A STUDY OF MUSIC: APPLICATION OF A HIERARCHICAL MODEL IN THE LEARNING OF SELECTED HARMONIC ELEMENTS

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MYRON D. COLBER

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This is to certify that the

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ABSTRACT

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Background and Purposes

In the winter quarter of 1970, an experimental study was conducted at Michigan State University with 40 elementary education majors participating. The model basic to this investigation was formulated by the psychologist/researcher, Robert M. Gagné, and is based on observations about learning and the classification of these experiences. The hierarchical conditions of learning that Gagné presents stems from the idea that complex forms of learning require simpler forms of behavior as prerequisites.

The main purpose of this study was to observe the change in achievement level attributable to the particular sequence of programed material presented to each of the four groups. Specific purposes branching from the central objective were to:

1. Determine the effect of an abridged auto-instructional program on a music learning task.

2. Examine the results of a scrambled instructional series when applied to music learning.
3. Study the influence on retention when scrambled and/or abridged programed material is used.
4. Learn if an ordered sequence of instruction in music is superior to scrambled or incomplete programs.

Procedures

1. Programed material was devised to assist the participants in learning the specified harmonic elements.
2. Four self-constructed tests were developed to measure achievement on the instructional material both prior to and after the treatment period. Parts of two Colwell Music Achievement Tests were also used.
3. The 40 college students, enrolled in a required course for elementary education majors, were randomly assigned to four numerically equal groups; each group received and completed a full, ordered program, a scrambled program, an abridged program, or a scrambled/abridged program.
4. The treatment involved completion of the assigned programed material; this took place during seven class hours (350 minutes) over a 15 day period.
5. Twenty-one subjects voluntarily returned 13 weeks after the experiment to take one of the four devised tests; the test was used to measure retention.
6. An analysis of covariance was the means of testing the hypotheses.

Hypotheses and Results

1. The group exposed to the full, ordered sequence of material will have a greater increment of learning than the other groups as measured by the posttest. Rejected.
2. There will be no difference in achievement between the students exposed to the full, ordered sequence of material and the students experiencing the full, scrambled sequence as measured by the retention test. Accepted.
3. The students exposed to an incomplete sequence, whether ordered or scrambled, will not differ in achievement on the retention test. Accepted.
4. The students that are exposed to the full sequence of material, whether ordered or scrambled, will show a higher achievement on the posttest than the students experiencing an abridged sequence. Rejected.
5. The students undergoing a scrambled/abridged program series will have a lower achievement than the other groups as measured by the posttest. Rejected.
6. There will be no difference in retention levels among the four groups on the delayed retention test. Accepted.

Conclusions

Based on the results of this investigation, the following conclusions are admissible:

1. When nonmusicians undergo a series of programed material, a reordering of the blocks within the program has no statistically significant effect on the overall learning.

2. Providing all facts necessary for mastering a specific task are present, the omission of additional information does not impair students' achievement level. An abridged auto-instructional program does not necessarily inhibit learning.
3. A combination of scrambling and abridging a programed sequence of learning has no statistically significant detrimental effect on terminal achievement. This assumes that scrambling does not take place within blocks nor that abridgement removes vital information.
4. Retention level is not adversely affected at a statistically significant level by scrambling segments of a programed series. The implication is that items within segments remain in order.
5. Students more than likely can overcome the effect of omitted material in an auto-instructional program, even though the task is compounded by scrambling segments of instruction. The retention level is equal for students whether the program is scrambled or abridged.

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CHAPTER I

THE PROBLEM

Need for Study

Considerable research has been and is being done in the area of human learning. The quest has ensued from many different angles: how much can be learned, when is the best time, why does a person learn, what learning is possible, how long can this learning be retained, and so forth. The search has been extensive in some disciplines, but meager in others.

In general, psychological or learning research has not been an item of intense interest to teachers of music. Many disciplines have seemed to profit from research by applying findings to educational practices. It appears, therefore, that basic research can provide insights into more effective and efficient means of instruction. If this is true music education should increasingly be engaged in the search for evidence fundamental to music learning.

From observation and experience there appears to be a barrier between scientific inquiry and the arts. The performing and teaching musicians are not called upon to think scientifically although they may use some scientific

approaches in solving musical problems. The avoidance in applying scientific thought to musical situations may be due chiefly to the fact that few musicians are oriented in the sciences and develop a basic mistrust and prejudice against them. It is understandable that such a musician would naturally avoid the systematic inquiry of experimental research. This may be a partial answer to the fact that there is little research which combines scientific inquiry and music. This lack needs to be met to take advantage of improvements that would accrue from such investigations.

The need for this study and others like it are justifiable from another viewpoint. Music is basically a nonverbal medium whereas other fields of study in which the majority of research is done are verbal in nature. It is probable that similar experiments in music and a verbal discipline would yield dissimilar results. Conversely, it is not unrealistic to assume that the procedures used to produce findings based on nonverbal (music) research could be duplicated in an otherwise verbal discipline and result in valuable information for that field of study. The need exists for a mutual sharing of research between music and other studies so that all may profit from the benefits.

It is self-evident that an improvement in both teaching and learning would be most welcome in the music education process. The responsibility of initiating changes resulting in improved teaching and learning rests on the

teaching musicians. As long as there is a probability that the teaching/learning process in music can benefit by application of methods and procedures found successful in other areas, a necessity exists to research every possibility.

This study has been undertaken with the expectancy that the findings will assist in understanding the processes of music learning. The attainment of this goal would contribute much to the music education enterprise. The learning model investigated is widely accepted in the academic community and has had considerable research application in other subject fields.

Discussion of Research Model

The model basic to this investigation has been formulated and presented by the psychologist/researcher, Robert M. Gagné (1965). The emergence of Gagné's model is based on observations about learning and the classification of these experiences. The focus is on changes in behavior due to learning and not attributable to maturation. The conditions of learning that he has categorized into eight types of tasks is not to be construed as a theory of learning. Gagné does, however, draw upon many theories of learning to define and describe his hierarchical model. He relates Signal Learning (Type 1) to the work of Guthrie, Mowrer, and Kimble. Stimulus-Response Learning (Type 2) he associates with Pavlov and Skinner. Gilbert provides the background for Chaining (Type 3) while Verbal Association Learning (Type 4)

draws upon the research of Ebbinghaus, Jensen, Jenkins and Underwood. Multiple Discrimination (Type 5), Concept Learning (Type 6), Principle Learning (Type 7), and Problem Solving (Type 8) comprise the four higher levels of Gagné's stratified system. Detailed definitions of the eight types of learning are presented in Chapter II and include musical examples relating to each level.

A survey reveals that the bulk of Gagné's writings and research based on his model involves verbal learning. This is natural in that verbal communication is the means of information exchange in the academic and research community. As mentioned in the previous section, music is basically nonverbal in nature; however, verbal communication is the vehicle by which music learning takes place. The higher the level of learning on Gagné's model, the greater is the dependency on verbal communication. Available literature also indicates that a greater frequency of overlapping and simultaneity of learning tasks exists as the higher levels of Gagné's model are practiced. This is not to say that Principle Learning (Type 7) employs the lower six levels simultaneously. Gagné himself has questions and reservations regarding the sequence of levels in achieving learning above the Signal type.

The thrust of Gagné's system is aimed at planning and managing instruction and only indirectly at teacher/student interaction, motivation, establishment of attitudes and

values, creativity, and mode of instruction. As any teacher knows, there is great value in designing the subject content to match the student's background and capabilities. This is the strength of Gagné's model: it is a method of sequencing instructional material to enable a student to move from his level of understanding to a higher level of knowledge by mastering a succession of logically structured learning tasks equal to his capabilities. This principle could apply to many methods, i.e., lecture, discusssion, assigned reading, programmed instruction and audio-visual media. Finally, direct application of the model is the possibility of evaluating student learning from the material to which he was exposed. By this the teacher may evaluate his success in structuring learning and the student may know what knowledge he has achieved.

The principles discussed in this section are felt to be applicable to the study of music, whether it be individual or mass instruction, verbal or nonverbal, performance or academic in nature. It is the intent of this study to show the value of relating Gagné's model to an aspect of music study.

Briefly stated, the model that Gagné presents is formulated from the idea that complex forms of learning require simpler forms of behavior as prerequisites.

Purpose

The main purpose of this study is to determine the change in achievement level attributable to the effect of programed instruction in a music learning situation. Stemming from this main objective is the investigation of a number of specific questions that pertain to scrambling and/or omitting portions of sequenced learning material. Harmonic elements, as related to the levels of Gagné's hierarchical model, are used as the musical means to determine the effect of a scrambled and/or incomplete sequence on learning and retention. Does the order of presentation effect a student's learning? Can the "mind bridge the gap" when certain material is omitted from an instructional sequence? What is the resultant retention efficiency when a portion of a body of knowledge is left out or the order of presentation is scrambled? This study attempts to answer these types of questions and presents statistical findings based on this search. Implicit in this investigation, but not specifically reported, is the objective of determining whether learning models can be applied to music study, and whether a hierarchical system can be employed in teaching music.

Hypotheses

Testable forms of the six hypotheses are contained in Chapter III. For introductory purposes, the hypotheses stated in broad, general terms are:

1. The group exposed to the full body of material in original sequence will have a significantly higher achievement than the other groups.
2. There will be no difference between groups that receive the full body of instruction even though the order of presentation is scrambled.
3. There will be no difference between the two student groups that have a portion of the programed material omitted even though the sequence may vary.
4. The subjects exposed to a full sequence of material, whether ordered or scrambled, will show a greater increment of learning than will subjects experiencing an incomplete sequence.
5. The students who are exposed to an incomplete and scrambled body of instruction will have the lowest achievement of all groups.
6. There will be no difference in retention levels among the four groups.

Definition of Terms

EGRULE--a deductive approach to learning; from the general to specifics--from example to rule

Hierarchical task--a task where mastery of each successive part is a prerequisite to mastery of the next part

Knowledge--that inferred capability which makes possible the successful performance of a class of tasks that could not be performed before the learning was undertaken (Gagné, 1962)

Productive learning--the kind of change in human behavior which permits the individual to perform successfully on an entire class of specific tasks, rather than simply on one member of the class (Gagné, 1962)

RULEG--an inductive method of structuring learning; proceeding from the specific to the general--from rule to example; discovery method

Limitations

The subjects taking part in the study were bachelor degree candidates enrolled in one section of a required music course for elementary education majors. A survey of the students involved in the experiment revealed a high proportion of women, therefore, a comparison of male and female achievement levels was not possible. The total treatment time was 350 minutes divided into seven equal sessions over a two week period.

The intent of the study is limited to the development of the ability to visually, aurally, verbally, and in performance, identify major and minor triads and their intervallic components. It was not presumed that the programed material developed for this study would lead to mastery of the subject matter. The program was devised by the researcher to facilitate control over the order in which material was presented to the experimental groups. Too, it must be understood that the programed series was adjunctive to the lectures, piano and practice labs and instructional tapes that formed the thrust of the course.

Over-view of the Thesis

In the following chapter, literature and the research model relating to this study are reviewed. A study similar to this one, but dealing with rhythmic rather than harmonic elements, is closely inspected. Studies in other disciplines but guided by like objectives are reviewed.

In Chapter III the design of the study is discussed. This will include various characteristics of the population, the instruments employed as pre- and post-treatment measures, and the structure and schedule of the experiment. Comment is made regarding auto-instructional material. The testable hypotheses and means of analysis also appear in Chapter III.

