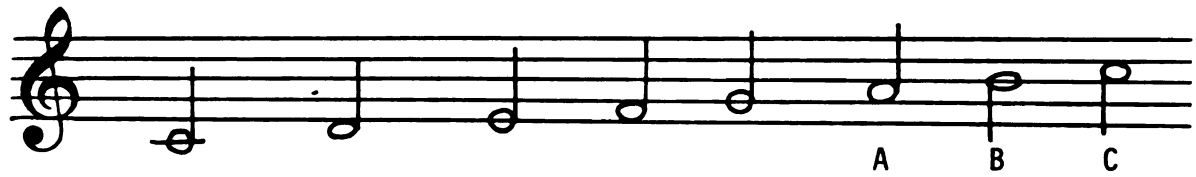
Answer 66.

What would you say the the last note should be? C

Work Problem 67.

On the staff below, write the line or space that A B and C are on.

67



A B C

Line 1 below staff | Space 1 below staff | L 1 | S 1 | L 2 | ____ | ____ | ____

Question 67.

Does the work problem above use up all the letters in the musical alphabet?_____

Work Problem 67.

A B C

S 2 L 3 S 3

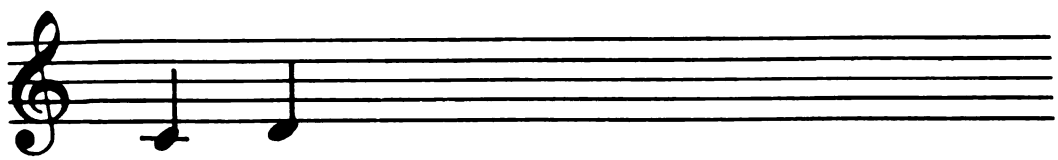
Answer 67. Does the work problem above use up all the letters in the musical alphabet? yes

---

68

Work Problem 68.

Finish writing the group of notes from C to C in Quarter notes.

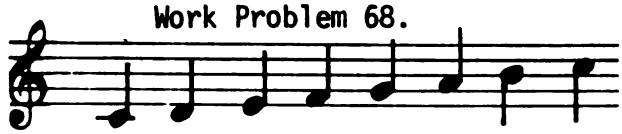


C D E F G A B C

Question 68.

Are the group of notes above in alphabetical order?_____

Work Problem 68.



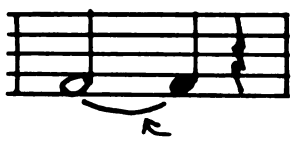
C D E F G A B C

Answer 68. Are the group of notes above in alphabetical order? yes

THE TIE

69

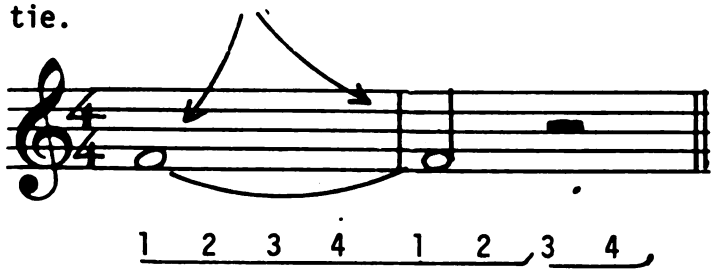
Sometimes a composer will want a note to be held longer than 1 measure.



Any note can be made longer by tying it to another note which is the same sound as the first note.

This is a tie

Both notes must have the same letter name or sound to make a tie.



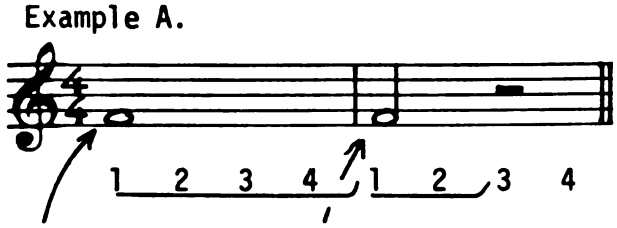
1 2 3 4 1 2 3 4

Question 69. Must both notes in a tie have the same letter name or sound? _____

Answer 69. Must both notes in a tie have the same letter name or sound? yes

70

Example A.

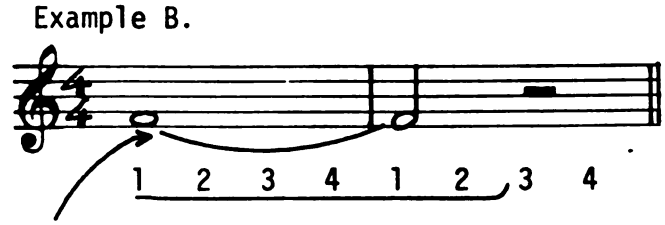


1 2 3 4 1 2 3 4

This note is held 4 beats.