An analysis of the results of the study are presented in the fourth chapter and follow the order of the hypotheses as established in Chapter I. An interpretation of the outcomes of testing the hypotheses, statements of significance, plus a summary conclude this chapter.

The final summary and conclusions will be submitted in Chapter V. A focus on the major findings of the research, discussion of the relationship of these findings to Gagné's model, and implications for further research are presented.

The appendix includes the measuring instruments and programed material specifically devised for this study.

CHAPTER II

SURVEY OF THE RELATED LITERATURE

Four areas of review seem pertinent to this study: directly related music research, extra-disciplinary studies employing the Gagné model, and the Gagné model itself. The fourth area, of less critical nature, is the Colwell test series which is used as a basis for determining entering musical achievement of the subjects participating in the experiment.

Relevant Music Studies

The literature available yields but three studies in music that relate to this experiment.

By means of teaching machine and tape, an experiment was conducted studying the effects of order of presentation on aural recognition of melodic intervals (Jeffries, 1967). Twenty-four college students were tested on two factors: (a) the use of small steps of increasing difficulty for presentation of interval items, and (b) the effects of knowledge of results (KR) for confirming interval judgments. The problem was to investigate the effects on melodic interval learning of presenting a random versus an ordered

sequence of intervals for dictation and the effects of KR and delayed KR. Data analysis indicated that drilling the subjects on intervals in random order produced better learning results than drilling the subjects on intervals in the order of increasing difficulty. This was especially evident on the retention test where an analysis of variance test showed random presentation to be superior beyond the 01 per cent level of confidence. The design of the Jeffries experiment is similar to the present study. The item of interval recognition, however, would appear to be confined to a single level (Type 3) on Gagné's hierarchical model and therefore relates only in principle.

The one musical study (Milak, 1969) that employs Gagné's model, purposed to examine and apply certain basic types of learning to aspects of music education. In addition, Milak builds and tests a sequence of instruction upon concepts derived from these types of learning. Instead of trying to apply principles of learning psychology to general levels of music, like performing and understanding, an attempt was made to relate specific types of learning to specific tasks in music education. The specific tasks defined were structured into a learning hierarchy and from this a sequence was derived from which the student was to learn to read and perform musical rhythms. An extended nonmusical presentation of Gagné's system through multiple discrimination (Type 5) preceded the musical

examples to be employed. Milak chooses to limit his use of the model to Types 2, 3, and 5, omitting the verbal association phase. A summary upon which the experiment is vitally dependent states:

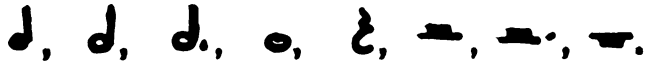
> Although there is no specific point where one type ends and the other starts, each more complicated type of learning needs the lesser complicated type of learning as a prerequisite. This writer believes that before a child can read a melody, he must learn to perform the pattern or phrases of the melody (multiple discrimination) by knowing how to respond to the individual notes in the phrases or pattern (chaining), which is dependent upon understanding the basic elements of each note (stimulus response). Although other types of basic learning (signal learning and verbal association) can be related to music education, they do not significantly effect the learning hierarchy necessary for basic music reading (p. 59).

In the second part of his report Milak makes a practical application of the theory and tests his approach against a "popular conventional method" of teaching rhythm. Rhythm was chosen because it appeared to be the easiest musical task to teach and yet one that was difficult to master. The experimenter describes the conventional method.

> The whole note is introduced on a five line staff. It is described as a circle which is held for four beats. Then the teacher plays the note and has the students count to four while he plays. The students are then instructed to repeat the note durations. After the students learn to respond to these notes, they are combined with their respective rests into rhythmic exercises of one pitch, written on the five line staff and in a meter with bar lines. The bar lines are explained as the even division of the beats in a piece to which an order of counts are applied. These counts are added when necessary as an aid for reading the rhythm. In this method the written symbols for rhythm are immediately used as a stimulus and the response is producing the proper length of note or rest (p. 62).

In his experimental method Milak first teaches his subjects to respond to symbols that represent steady beats. After that ability was learned the child would then learn to play longer notes or observe similar rests which were multiples of the basic beat. This was Phase One or the stimulus-response level of the Gagné model.

Phase Two of the experimental method involved learning to observe a note or rest of a specified length (in terms of number of beats). This is defined as a chained response. Also, as part of Phase Two, the student learns to respond to the musical symbols (notes and rests) that represent duration rather than "beat signs" used to this juncture. This process continues until the student can recognize, by playing or resting, the following note and rest values:



Phase Three of the method (Type 5 in the Gagné model) specifies that the subject is able to classify each note and rest symbol as to the proper number of beats. Many different patterns are formed from the eight symbols and the student develops the ability to read written phrases which consist of notes and rests in a quick, reliable manner.

The two methods, conventional and experimental, were introduced to two groups of fifth grade students who were beginning an instrumental program on brass instruments. Another group of private piano students were added to the

first two groups to check intervening variables. The experimental group consisted of six male students who met as a group and received approximately five to seven minutes of experimental rhythm instruction each lesson. They had 30 minute lessons on Monday, Wednesday, and Friday but were not permitted to take their instruments home. The control group of four fifth grade students, two girls and two boys, were instructed for approximately ten minutes each lesson by the conventional method. These students had only one 30 minute lesson per week but were permitted home use of instruments.

A second experimental group of four fourth and fifth grade piano students was instructed once a week for 30 minutes using the experimental method. These, as the control group, were instructed to practice 30 minutes a day. The author taught all three groups, each receiving nine weeks of lessons after which a test of sight-reading a rhythm was given to each subject.

The results indicated that both groups taught by the experimental method outperformed the control group. The experimenter observed that a relationship seemed to exist between the number of verbal cues and the number of repetitions.

Milak's conclusion was that the validity might be questionable due to the small number of subjects, but that the basic theory seemed workable and pointed to the need for more sophisticated experimentation.

The results of Milak's experiment methods are as follows:

Group	Subjects	No. of Cues	No. of Repetitions
1st Experimental	1	1	1
	2	0	0
	3	3	1
	4	1	2
	5	0	1
	6	1	2
Total		6	7
Average		1	1.16
2nd Experimental	1	1	1
	2	0	0
	3	2	1
	4	1	1
Total		4	3
Average		1	0.75
Control Group	1	0	0
	2	3	3
	3	2	1
	4	1	4
Total		6	8
Average		1.5	2

Mr. Milak may have strengthened his study by using a greater number of subjects and certainly could have profited by a more refined measuring device. Also, dependent on the collected information, an improvement in data analysis would have been desirable.

Logical versus random sequencing of items was the topic of another study (Hamilton, 1964). The experiment was designed to examine the effectiveness of learning from autoinstructional programs which required either specific or nonspecific responding and in which the units were sequenced either logically or randomly. Hamilton defines specific

response as one in which the subject is asked to "think the answers" into the answer blank, and nonspecific response as providing no answer blanks nor suggestion for "thinking the answer." It was hypothesized that: (a) the specific response mode would produce greater gains in learning than the nonspecific response mode, and (b) the logically ordered sequence would produce greater gains than the randomly ordered sequence, and (c) an economy of time would result, from both the logically ordered sequence and the nonspecific response mode.

The subjects were 68 fifth and sixth grade students in three classes who were randomly assigned to four treatment groups. A pretest was given immediately before the program began and the posttest was given immediately after the program. The entire experiment took about two hours in each of the four classrooms.

The instructional instrument was a 106-item auto-instructional program on the subject of recognition, construction, and computation of the relative time value of music notes and rests. The researcher constructed the program and assessed its effectiveness in a classroom situation. The entire sequence of program items was randomized without breaking it down into self-contained units and a different random sequence was assigned to each subject in the random sequence conditions.

Data showed the random specific program version to have produced significantly less gain in learning than either of the two nonspecific program versions, but not demonstrably less than the logical specific version. This finding is partly in agreement with the general hypothesis that logically ordered sequence would produce greater gains than randomly ordered sequence. This supported the belief that with randomly ordered sequence, the nonspecific response mode would produce greater gain than the specific response mode. The nonspecific response mode resulted in an economy of time according to the data analysis. Since the logical sequence specific response condition produced somewhat greater gain than the random sequence specific response condition, Hamilton suggests it is safe to assume that interframe cueing which accrued to the learner from the logically ordered sequence probably offset some of the negative effects of the lack of formal confirmation in the specific response conditions.

Related Studies

Several studies pertaining to sequence, material gaps, and scrambling of instructional content seem pertinent to the present study.

One such study (Miller, 1969) addressed the following questions:

1. What effect does sequencing have on the effectiveness of a programed unit as measured by criterion and retention tests?

2. What effect does sequencing have on the efficiency of a programed unit as measured by time on the program, and number of errors on the program?
3. Will prior information in the form of an outline specifying the topics to be covered in the program be helpful to students (especially those using nonlogical sequences)?
4. Will the experimental variables have an effect on the mood or feelings of the students?
5. How will the students' level of subject matter achievement be related to sequencing and prior information variables? (p. 64)

Eight programs on matrix arithmetic, representing four methods of sequencing and two levels of prior information, were presented to two groups of experimental subjects. Substudy I used a group of 119 eighth grade students and Substudy II, a group of 111 twelfth graders. Students in each of the substudies were randomly assigned to one of the treatment combinations. Treatment sequences were described as follows:

1. logical--both macro-order (large blocks of content remained in order) and micro-order (material remained in sequence within the three larger blocks) were preserved.
2. nonlogical I--this sequence involved randomization over the entire length of the original sequence, thus disrupting both macro- and micro-orders.
3. nonlogical II--micro-order was disrupted but macro-order was preserved.
4. nonlogical III--micro-order was preserved and macro-order disrupted in this sequence.

The 96-frame linear programed instructional unit selected for the study was developed in a workshop at the University of Rochester and was field tested successfully by its author. A 46-item objective criterion measure was developed for use in the study, and was estimated to be 0.90 reliable by the Kuder-Richardson Formula Number 21. The level of significance for rejection of all hypotheses was set at .05.

In both substudies, the treatment groups that registered the better performances on the multiplication portion of both the criterion and retention measures were those in which macro-order was preserved. Miller suggests this lends support to Gagné's ideas that the attainment of individual tasks within a hierarchy can be accomplished in a number of ways, including nonlogical programed sequences. He continues by suggesting that there exists a point beyond which extreme attention to logical sequencing yields diminishing returns proportionate to the effort expended.

In conclusion Miller states that students apparently overcame the effects of disrupting micro-order through some means of mental reorganization of the information and that sequence of frames does not make a difference as long as the order of concepts is preserved. The trends in the criterion measure persisted in the retention measure; no sequencing treatment appeared to affect retention in any unusual way.

The implications are that logical sequence still appears to be the best in terms of overall effectiveness and efficiency, but that detailed laboring over micro-order sequencing is unnecessary.

Robert Mager has been very active in learning outcomes and in one study (Mager, 1961) proceeded to determine whether a learner-generated sequence would be similar to an instructor-generated sequence, and whether or not there would be a common element of sequences generated by independent learners. The instructor met with a single learner who had expressed interest in elementary electronics. The learner was informed that he would have control over the curriculum simply by asking the teacher questions and only that information would be given. A complete lab and materials were made available and the learner was informed that the course would terminate at his own request. A total of six adult subjects (3 male and 3 female) independently participated for a total of 24 instructional sessions. The average session length was 65 minutes.

Three observations appeared worthy of reporting according to Mager.

1. The learner begins the course in electronics with an entirely different topic than does the instructor. All six participants asked about the vacuum tube during the first 40 minutes of instruction even though eight different electronic courses in

industry and the military began either with the subject of magnetism or with the electron theory.

2. Common subject matter was greatest at the beginning and as instruction progressed the learner moved into areas of his specific interest.
3. The subject tended to direct his sequence from the simple to the complex, for him that meant from a simple whole to a more complex whole, or from the general to the specific.

The author's stated implications are that the learner's sequence is most often different than the instructor's and that the learner's motivation increases in proportion to the degree of control or apparent control he is permitted to exercise over the learning experience.

Another study based on Gagné's theory (Merrill, 1965) proposed to test the assumption that in mastering a hierarchical task learning and retention are facilitated by mastering each part of the material before proceeding to the succeeding parts. The following hypotheses were tested:

1. If Part I is mastered, subjects are able to learn Part II faster and with fewer errors than if Part I is not mastered before proceeding to Part II, etc.
2. When the terminal test requires every subject to review previously presented materials until he is able to answer every question correctly, subjects who are required to master each successive part of the task before proceeding take less total time to master the terminal test than subjects who proceed from part to part with no requirement of mastery.

> 3. Subjects who are required to master each successive part of the task before proceeding retain the material better than subjects who proceed from part to part with no requirement of mastery even when the terminal test requires every subject to review previously presented materials until he is able to answer every question correctly (p. 225).

The task used was a complex imaginary science which described a system of satellites that move about a nucleus. In content and structure, this task was almost identical to many scientific topics taught in school, and yet, because it was imaginary, it was extremely unlikely that any student would already know the content. The terminal task selected was on the application level, and consisted of 68 problems that required the use of every principle of the science.

The learning sets were divided into five lessons which were presented in branching-type programed instruction. A multiple-choice question, including an "I don't know" alternative, was presented at the end of each frame. A quiz followed each lesson and was also in programed form and allowed a branched return if an incorrect answer was recorded. The terminal test of 68 items was similarly constructed.

Sixty-two volunteers (25 males and 37 females) were recruited from the undergraduate and master's-level education program. After a series of six pretests, which revealed no significant differences, the subjects were randomly assigned to four groups (two containing 14 and two

with 11). A fifth group (N=12) was not shown any of the programed lessons or quizzes, but was presented only the summary statement of each lesson.

Groups I-IV participated in a total of six hours of teaching machine time and then took the post test. Three weeks later the subjects returned for the retention test.

Analysis of data revealed that Hypothesis 1 was rejected. Hence, subjects that were required to master Part I before proceeding to Part II did not make fewer errors and did not take less time on succeeding tasks than the other subjects. The two groups having the benefit of a correction/review facility took more total time in completing the task, thus rejecting Hypothesis 2. Hypothesis 3 was rejected on the grounds that the two groups who received correction/review while learning took longer on both the post test and retention test than the other groups. There was no significant difference in the number of errors, however.

The fifth group was presented only the set of summary statements which were used for the general review on the lessons. Merrill expected this group would take longer to complete the test section than the other groups but less time to complete the test section than the time required for other groups to complete lessons plus the test section. Both these assumptions were true. Group V retained as much learning and performed as efficiently as the experimental groups, thus representing the most efficient procedure.

Merrill believes the results indicate that it is not necessary to master one level before proceeding to the next. In fact, the correction/review procedure actually increases the time expended and results in no greater mastery.

Manipulation of three variables in learning a verbal concept provided some interesting results in efficiency and integration of material (Newton and Hickey, 1965). The variables were:

1. the order of subconcepts,
2. the effect of applying whole or part learning procedures to inclusion of subconcepts in the program, that is, either learning all subconcepts first (part method) or learning them as they are needed in the overall program (whole method), and,
3. program direction or whether instruction moved (a) from specific to general (RULEG) or (b) from the general to specific (EGRULE): overall directionality confounded with directionality within subconcepts.

In the context of the study, it appears that Newton and Hickey equate subconcept with one level of Gagné's hierarchy and concept with a higher level.

The 132 college students were unsystematically assigned to one of twelve experimental groups, for a total proportionately represented. The treatment involved completion of a 59 frame programed series within a 50 minute class

period. A ten item multiple-choice test was devised to evaluate transfer ability and information beyond that obtainable from analysis or response errors within the program. The vehicle topic of the study was gross national product (GNP) and four major clusters of terms within that concept. These clusters corresponded to the variables identified in the previous paragraph. A pretest was not given because the experimenters were interested in relative terminal differences among the groups and not the absolute changes.

Analysis revealed no significant differences at the .05 level among the groups in the number of errors made during learning. This led the authors to conclude that in considering error scores, student performance was insensitive to manipulations in their program sequence. Test performance was poorest both when the two subconcepts were placed at the beginning of the program with the definition of the concept last, and when the two subconcepts were at the end of the program and the concept was defined at the beginning. In other words, when the concept was remote from the subconcepts, learning suffered. More importantly, the most rapid completion of the program occurred when the subconcepts were placed together at the start of the program and led to the concept.

The findings of Newton and Hickey tend to agree with those of Miller, in which micro-order (subconcepts) was disrupted and macro-order (concept) was preserved for

maximum learning. Both studies appear to support Gagné's theory of the benefit of hierarchical sequence.

Scrambling the order of three programs was the basis of a study (Payne, Krathwohl and Gordon, 1967) on 195 college sophomores. The three programs varied in the judged interrelatedness of the material in each program from low to fairly high. Both immediate and delayed retention tests were administered. It was hypothesized that the effect of scrambling would be greatest for those programs dealing with topics having the most internal logical development. The subjects were randomly assigned to eight treatment subject groups in an elementary educational psychology course. Analyses indicated no significant initial differences among groups with respect to general aptitude, reading comprehension and arithmetic ability.

Each of the three programs was prepared in both logical and scrambled form. Frames were scrambled by use of a table of random numbers. Each of the eight randomly constituted groups worked through one of the permutations of the three programs in linear or scrambled form. Two forms of a short answer criterion test were formed; the immediate retention test contained 56 items, the delayed retention test 53. The latter test was administered two weeks after completion of the programed material.

The researchers anticipated a trend in the total scores dependent on the degree of scrambling. This expected

decrease did not occur. An analysis of variance confirmed that no significant difference among the means existed ($F=.87$, df 7/187, $p>.05$ for the initial test and $F=.40$, df 7/187, $p>.05$ for the retention test). Test results revealed no logical pattern of correlation between achievement levels and program sequence, thus the hypothesis was rejected. There was, however, a higher error incidence among scrambled forms than with their ordered counterparts.

The authors suggest that the students possibly bridged the gaps between items in a scrambled program, thus indicating a discovery and inductive development of learning. The study did not indicate whether the material presented was classified according to a stratified model of learning. Perhaps that information could provide the reason for rejection of the hypothesis.

Teaching machines were used by Evans, Glaser and Homme (1960) in an investigation of verbal learning sequences. In one experiment of a series of five, they were interested in whether or not it would be possible to produce the same level of learning performance with varying amounts of programed material. The editing out of some repetitive material would create larger "steps" since fewer statements and responses were required. The four final programs contained 30, 40, 51, and 68 steps respectively. Four groups of five subjects each, all graduate students taking psychology courses, were given the sequences. After

completing the sequences, the students were given an immediate post test and sometime later a retention test. Results indicated that:

1. small-step sequences produced significantly better performance ($p<.05$) on both immediate and retention tests than did the shorter large-step sequences,
2. small-step sequences produced significantly fewer response errors ($p<.05$) during the learning sequence despite increased opportunities for error, and
3. small-step sequences in general took more time than large-step sequences.

The authors conclude that smaller steps in a program are associated with better immediate test performance, better retention, and fewer response errors in the course of learning.

One phase of a self-instructional program by Moore (1968) studied the effects of gaps in sequences. The gaps principle asserts that criterion performance is increased by the absence of gaps and decreased by the presence of gaps. Two types of frames appear to fill gaps in a program. Type 1 are frames logically related to the task, which a content analysis indicates are intermediate steps to learning the criterion task. Type 2 are frames identical or similar to questions on the criterion test. In the experiment only frames of the second type were excluded.

A total of 184 eighth grade students participated in the investigation. Four general information tests of 30 questions each were constructed and the degree of difficulty was varied. Condition and instrument administration were carefully controlled. Two days after the programed exposure the subjects were tested.

Moore offered two tentative conclusions that are of interest. Where a gap exists that simulates the criterion task, learning is more effective than when the simulation is absent. Secondly, if gaps are introduced into the program, mastery of the remaining material does not appear to benefit instruction.

Levin and Baker (1963) did a thorough study on the topic of item scrambling in a self-instructional program. It was conducted to determine the importance of presenting items in a standard, logical sequence which had been arrived at on the basis of prior planning and experimentation. A matched-group experiment was planned which would make it possible to examine the effects of scrambling item sequence in one unit of a program on (a) error rate during acquisition, (b) performance on a subsequent unit of the program, and (c) performance on an achievement test which measured retention and transfer.

The 36 second-grade participants were placed in two equal groups. The research instruments included two forms of a specially developed self-instructional program,

teaching machines for presenting the programs, and two tests. The devised program, informal geometry, had undergone a validation study and was found to produce a statistically significant amount of learning. The program consisted of 180 items grouped in five units, the first being an instructional unit on teaching machine operation. The other four units comprised a linear sequence in which concepts and notation taught in one unit were used and built upon in subsequent units. The only portion of the experimental program which differed from the standard form was the unit on angles, chosen because of its difficulty and place in the program. The content of the units for both control and experimental groups was identical. The material was scrambled for the latter. The subjects were told and their material indicated that there were differences in the two units.

Two achievement tests had been developed. Test S was designed for screening purposes and Test 1 developed to assess learning incurred during the program. Spearman-Brown corrected split-half reliabilities for Test S and Test 1 were .68 and .87 respectively.

The experiment began with the screening test and concluded 17 days later. All work was in the home classroom and instruction was about 15 minutes per day. The students were matched and assigned randomly to treatment groups. After finishing the angles unit (treatment period), all

subjects were taken through the remaining section. Final testing was the next class day.

Analysis of group comparisons of acquisition, retention, and transfer data indicated that the experimental treatment had no statistically significant effects. The authors suggest that while the findings failed to support the assumption that item sequence is important, it seems neither appropriate nor even tempting to abandon the hypothesis that the order of presentation matters under some conditions.

Roe, Case and Roe (1962) conducted an experiment investigating the effect of scrambling and ordered sequence in auto-instructional programs. Stated as a hypothesis: The mean performance in a criterion test of students who have studied a proper sequential ordering of related subject items will be significantly different from the mean performance on the same criterion test by students who have studied a random ordering of the subject items. The material sequence was based on the premise that each item depended on a preceding item and on the student's terminal behavior. The authors expected to gain some knowledge of the effects by (a) eliminating the repetition of missed items, (b) eliminating the leveling effect of time on long-term retention by administering the criterion test immediately after the learning session, and (c) scrambling larger blocks of items.

A group of 36 freshman psychology students were classified into upper, middle, and lower thirds according to their prior mathematical ability as indicated by scores on CEEB examinations. Within each third students were randomly assigned to each sequencing group. Prior experience showed that lower division students had little knowledge of the material content. Learning items on elementary probability developed over a two year period consisted of 71 frames registered on 4 x 6 inch cards. Half the students received cards with an ordered sequence and the other half received cards in a scrambled order. On completing the program each student was given a criterion test and his completed program was examined for response errors.