This note is held 2 beats.

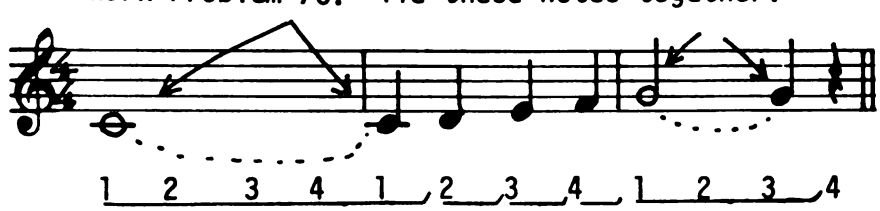
Example B.



1 2 3 4 1 2 3 4

The tie makes the two notes into one long tone, held 6 beats.
(4 beats + 2 beats = 6 beats)

Work Problem 70. Tie these notes together.

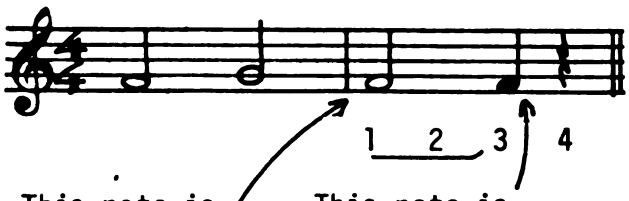


1 2 3 4 1 2 3 4 1 2 3 4

71

Work Problem 70.

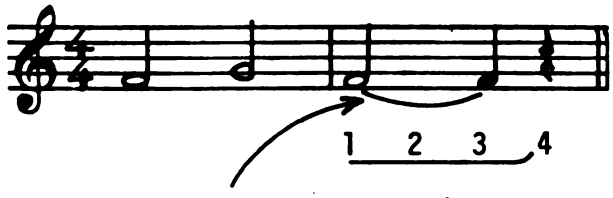
Example A.



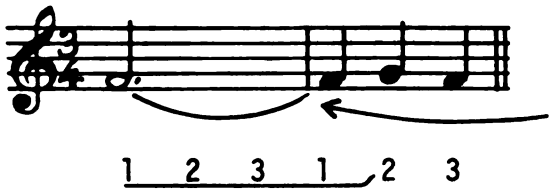
This note is held 2 beats.

This note is held 1 beat.

Example B.



The tie makes the two notes into one tone held 3 beats.
(2 beats + 1 beat = 3 beats



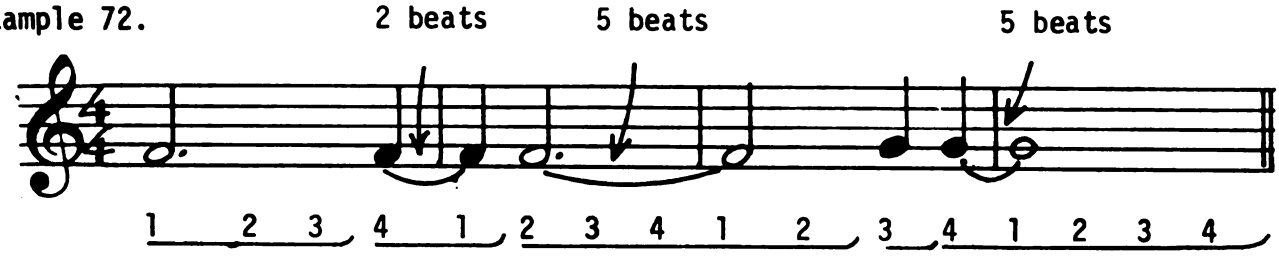
Question 71.
This tie makes the two notes into one tone held_____beats.

72

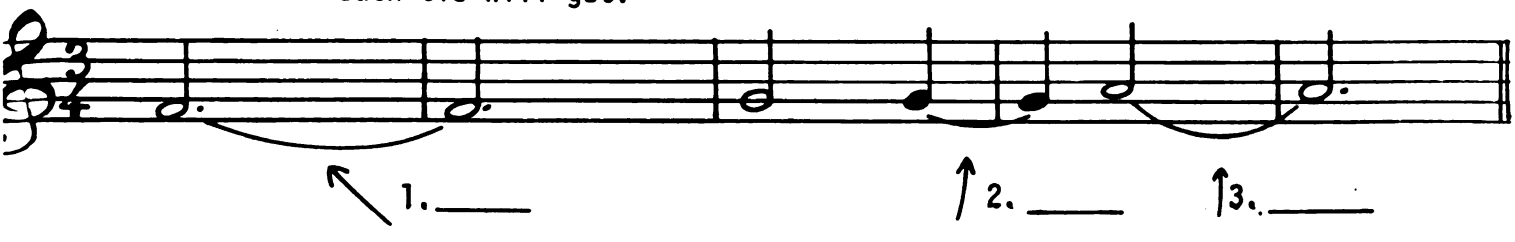
Question 71. This tie makes the two notes into one tone held 4 beats.