Analyses of variance were performed on time for learning, error score for learning, time for criterion test, and test scores. The two variables in each of these analyses of variance were the method of sequencing items and the students mathematical aptitude. It was found that item sequence had no significant effect on the dependent variables, nor was there any significant effect on the interactions between sequencing and aptitude.

The authors believe the experiment indicates that college level students may not require the careful sequencing of auto-instructional items as had previously been supposed.

Research Model

In recent years psychologists have presented a number of theoretical models of learning. The specific prototype for this study is a hierarchical model suggested by Robert Gagné.

Gagné states his rationale for a model of hierarchical learning sets in a recent publication (Gagné and Gephart, 1968). According to Gagné:

> Knowledge consists of a set of subordinate capabilities called learning sets which are arranged in a hierarchy. Each learning set may have several other learning sets subordinate to it. Together the subordinate learning sets mediate positive transfer to the learning set of the next higher order in the hierarchy. If one or more of the subordinate learning sets is not present or cannot be recalled,transfer to the next higher order of learning set is predicted to be zero. The learning sets at the bottom of the hierarchy are basic human abilities relevant to the superordinate learning sets. The learning sets higher in the hierarchy are the sets of behavior particularly related to the problems and tasks to be learned in a sequence of instruction.
>
> Learning sets, along with instructions, comprise the two fundamental variables of the theory. Together these two variables are used to predict transfer as it operated in instruction.
>
> To define the hierarchy of learning sets relevant to any given learning task, Gagné suggests the researcher begin with the following question: "What would the individual have to know how to do in order to be able to achieve this (new) task, when given only instructions?" By answering this question, the experimenter begins the first cycle of the analysis of the final task. Each of the subordinate learning sets obtained by answering the above question is in turn investigated with the same question which leads to a definition of the next level of subordinate learning sets. This procedure is reiterated until the entire hierarchy is defined.

An earlier article (Gagné, 1962) emphasizes the transfer aspect embodied in the model.

> A human learner begins the acquisition of the capability of performing a particular class of tasks with an individual array of relevant learning sets, previously acquired. He then acquires new learning sets at progressively higher levels of the knowledge hierarchy until the final class of tasks is achieved. Attaining each new learning set depends upon a process of positive transfer, which is dependent upon (a) the recall of relevant subordinate learning sets, and upon (b) the effects of instructions (p. 358).

Many thinkers in the field of educational instruction agree that the sequence of material effects learning. Jerome Bruner stresses the necessity of sequence in the educational process while leaving room for individuality (Bruner, 1966).

> Instruction consists of leading the learner through a sequence of statements and restatements of a problem or body of knowledge that increase the learner's ability to grasp, transform, and transfer what he is learning. In short, the sequence in which a learner encounters materials within a domain of knowledge affects the difficulty he will have in achieving mastery.
>
> There are usually a variety of sequences that are equivalent in their ease and difficulty for learners. There is no unique sequence for all learners, and the optimum in any particular case will depend upon a variety of factors, including past learning, state of development, nature of the material, and individual differences (p. 313).

In addition to a strong belief in classification of learning tasks, Gagné concurs with Bruner on the matter of preparing instruction for individuality. Gagné (1962) comments regarding personalized attention in learning:

> If one wants to investigate the effects of an experimental treatment on the behavior of individuals or groups who start from the same point, he would be well advised to measure and map out for each individual the learning sets relevant to the experimental task (p. 365).

A lucid account in a Russian education periodical illustrates the international interest in learning sequentially (Talyzina, 1968).

> In the first place, operations (activity) on the part of the pupil adequate to the knowledge to be mastered should be identified as necessary means of assimilation. In the second place, these actions should be initially modeled in external, material (or materialized) form, which makes it possible not only to make their content clear to the pupil but to assure that they will be mastered. In the third place, a program should be drawn up for step-by-step changes in these acts, and they should be modified at each stage in accordance with independent characteristics. In the fourth place, at each of the steps in the modification of the operations, control over their performance should be provided, operation by operation. In the final stages of assimilation, this becomes self-monitoring. All this taken together permits planned direction of the shaping of mental actions and, through them, of the shaping of knowledge as their products. It becomes possible to shape in all pupils knowledge and abilities with properties determined beforehand, to reduce considerably the time required to assimilate this knowledge, to diminish considerably the scattering of grades received, and to cause the successes scored to approximate the upper possible limits. Moreover, the diversity of the intermediate stages disappears, as do the errors characteristic of each stage. It becomes possible to shape various types of intellectual activity at an earlier age than is generally regarded as possible (p. 39).

For a more thorough understanding of the theoretical model of this study it is necessary to examine Gagné's hierarchical system (Hilgard, 1966).

> Gagné accepts eight types or categories of learning, each with its own rules, but arranges them in a hierarchy from simple to complex, on the assumption that each higher order learning depends upon the mastery of the one below it. Hence the theory is not strictly an eclectic theory (which chooses good principles from here and there without any order among them), but is the beginning of a unified theory on the assumption that appropriate transformation equations could be found for moving from one level to the next. The proposal of eight kinds of learning is sufficiently elaborated to be deserving of review.
>
> Gagné's own summary of the eight types are as follows:
>
> Type 1. Signal learning. The individual learns to make a general diffuse response to a signal. This is the classical conditioned response of Pavlov. The responses are a type of learning that has a truly "involuntary" character, and applies to responses that are not typically under voluntary control.
>
> Type 2. Stimulus-response learning. The learner acquires a precise response to a discriminated stimulus. What is learned is a connection or a discriminated operant, sometimes called an instrumental response. Regarding a dog which a master is attempting to teach to "shake hands": after several repetitions of raising the dog's paw, shaking it, and rewarding the animal, the dog raises his own paw when his master says, "shake hands." Eventually, the dog comes to perform this act promptly and more or less precisely whenever the proper signal is given. It can then be said that the dog has learned what may be called a stimulus-response capability.
>
> Obviously, this kind of learning is distinguishable from signal learning in terms of its outcome. The response acquired by this means is a fairly precise, circumscribed, skeletal muscular act, far different from the generalized emotional responding that characterizes the Pavlovian kind of signal-responding. This differentiation is shown by using an arrow rather than the line between the S and the R, as S→R, to

emphasize that a process of discrimination is an integral part of this kind of learning. A degree of precision has been established in the response, which can easily be distinguished from similar although "wrong" responses.

Still another characteristic of stimulus-response learning must be noted before the description is complete. Every uncomplicated example of S→R learning indicates that it is motor learning. The implication of this statement is not simply to the effect that muscular movements are involved in the outcome, because this may be true of other varieties, including signal learning (as when an animal learns to struggle or run at a signal originally paired with shock). In S→R learning, though, an important component of the stimulus itself is generated by muscular movements. While the act is being established, the external stimulus "shake hands" is accompanied by proprioceptive stimulation from the muscles that raise the dog's paw. Even when the act is fully learned, some parts of this stimulation are still present. For example, the dog often raises his paw "as if voluntarily," even when no one has said "shake hands." He may now "invite" his master to shake hands. Presumably, this portion of the total stimulation plays an important role in the learning process.

Type 3. Chaining. What is acquired is a chain of two or more stimulus-response connections. The conditions for such learning have been described by Skinner (1938) and others, notably by Gilbert.

Type 4. Verbal Association. Verbal association is the learning of chains that are verbal. Basically the conditions resemble those for other (motor) chains. However, the presence of language in the human being makes this a special type because internal links may be selected from the individual's previously learned repertoire of language.

Type 5. Multiple Discrimination. The individual learns to make different identifying responses to as many different stimuli, which may resemble each other in physical appearance to a greater or lesser degree. Although the learning of each stimulus-response connection is a simple Type 2 occurrence, the connections tend to interfere with each other's retention.

> Type 6. Concept Learning. The learner acquires a capability of making a common response to a class of stimuli that may differ from each other widely in physical appearance. He is able to make a response that identifies an entire class of objects or events.
>
> Type 7. Principle Learning. In simplest terms, a principle is a chain of two or more concepts. It functions to control behavior in the manner suggested by a verbalized rule of the form "If A, then B," where A and B are concepts. However, it must be carefully distinguished from the mere verbal sequence "If A, then B," which, of course, may be learned as Type 4.
>
> Type 8. Problem Solving. Problem solving is a kind of learning that requires the internal events usually called thinking. Two or more previously acquired principles are somehow combined to produce a new capability that can be shown to depend on a 'higher-order' principle.

The notion that each of the higher stages requires the next lower as a prerequisite is limited for Gagné only by some uncertainty with respect to Types 1 and 2; he is not convinced that Type 2 has Type 1 as its essential background. Gagné rejects the interpretation that learning is basically the same for all types; their differences are said to be more important than their similarities. A strong emphasis within Gagné's analysis is upon the structure of knowledge, an important supplement to principles of learning whenever a practical instructional task is under consideration (pp. 569-570).

Application to Music Learning

The model which Gagné has constructed is potentially very flexible. A beginning student of the violin may experience the Problem Solving level (Type 8) in performing a major scale while the seasoned violinist, on the same scale, would function at a Type 7 or Type 6 level. Given a learning task, three students could conceivably operate on as many different levels of the hierarchy at the same

time. The sliding nature of Gagné's system makes it highly adaptable to individualized learning.

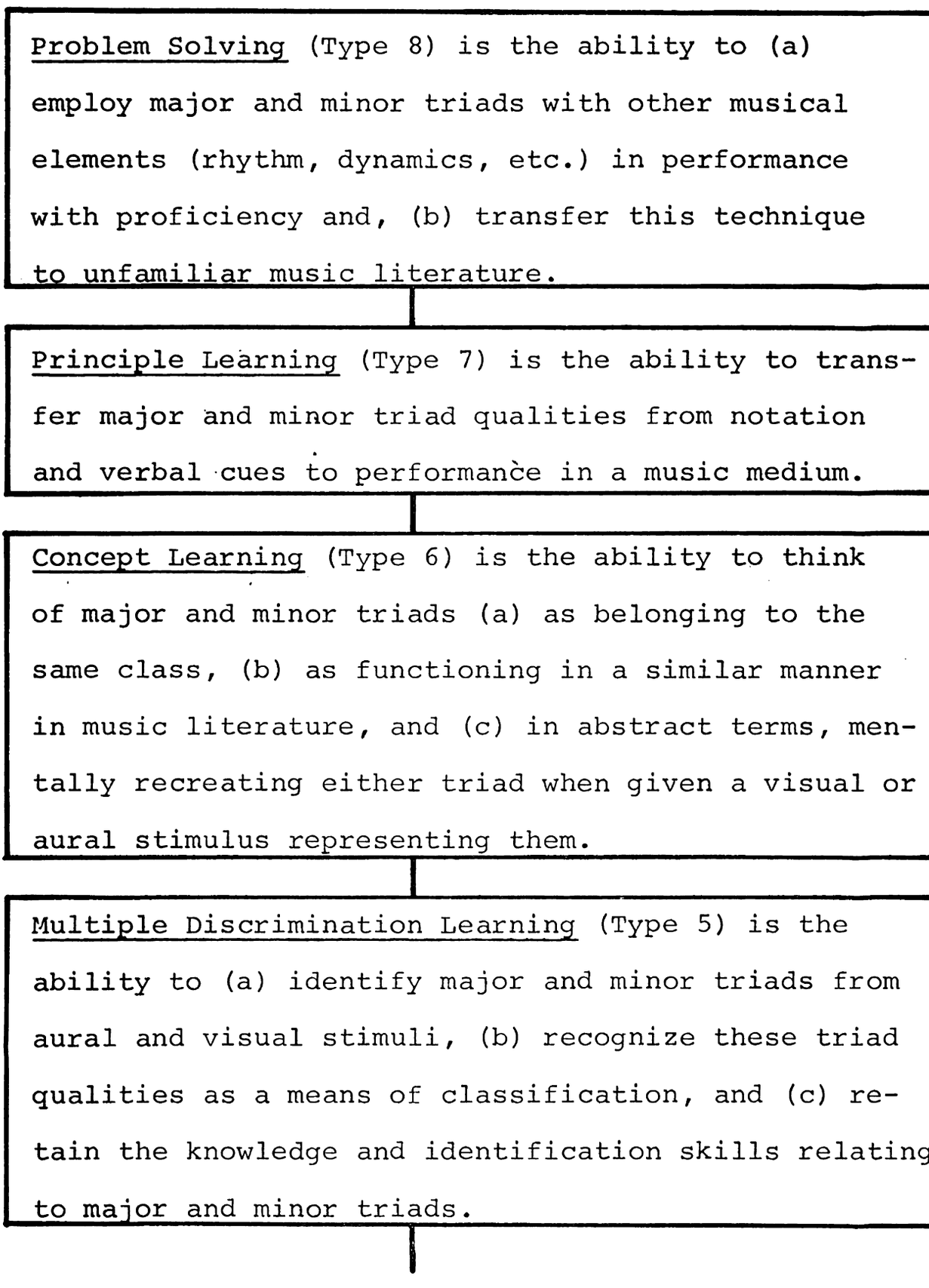
When a student labors with a learning assignment he uses one or more of his four operational faculties. The cognitive, affective, psychomotor, and perceptual domains may be functioning simultaneously on any given task. Gagné does not identify these operations in relation to the conditions of learning he has established. For certain types of research it would seem necessary to specify the kind of operations(s) involved. Integrating the operational domains with Gagné's model would enable the teacher or researcher to more precisely define the functions of a student involved in a learning task.