Add the time value of the two tied notes together to find out how many beats to give the tone.

Example 72.



Question 72. Give the number of beats each tie will get.



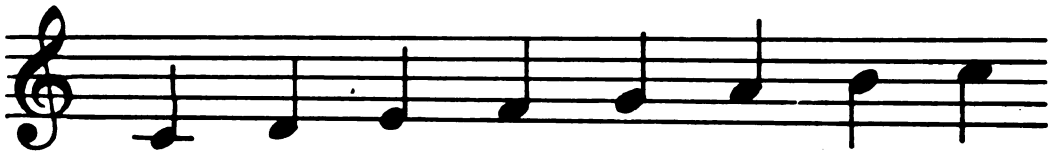
Answer 72. Give the number of beats each tie will get? 1. 6 beats 2. 2 beats 3. 5 beats

73

REVIEW QUESTIONS

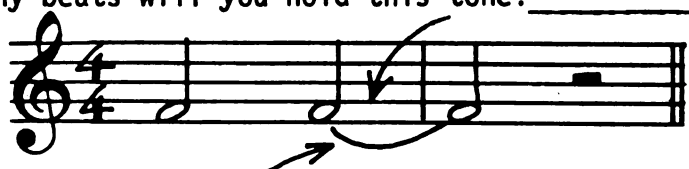
A. Does the stem being up or down change the time value of the note?_____

B. Write below each note its letter name.



_____ _____ _____ _____ _____ _____ _____ _____

C. How many beats will you hold this tone?_____



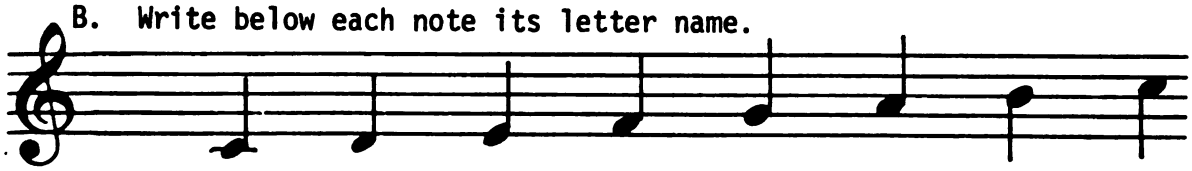
D. What is the curved line called?_____

74

Answers to REVIEW QUESTIONS

A. Does the stem being up or down change the time value of the note? no

B. Write below each note its letter name.



C D E F G A B C

C. How many beats will you hold this tone? 4 beats

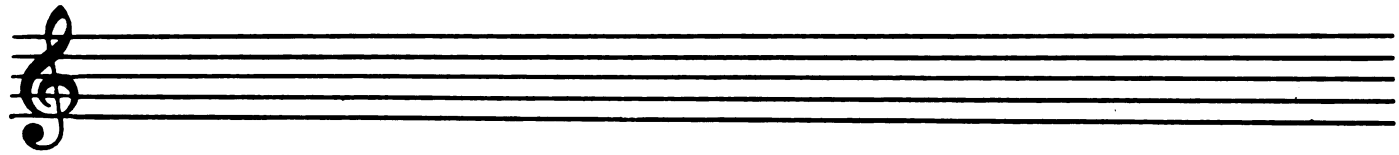
D. What is the curved line called? a tie

75

Write a song using what you have learned so far.

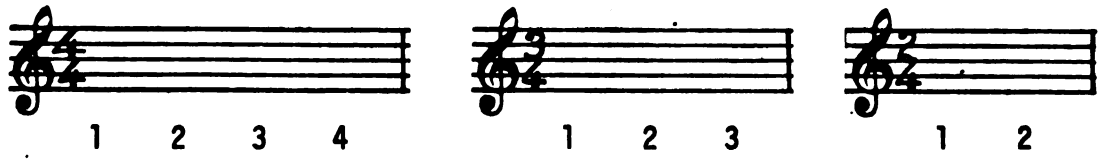
Start your song on C and end on C.

Use any one of the time signatures you have learned.



76

Time signatures (meter signatures) that you have worked with in this book.



Note values in $\frac{4}{4}$ - $\frac{3}{4}$ and $\frac{2}{4}$ time.

Whole note	𝅝	1	2	3	4	= 4 beats
Dotted half	𝅗𝅥.	1	2	3		= 3 beats
Half note	𝅗𝅥	1	2			= 2 beats
Quarter note	♩	1				= 1 beat