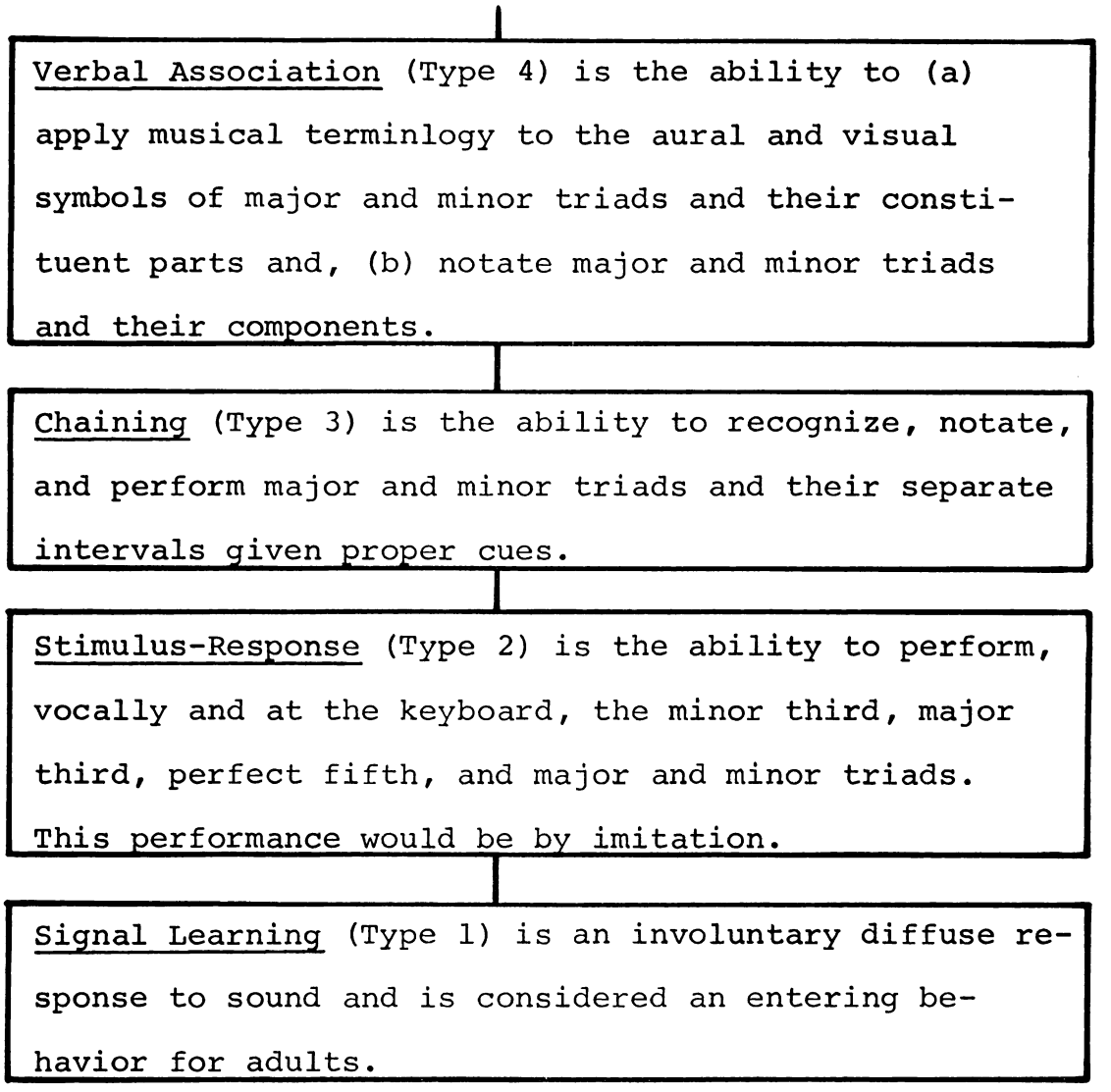
Effective problem-solving entails a clear view of the problem itself and subsequent gathering of all facts, materials, and responses necessary to arrive at a solution. The person who structures a learning situation can best assist the student by clearly delineating the problem and then supplying the means to solve it.

If a problem-solving situation is structured from the simplest level upward, there is a danger that extraneous subtasks may be included; whereas, if the problem is clearly understood, the lower level components will be an outgrowth of the problem and other subtasks may be added as needed.

Although music is considered a nonverbal medium, there are learning tasks in music that correspond to the

categories of Gagné's model. The specific musical elements chosen to relate to Gagné's hierarchy and serve as vehicles for this research are the major and minor triads. These triads and their constituent parts relate to Gagné's model as presented in the following flow chart:





In view of the subjects available for this experiment and the course content restrictions, it was advisable to limit the present study to Types 3, 4, and 5 of Gagné's model. The other levels are vital to the model but are beyond the scope of this research.

Review of Colwell Music Achievement Test (MAT) 1 & 2

As part of a pre-treatment evaluation in this study, three tests were administered. One criterion measure was

a composite score from Colwell Music Achievement Tests 1 and 2 (Colwell, 1968). The Music Achievement Tests are designed to provide an accurate measurement of achievement for some of the most important objectives of the music education program. They are divided into independent tests covering the areas of pitch discrimination, interval discrimination, meter discrimination, major-minor mode discrimination, feeling for tonal center, and auditory-visual discrimination. The MATs do not purport to measure total "musicianship" but provide (a) a measure of the extent to which a pupil has profited from past musical instruction, (b) a measure of the quality of his musical instruction, and (c) an indication of the extent to which the pupil is likely to profit from further musical instruction.

Validity, standardization, and reliability of the Music Achievement Tests were established in accordance with practices acceptable to the research community. The reliability of MATs 1 and 2 was computed in two of the most common ways: (a) split-half reliability and (b) Kuder-Richardson formula 21. The reliability of Test 1 estimated by K-R 21 is .88, standard deviation 10.41, with a sample size of 7,710 students, while the split-half method yielded an estimated reliability of .94, mean standard deviation 5.3 with a sample size of 7,725 subjects. Other detailed information on the MATs is contained in the Interpretive

Manual (Colwell, 1969), including item analysis, test question descriptions, scoring instruction, tables or norms, etc.

For the present study, only Parts 1 and 2 of MAT 1 and Parts 1 and 3 of MAT 2 were used, for only these parts related directly to the musical elements of concern in the experiment. Since statistics on college-level subjects are not included in Colwell's Interpretive Manual, it was not possible to compare the students in the present study with those of his population sample. The purpose of using the MAT series was to (a) employ the data as a means of correlating and validating the instruments devised for the present study, and (b) use it as a covariate in an analysis of post treatment criterion measures.

Summary

A review of the literature germane to the present study reveals an implied sense of stratification of content material. There are numerous semantical parallels to Gagné's terminology. Whereas one researcher would employ the terms concepts and subconcepts, another would use macro-order and micro-order, and still a third, learning sets and subsets; these all allude to the idea of different levels of cognitive endeavor.

The substance of the literature review indicates that scrambling items within a program will not inhibit learning as long as the overall sequence of learning material is

not disrupted. Hamilton (1964) seems to summarize the literature review quite adequately when she states:

> Randomizing the sequence of frames probably does not impede the learner and may well provide him with a useful form of active organizing response, if all the information is available to the learner, if the concepts to be gained from the randomized sequence are few and simple or if the randomizing is done so that the concepts to be learned remain sequenced according to the order in which it is necessary that they be acquired (randomizing within subunits of a task) (p. 264).

CHAPTER III

DESIGN OF THE STUDY

Sample

Forty-one college students participated in this study during the winter term of 1970. They were all elementary education majors on the bachelor degree level at Michigan State University and ranged in age from 18 to 32 years. By class level there were 10 freshmen, 14 sopomores, 11 juniors, and 5 seniors. Only two of the subjects were male. All students completed the programed material and attendance during the study was slightly under 90 per cent. Musical background, as determined by the Colwell Music Achievement Tests, indicates no significant difference among groups.

The 40 students were randomly assigned to four experimental groups: A, B, C, and D. The students were not informed that they were involved in a study and did not realize this even at the time of the delayed retention test. They were in two different classes that met at 10:20 A.M. and 1:30 P.M. There were 21 students in the earlier section and 19 in the later section. The final test of the seven was given 13 weeks after the treatment

period. Participation was on a purely voluntary basis and data was collected on 21 of the original 40 students.

Criterion Measures

Prior to the treatment period the students were given a battery of three tests. The Music Achievement Tests 1 and 2, described in Chapter II, were two of the measures. Since the study involved harmonic elements, only certain parts of the MAT series were applicable; these were Parts 1 and 2 of MAT 1 and Parts 1 and 3 of MAT 2. Using the Kuder-Richardson 20 formula, the two tests yielded a mean reliability factor of .93 for the students in this study.

For the purpose of this study three testable areas were identified that relate to harmonic elements. A thorough survey of available standardized tests revealed a necessity to construct measuring devices peculiar to the needs of this study. The following scheme defines the three major areas and their subtests (the complete forms of the self-constructed measures may be found in the appendix section):

Section I--Aural and Visual Discrimination of Intervals and Triads

Subtest A--Aural

The purpose of this phase of the test was to determine the ability of the subject to identify, by comparison, the similarity in interval or

triad quality among three sound units. Three sound units were played from a pre-recorded tape and the student was asked to determine which, if any, of the sound units were alike in interval or triad quality. This task corresponds to Type 5 (Multiple Discrimination) on Gagné's model.

Subtest B--Visual

This portion of the test purposed to determine the ability of the student to relate physical distance to interval distance. The student was asked to match a two- or three-note sound unit with the corresponding keyboard diagram. There were three keyboard diagrams and a "none of the above" option for each item. Chaining (Type 3) is the learning level used in this subtest, although Multiple Discrimination is an option, depending on the cognitive function of the student.

Section II--Aural to Keyboard Transfer

Subtest A--Matching Aural with Notation

The subject was to match an aural stimulus with the corresponding musical notation. A two- or three-note sound unit was played. The student was to choose which staff notation, if any, symbolized the given unit. Multiple Discrimination is the type of learning involved in this subtest.

Subtest B--Interval and Triad Construction

Given a two- or three-note sound unit with the lowest tone notated, the student was to complete the upper note(s) of the unit. This subtest is considered a function on the Multiple Discrimination level.

Section III--Simulated Keyboard Application

Subtest A--Keyboard to Notation Transfer

The student, for all but the retention test, was at an electronic keyboard instrument for this section and was permitted to play the identified sound units. An interval or triad was identified by X's on a keyboard diagram. The student was to match the diagram with one of three staff notations. A fourth, "none of the above," was an option. The learning task level of this subtest is considered to be Type 3 (Chaining).

Subtest B--Notation

From a given letter/number symbol the student was to construct that interval or triad. The low note of the sound unit was placed on the staff and the student was to complete the upper note(s). As in the preceding subtest, each student had an electronic keyboard instrument and was permitted to play the sound unit represented by the letter/number symbol. Verbal Association (Type 4) is the learning level involved in this subtest.

All sections of each test which required an aural stimulus were pre-recorded on tape at 7-1/2 ips. This included narrated instructions plus at least one example item for every subtest. The low pitch limit was f (second f below 'middle c') with a high pitch limit of f (second f above 'middle c').

The four devised instruments, as described above, were used to collect data. Prior to the study it was determined that certain subtests could be used in the later stages of the experiment that could not be used at the beginning. This was possible because students acquired terminology and functional skills as the study progressed, which permitted them to operate in broadened musical experiences. The following matrix identifies the subtests used in each of the four devised instruments (Table 3.1).

In all four tests, items within a subtest were identical or extremely similar; similar, in that an interval or triad was transferred from G to F clef or the converse. From test to test, items within a particular subtest were often reordered to vary the pattern but were otherwise identical.

Reliability coefficients for the four constructed tests were determined during the study on the participating subjects. These reliability estimates (see Table 3.2) were derived from the Kuder-Richardson 20 formula. The Evaluation Services at Michigan State University processed the data, which had been recorded on mark sense scoring sheets.

TABLE 3.1.--Subtest Matrix.

	Harmonic Element Survey Pretest (HESPRE) T_3	Harmonic Element Survey Posttest (HESPST) T_4	Harmonic Element Survey Delayed Posttest (HESDPT) T_5	Harmonic Element Survey Retention Test (HESRTN) T_7
Section I-Aural and Visual Discrimination				
Subtest A-Aural	X*	X	X	X
Subtest B-Visual	X	X	X	X
Section II-Aural to Keyboard Transfer				
Subtest A-Matching Aural with Notation	X	X	X	X
Subtest B-Interval and Triad Construction		X	X	X
Section III-Simulated Keyboard Application				
Subtest A-Keyboard to Notation Transfer	X			X
Subtest B-Notation from Letter/Number Symbol		X	X	X

*An "X" identifies the subtests used in each of the four self-constructed tests.

TABLE 3.2.--Reliability Coefficients of Constructed Tests.

Harmonic Element Survey Pretest (HESPRE) T_3 40 students; 20 items	.61
Harmonic Element Survey Posttest (HESPST) T_4 40 students; 25 items	.80
Harmonic Element Survey Retention Test (HESRTN) T_5 40 students; 25 items	.81
Harmonic Element Survey Delayed Retention Test (HESDRT) T_7 21 students; 30 items	.90

Two other test titles, identified for computer usage as PERPRE (T_1) and PERPST (T_6) may appear occasionally in this thesis. These tests were part of standard measurement for the course in which the subjects were enrolled. They relate only indirectly to this study and are mentioned so their presence may not cause undue confusion.

Programed Material

A pilot study had been attempted in the term preceding the one in which the experiment was actually realized. The problem of control of material content became a very obvious concern so it was decided to program the necessary information. The programed material was then given to an instructor who taught 76 students enrolled in other sections of the same course as the experimental subjects. The

76 students were asked to write comments and questions in the margins of the programed material in the event that clarity or continuity were lacking. Following a thorough review of errors, comments and questions, the material was revised and prepared for the treatment period of this study. Several authoritative works on programing were studied and served as guidelines to the development of the resultant linear program (Lunsdaine and Glaser, 1960; Galanter, 1959; Smith and Moore, 1962). The final revised material appears in the Appendix.

Design

The 40 subjects were randomly assigned to four experimental groups of equal size. All students were given two tests (T_2 and T_3) prior to the treatment period and two tests (T_4 and T_5) following the experimental treatment. In response to a letter of request, 21 students (52-1/2 per cent) returned 13 weeks after the treatment period to participate in the Delayed Retention Test (T_7). Table 3.3 indicates the time schedule of the study.

During the seven class hours of the treatment period the students came to the regularly assigned room and each student was given a programed booklet according to the predetermined pattern for his assigned group.

The student took his booklet to a piano practice room and proceeded to respond to each item. If the student finished with the booklet before the class hour ended, he

TABLE 3.3.--Experiment Time Schedule.

January 9	Perception Pretest (PERPRE) T_1 (27 items)
January 12	Colwell MAT 1 (Parts 1 & 2) Colwell MAT 2 (Parts 1 & 3) (111 items) (COLWEL) T_2
January 21	Harmonic Element Survey Pretest (HESPRE) T_3 (20 items)
January 23, 26, 28, 30 and February 2, 4, 6	Trèatment Period (seven 50 minute class periods)
February 9	Harmonic Element Survey Posttest (HESPST) T_4 (30 items)
March 11	Harmonic Element Survey Retention Test (HESRTN) T_5 (25 items)
March 13	Perception Posttest (PERPST) T_6 (34 items)
May 11-15	Harmonic Element Survey Delayed Retention Test (HESDRT) T_7 (30 items)

returned it to the instructor and began the next booklet in his treatment sequence. If he did not complete the booklet that class hour, he returned it to the instructor and resumed from that juncture the next class period. Students were aware that the order of material was different among class members but were told that their sequence had been determined by the achievement level of a test administered the first day of class.

The devised program material was organized into three (3) sections. One section included Series A (Terminology, Scales, and Notation--82 frames) and Series M (Intervals--33 frames) and was denoted as treatment XM_a. Another section was Series R (Major and Minor Triad Construction--14 frames) and was labeled treatment XM_b. A third section was Series B (Major and Minor Triad Terminology--11 frames) and was labeled treatment XM_c.

The sequence in which these three sections were presented comprised the treatment. Each of the four groups of subjects received a different order of programed material. In addition to varying the sequence of material, one section (XM_b) was entirely omitted for two of the groups (Groups B and D). Table 3.4 indicates the order in which the four groups were presented sections of programed material.

Testable Hypotheses

Some of the hypotheses are stated as negatives (null) and the remainder are in positive form. The computer program was established before the researcher was totally aware of the mixed positive and negative directions of the hypotheses. Rather than revising the computer program the hypotheses were allowed to remain in the original form.

The study was designed to test six hypotheses. These are:

TABLE 3.4.--Test and Treatment Design.

	R Group A 10 students	R Group B 10 students	R Group C 10 students	R Group D 10 students
Perception Pretest (PERPRE) T_1	N=10	N=10	N=10	N=10
Colwell MATs 1 & 2 (COLWEL) T_2	N=10	N=10	N=10	N=10
Harmonic Element Survey Pretest (HESPRE) T_3	N=10	N=10	N=10	N=10
Treatment Period	XM_a*	XM_a	XM_c	XM_c
	XM_b**	XM_c	XM_a	XM_a
	XM_c***		XM_b	
Harmonic Element Survey Posttest (HESPST) T_4	N=10	N=10	N=10	N=10
Harmonic Element Survey Retention Test (HESRTN) T_5	N=10	N=10	N=10	N=10
Perception Posttest (PERPST) T_6	N=10	N=10	N=10	N=10
Harmonic Element Survey Delayed Retention Test (HESDRT) T_7	N=7	N=5	N=5	N=4

*XM_a: Programed Series A (Terminology, Scales, & Notation--82 frames) & Programed Series M (Intervals--33 frames).

**XM_b: Programed Series R (Major and Minor Triad Construction--14 frames).

***XM_c: Programed Series B (Major and Minor Triad Terminology--11 frames).

Hypothesis I: The students receiving the full, ordered sequence of material (Group A) will attain greater achievement than the other groups as measured by the Posttest.

Hypothesis II: There will be no difference between students exposed to the full, ordered sequence of material (Group A) and those experiencing the full, scrambled sequence (Group C) measured by the Retention Test.

Alternate: Groups A and C will have equal achievement on the Retention Test.

Hypothesis III: The students experiencing incomplete sequences (Groups B and D) will show no difference on the Retention Test.

Alternate: Groups B and D will differ on the Retention Test.

Hypothesis IV: Students exposed to the full sequence of material (Groups A and C), whether scrambled or ordered, will have a higher achievement on the Posttest than the other two groups.

Hypothesis V: Students experiencing the scrambled, incomplete program sequence (Group D) will have a lower Posttest score than the other groups.

Hypothesis VI: There will be no difference in retention levels among all four groups as evaluated by the post-treatment tests.

Alternate: A difference will exist among groups on the retention tests.

Analysis

Raw data from the individual tests were transferred to mark sense scoring sheets and processed by Evaluation Services at Michigan State University. This process furnished the mean, variance, standard deviation, standard error of measurement, mean item difficulty, mean item discrimination, and mean point biserial correlation for each of the five tests.

Computer cards were punched for all 40 students and included the standard score of each of the tests. A program, written by Jeremy Finn (1968), State University of New York at Buffalo, for analysis of covariance was used to test the six hypotheses. In addition to the coefficients of confidence for each test, cell means and a correlation matrix were derived. Those figures appear in Chapter V.

CHAPTER IV

PRESENTATION OF THE DATA

Review of Procedure

The purpose of this study was to investigate how scrambling and/or omitting portions of sequenced material would affect the learning and retention of harmonic elements when employing Gagné's hierarchical system as a theoretical framework.

Forty college students participated in the experiment in the winter term of 1970 at Michigan State University. During the spring term, 21 of the 40 responded to take a delayed retention test. Table 4.1 shows the frequency of participation.

The data collected from the tests were recorded on computer cards and prepared for processing through an IBM 3600 at the Computer Center, Michigan State University. An analysis of covariance was the means of determining acceptance or rejection of each hypothesis. The specific treatment is a sub-program of a multivariate analysis of variance developed by Jeremy Finn, State University of New York at Buffalo.

TABLE 4.1.--Analysis of Participation.

	Group A	Group B	Group C	Group D	Total
Pre-treatment test battery:	10	10	10	10	N=40
(PERPRE) T_1					
(COLWEL) T_2					
(HESPRE) T_3					
Treatment Period	10	10	10	10	N=40
Post-treatment tests:	10	10	10	10	N=40
(HESPST) T_4					
(HESRTN) T_5					
(PERPST) T_6					
Post-treatment test:	7	5	5	4	N=21
(HESDRT) T_7					

In Table 4.2 the means of the criterion measures are shown in terms of standard scores. Table 4.3 contains an estimation of the correlations among the seven instruments.

TABLE 4.2.--Means of Cells on Measuring Instruments.

	PERPRE	COLWEL	HESPRE	HESPST	HESRTN	PERPST	HESDRT
Group A	51.1	51.2	51.6	53.9	51.7	48.6	50.1 (7)
Group B	51.4	50.1	50.4	49.2	47.1	47.6	45.4 (5)
Group C	48.4	50.3	50.2	48.8	52.5	50.5	54.8 (5)
Group D	50.5	48.4	51.0	48.5	49.0	47.0	50.5 (4)
	N=40	N=40	N=40	N=40	N=40	N=40	N=21

TABLE 4.3.--Correlation Matrix of Measuring Instruments.

	PERPRE	COLWEL	HESPRE	HESPST	HESRTN	PERPST	HESDRT
PERPRE	1.0000						
COLWEL	0.7121	1.0000					
HESPRE	0.6760	0.5369	1.0000				
HESPST	0.5888	0.7338	0.4445	1.0000			
HESRTN	0.6864	0.6804	0.5466	0.7457	1.0000		
PERPST	0.7377	0.7424	0.6001	0.7369	0.7474	1.000	
HESDRT	0.7293	0.8612	0.6490	0.8983	0.8350	0.8671	1.0000

Hypotheses

Hypothesis I

The group exposed to the full, ordered sequence of material (Group A) will have a greater increment of learning than the other groups as measured by the Posttest (HESPST).

The obtained F value indicates a rejection of the hypothesis. The probability of this occurring by change was less than .94 for 40 subjects. Results are shown in Table 4.4.

TABLE 4.4.--Analysis of Covariance Summary between the Pretest (T_3) and the Posttest (T_4).

Source	SS	df	MS	F
Between groups	0.5	1	0.5	0.06
Within groups	3010.0	35	86.0	
Totals	3010.5	36		

Hypothesis II

There will be no difference in achievement between the students (Group A) exposed to the full, ordered sequence of material and the students (Group C) experiencing the full, scrambled sequence as measured by the Retention Test (HESRTN).

Alternate: The students (Group A) exposed to the full, ordered sequence of material will have a higher achievement, as measured by the Retention Test (HESRTN) than the students (Group C) experiencing the full but scrambled sequence of material.

The F value indicates acceptance of the null hypothesis that no statistically significant difference exists between

Groups A and C (see Table 4.5). The probability of this occurring by chance was less than .29 for the 40 students.

TABLE 4.5.--Analysis of Covariance Summary between the Pretest (T_3) and the Retention Test (T_5).

Source	SS	df	MS	F
Between groups	101.5	1	101.5	1.17
Within groups	3208.4	35	91.7	
Totals	3309.9	36		

Hypothesis III

The students (Groups B and D) exposed to an incomplete sequence of materials, whether ordered or scrambled, will not differ in achievement on the Retention Test (HESRTN).

Alternate: The students of Groups B and D will differ in achievement as measured by the Retention Test (HESRTN).

The null hypothesis that there is no difference in achievement between student groups exposed to an imcomplete sequence was accepted at the .16 level of probability (see Table 4.6).

TABLE 4.6.--Analysis of Covariance Summary between the Pretest (T_3) and the Retention Test (T_5).

Source	SS	df	MS	F
Between Groups	151.4	1	151.4	2.0
Within groups	2649.5	35	75.7	
Totals	2800.9	36		

Hypothesis IV

The students (Groups A and C) that are exposed to the full sequence of material, whether ordered or scrambled, will show a higher achievement on the Posttest (HESPST) than the students (Groups B and D) experiencing an incomplete sequence.

The hypothesis that groups exposed to the full sequence of material will realize a higher achievement than groups having an incomplete sequence was rejected. The results are shown in Table 4.7. The probability of this occurring by chance was less than 0.42 for the 40 participants.

TABLE 4.7.--Analysis of Covariance Summary between the Posttest (T_4) and Pretest (T_3).

Source	SS	df	MS	F
Between groups	58.4	1	58.4	0.68
Within groups	3022.3	35	86.4	
Totals	3080.7	36		

Hypothesis V

The students undergoing a scrambled, incomplete program series (Group D) will have a lower achievement than the other groups, as measured by the Posttest (HESPST).

The obtained F factor indicated that there is not a significant difference between the students (Group D) having a scrambled, incomplete program and the others (see Table 4.8). The probability of this occurring by chance was less than .51 for the 40 subjects.

TABLE 4.8.--Analysis of Covariance Summary between the Pretest (T_3) and the Posttest (T_4).

Source	SS	df	MS	F
Between groups	37.8	1	37.8	0.44
Within groups	3021.9	35	86.3	
Totals	3059.7	36		

Hypothesis VI

There will be no difference in retention levels among the four groups as measured by the post-treatment tests.

Alternate: The groups undergoing the full program series (Groups A and C), whether ordered or scrambled, will have a higher retention score than the other two groups.

As seen in Table 4.9, on the basis of 40 students, the F ratio indicates acceptance of the null hypothesis. The probability of this occurring by chance is less than .60 for the 40 students.

TABLE 4.9.--Analysis of Covariance Summary between the Posttest (T_4) and the Pretest (T_3).

Source	SS	df	MS	F
Between groups	164.4	3	54.8	0.63
Within groups	3022.3	35	86.4	
Totals	3186.7	38		

A comparison of a different set of tests for the same hypothesis shows similar results (see Table 4.10). The four groups showed no difference in retention levels. The probability of this occurring by chance is less than .50 for the 40 participants.

TABLE 4.10.--Analysis of Covariance Summary between the Retention Test (T_5) and the Pretest (T_3).

Source	SS	df	MS	F
Between groups	180.0	3	60.0	0.80
Within groups	2640.4	35	75.4	
Totals	2820.4	38		

Twenty-one students were used to test the null hypothesis that there is no difference in retention levels among the four groups. The F value as shown in Table 4.11 signifies acceptance of the hypothesis. The probability of this occurring by chance was less than .55.

TABLE 4.11.--Analysis of Covariance Summary between the Pretest (T_3) and Delayed Retention Test (T_7) for 21 Students.

Source	SS	df	MS	F
Between groups	144.6	3	48.2	0.72
Within groups	1072.9	16	67.1	
Totals	1217.5	19		

The complexity of hypotheses and the tests with which each is identified may be simplified by referring to Table 4.12. For each hypothesis, data are analyzed for significance on group achievement comparisons for the two tests specified.

TABLE 4.12.--Hypothesis Matrix, Qualifying Tests, and Results of Data Analysis.

	N	T_1 (PERPRE)	T_2 (COLWEL)	T_3 (HESPRE)	T_4 (HESPST)	T_5 (HESRTN)	T_6 (PERPST)	T_7 (HESDRT)	Results
H_1	40			X	X				rejected
H_2 (H_0)	40			X		X			accepted
H_3 (H_0)	40			X		X			accepted
H_4	40			X	X				rejected
H_5	40			X	X				rejected
H_6 (H_0)	40			X	X				accepted
H_6 (H_0)	40			X		X			accepted
H_6 (H_0)	21			X				X	accepted

CHAPTER V

SUMMARY AND CONCLUSIONS

Review and Summary

This chapter has four sections: a review of purpose, population sample, procedures of the study and a summary of the findings; conclusions drawn from obtained data; a discussion; and suggestions for future research.

The purpose of this study was to investigate a number of questions related to scrambling and/or omitting sequenced instructional material and the effect this has on the learning and retention of harmonic elements when using Gagné's hierarchical model as a theoretical framework.

The 40 elementary education majors that participated in this experiment at Michigan State University in the winter term of 1970 were enrolled in a required music fundamentals course. These undergraduates from two of the 15 sections were randomly assigned to four experimental groups for the ten weeks of testing and treatment. Twenty-one students voluntarily returned nine weeks later (the following term) to write the Delayed Retention Test. The actual treatment took place in seven class periods of 50

minutes each encompassing 15 days. A battery of three tests preceded the treatment. These were:

Perception Pretest (PERPRE) T_1: a nonstandardized test already being used in the course for measuring aural discrimination.

Colwell Music Achievement Test 1 and 2 (COLWEL) T_2: standardized tests designed to measure pitch, meter, and mode discrimination.

Harmonic Element Survey Pretest (HESPRE) T_3: a self-developed instrument devised for this study to measure aural and visual discrimination of major and minor chords and their constituent parts.

Four tests followed the treatment; one test was given immediately, one test given five weeks later, and another was given after a thirteen week delay. The fourth test (Perception Posttest) was used in relationship to the course in which the students were enrolled, but has no direct bearing on this study. This is a terse description of each of the posttests:

Harmonic Element Survey Posttest (HESPST) T_4: a self-developed measure similar in kind to T_3 but expanded to include construction of triads and intervals.

Harmonic Element Survey Retention Test (HESRTN) T_5: the same items as T_4 but reordered; also a self-developed measure.

Perception Posttest (PERPST) T_6: similar in type to T_1 but including additional items.

Harmonic Element Survey Delayed Retention Test (HESDRT) T_7: a self-developed aural and visual discriminating instrument using notation and simulated keyboard to measure intervals and triads.

The treatment consisted of auto-instructional material specially written for this study and distributed to the subjects in original, scrambled or omitted order, or a combination of the last two.

Six hypotheses were tested for statistical significance. Each hypothesis and the research results are found on pages 71 and 72.

Conclusions

What has been found true of the 40 students who took part in this study cannot be assumed to be true for other similar student groups due to the peculiar background and conditions of this research. The conclusions drawn from this study relate only to the sample from which data were obtained. Based on the results of this investigation, the following conclusions can be admitted:

1. When nonmusicians undergo a series of programed learning material, a reordering of the blocks within the program has no statistically significant effect on the overall learning.

Hypothesis	Results
I. The group exposed to the full, ordered sequence of material (Group A) will have a greater increment of learning than the other groups as measured by the posttest (HESPST).	The hypothesis that the group having the full, ordered sequence of materials would have a greater increment was rejected.
II. There will be no difference in achievement between the students (Group A) exposed to the full, ordered sequence of material and the students (Group C) experiencing the full, scrambled sequence as measured by the Retention Test (HESRTN).	The null hypothesis that the groups experiencing the full sequence, whether scrambled or ordered, would have no difference in achievement was accepted.
III. The students (Groups B and D) exposed to an incomplete sequence of materials, whether ordered or scrambled, will not differ in achievement on the Retention Test (HESRTN).	The null hypothesis was accepted. There was no difference in achievement between groups that were exposed to an incomplete sequence of materials.

IV. The students (Groups A and C) that are exposed to the full sequence of material, whether ordered or scrambled, will show a higher achievement on the Posttest (HESPST) than the students (Groups B and D) experiencing an incomplete sequence.	The hypothesis that groups having a full sequence of material showing a higher achievement than the others was rejected.
V. The students undergoing a scrambled, incomplete program series (Group D) will have a lower achievement than the other groups, as measured by the Posttest (HESPST).	The students undergoing a scrambled, incomplete program series had no significant achievement difference than the others. Therefore, the hypothesis was rejected.
VI. There will be no difference in retention levels among the four groups as measured by the post-treatment tests.	There were no significant differences on retention levels among groups, thereby confirming and accepting the null hypothesis.

2. Providing all facts necessary for mastering a specific task are present, the omission of additional information does not impair students' achievement level. An abridged auto-instructional program does not necessarily inhibit learning.
3. A combination of scrambling and abridging a programed sequence of learning has no statistically detrimental effect on terminal achievement. This assumes, of course, that scrambling does not take place within blocks nor that abridgment removes vital information.
4. Retention level is not adversely effected at a statistically significant level by scrambling segments of a programed series. The implication is that items within segments remain in order.
5. Students can more likely overcome the effect of omitted material in an auto-instructional program, even though the task is compounded by scrambling segments of instruction. The retention level is equal for students whether the program is scrambled or abridged.

Discussion

Every effort was made to construct the programed material in accordance with Gagné's theory specifically as it related to the three types of learning tasks used in the experiment (Types 3, 4, and 5). An analysis of the

data reveals little difference as a result of the various treatments and that students in the four groups were able to overcome deficiencies imposed by the experimental design. It is quite probable that the imposed treatment deficiencies were overcome due to (a) the musical background brought to the learning situation, (b) formal or informal learning outside of class during and after the treatment period, and (c) contact with, and application of, the knowledge and skills of the programed material through the lecture and taped series in which all subjects participated as part of a course requirement. Observation indicated that there was a much higher incident of questions and evident frustration on the part of the students who received a scrambled and/or an abridged series than among those who were assigned the complete, ordered sequence. Questions were answered by the instructor by repeating material that had been presented in lecture, lab, tapes, and programed material. According to the findings, this questioning did not preclude eventual recovery and subsequent mastery of the learning tasks.

The narrowed variance on the Delayed Retention measure (T_7) implies a homogeneity among the 21 students that voluntarily returned to take an additional test. This might suggest something about the nonacademic nature of the students who returns to cooperate in a non-required activity, although test scores indicate the 21 students as being representative of the original 40 participants.

The findings of this research are generally in accord with studies of similar nature. Studies reviewed in Chapter II have two basic agreements: (a) that the learner can "fill in the gap" when material is missing if the task is generally within the scope of his capabilities and (b) that a person can mentally assimilate and reorganize materials presented in a scrambled order. The present study has not disproved these findings but rather is in harmony with them. This is not to say that this experiment can be compared on a direct basis with all of those reviewed because a fundamental difference does exist. Many of the studies reviewed do not clarify or identify levels of learning for the task involved. When structuring a learning sequence for students, it would seem desirable to identify a multiple-level model of learning to assist in formulating the sequence of instruction, for evaluation purposes or whatever other phase of the teaching/learning procedure is involved. This was not clear in some of the studies which makes it impossible to draw a direct comparison with the present inquiry.

Suggestions for Future Research

1. A replication of this study, using a larger and more diversified academic population, would be of interest.

2. Use of a similar study on the elementary school level might provide some valuable information concerning musical learning.
3. A study designed to limit the possibilities of "filling the gap" through external means might enhance the likelihood of significant differences.
4. Extending the length of the experiment and broadening the learning content would furnish some valuable information.
5. A study based on a greater number of levels in Gagné's model and in musical aspects other than the element of harmony could be helpful.

The music profession has had difficulty in defending some teaching/learning practices and in providing a rationale for the existence of music in the school curriculum. Certainly it is to the profession's advantage to obtain data to support its case. To this end an increase in research is recommended. A replication of the present study employing a larger and more academically diversified college population would provide music teachers with greater information on music learning. This in turn could lead to innovation and upgrading music teaching.

Use of a similar study on elementary school levels may furnish drastically different information, in which case the teaching approach should be adapted to take

advantage of research findings. Tighter controls on a similar study would increase the possibility of significant statistical differences and would assist in determining how students compensate for acquired or imposed handicaps. A closer look at the musical background and entering musical behavior of the subjects should be considered and included.

Extending the length of time of the experiment would increase the opportunity for retention and learning rate observations. An extended study would also enable the researcher to use more complex learning constructs and concurrently provide more detailed evaluation. The full use of Gagné's model on studies involving a number of problem-solving tasks representing the study of music would furnish data on the whole of music learning and not merely a small facet. This is needful that music learning may be observed in its total perspective and not out of context.

BIBLIOGRAPHY

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Periodicals

Gagné, Robert M. "The Acquisition of Knowledge," Psychological Review, Vol. 69, No. 4 (1962), 355-65.

Hamilton, Nancy Russell. "Effects of Logical versus Random Sequencing of Items in an Autoinstructional Program under Two Conditions of Covert Response." Journal of Educational Psychology, Vol. 55, No. 5 (1964), 258-66.

Jeffries, Thomas B. "The Effects of Order of Presentation and Knowledge of Results on the Aural Recognition of Melodic Intervals." Journal of Research in Music Education, Vol. XV, No. 3 (Fall, 1967), 179-90.

Levin, Gerald R., and Baker, Bruce L. "Item Scrambling in a Self-instructional Program." Journal of Educational Psychology, Vol. 54, No. 3 (1963), 138-43.

Mager, Robert F. "On the Sequencing of Instructional Content." Psychological Reports, Vol. 9 (1961), 405-13.

Merrill, M. David. "Correction and Review on Successive Parts in Learning a Hierarchical Task." Journal of Educational Psychology, Vol. 56, No. 5 (1965), 225-34.

Milak, John. "An Application of Certain Learning Theories to the Teaching of Musical Rhythm." Missouri Journal of Research in Music Education, Vol. II, No. 3 (Autumn, 1969), 49-67.

Miller, Herbert R. "Sequencing and Prior Information in Linear Programed Instruction." AV Communication Review, Vol. 17, No. 1 (Spring, 1969), 63-76.

Moore, James C. "Manipulating the Effectiveness of a Self-Instructional Program." Journal of Educational Psychology, Vol. 59, No. 5 (1968), 315-19.

Newton, John M.; and Hickey, Albert E. "Sequential Effects in Programed Learning of a Verbal Concept." Journal of Educational Psychology, Vol. 56, No. 3 (1965), 140-47.

Payne, David A.; Krathwohl, David R.; and Gordon, John. "The Effect of Sequence on Programed Instruction." American Education Research Journal, Vol. 4, No. 2 (March, 1967), 125-32.

Roe, K. Vlachouli; Case, H. W.; and Roe, A. "Scrambled versus Ordered Sequence in Autoinstructional Programs." Journal of Educational Psychology, Vol. 53, No. 2 (1962), 101-104.

Talyzina, N. F. "The Stage Theory of Formation of Mental Operations and the Problem of the Development of Thought." Soviet Education, Vol. X, No. 4 (February, 1968), 38-42.

Books

Bruner, Jerome S. Toward a Theory of Instruction. Cambridge, Mass.: The Belknap Press of Harvard University Press, 1966.

Colwell, Richard. Interpretive Manual: Music Achievement Tests 1 and 2. Chicago: Follett Educational Corp., 1969.

Evans, J. F.; Glaser, Robert; and Homme, Lloyd E. "A Preliminary Investigation of Variation in the Properties of Verbal Learning Sequences of the Teaching Machine Type." Teaching Machines and Programmed Learning: A Source Book. Edited by A. A. Lumsdaine and Robert Glaser. Washington, D. C.: National Education Association Department of AV Instruction, 1960.

Gagné, Robert. Conditions of Learning. New York: Holt, Rinehart and Winston, Inc., 1965.

Gagné, Robert M., and Gephart, William J., eds. Eighth Annual Phi Delta Kappa Symposium on Educational Research. Itasca, Ill.: F. E. Peacock Publishers, Inc., 1968.

Galanter, Eugene, ed. Automatic Teaching: The State of the Art. New York: John Wiley & Sons, Inc., 1959.

Hilgard, Ernest R., and Bower, Gordon H. Theories of Learning. 3rd Edition. New York: Appleton-Century-Crofts, 1966.

Lumsdaine, A. A., and Glaser, Robert, eds. Teaching Machines and Programed Learning: A Source Book. Washington, D. C.: National Education Association, 1960.

Smith, Wendell, and Moore, J. William. Programed Learning. Princeton, N. J.: D. Van Nostrand Company, Inc., 1962.

Miscellaneous

Colwell, Richard. Music Achievement Tests 1 and 2. Chicago: Follett Educational Corporation, 1968.

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

APPENDICES

APPENDIX A

PROGRAMED MATERIAL

Name_____

Section_____

MUSIC 135

PROGRAMED MATERIAL--SERIES A

TERMINOLOGY, SCALES, AND NOTATION

.....

Instructions:

(a) this programed study has been structured to progress systematically and will offer maximum benefit if followed sequentially

(b) use a 4 X 6 card or something similar to cover the printed answer while you write in your response

(c) you may want to refer to previous frames to reinforce your learning; some frames will direct you to earlier material for review

(d) if a frame appears vague or ambiguous to you, please write a few words stating the source of confusion and how it may be eliminated

(e) it is important that you use a keyboard instrument as you study this material

1. Music, in the traditional sense, is based on sound. Any study of music eventually necessitates a consideration of _____.

.....

sound

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

2. One of the characteristics of sound is pitch, which we describe as being relatively high or low. The "highness" or "lowness" of sound is defined as _____.

.....

pitch

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

3. We perceive musical sounds and are able to hear differences in pitch which we discriminate as relative "highness" or "lowness". A piccolo, for example, is capable of playing a higher _____ than the bassoon; and a bass in a quartet is able to sing a lower _____ than the soprano.

.....

pitch

pitch

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

4. The pitches used in making music are arranged in tonal ladders. The steps of the ladder may be numbered, lettered, have representative syllables, etc. Pitches can be _____ into a tonal ladder.

.....

arranged

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

5. The numerical sequence below represents a tonal ladder. Supply the missing numbers to this organized series.

1 2 3 ___ 5 6 ___ 8

.....

4, 7

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

6. West civilization has historically employed a tonal ladder (scale) of seven (7) tones in creating music. The progressive arrangement of seven pitches used as the foundation of traditional music is known as a _____.

.....

scale

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

7. You may have noticed that a seven-tone scale actually has eight members. The sound represented by the eighth step is similar to the first step; this similarity is known as the octave. The pitch difference between the low and high notes of an eight-tone scale is labeled the _____.

.....

octave

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

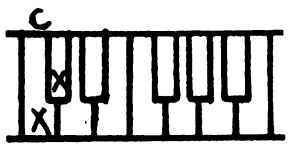
8. The octave is one of a number of intervals that you will use in music study. An interval is defined as the difference of pitch between two tones. Two different pitches form an _____.

.....

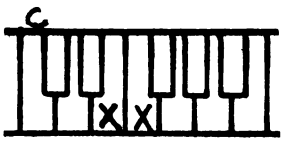
interval

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

9. The smallest interval in our tonal system is the half-step. A half-step is heard when the following tones are played. Play and sing these intervals.



-- and --

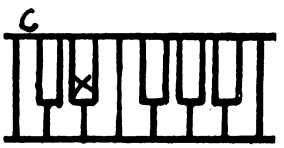


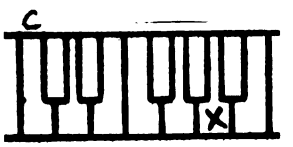
.....

(keyboard and vocal response)

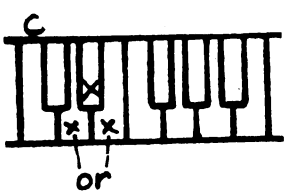
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

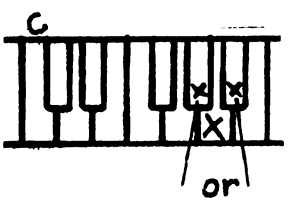
10. The distance defined as a half-step is heard as the difference between any one key and the nearest key to the left or right, black or white. Play and sing the interval of a half-step from the keys marked by Xs. Identify the nearest half-step with another X.





.....





(keyboard and vocal response)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

11. The smallest difference in pitch on the keyboard is the _____-_____.

.....

half-step

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

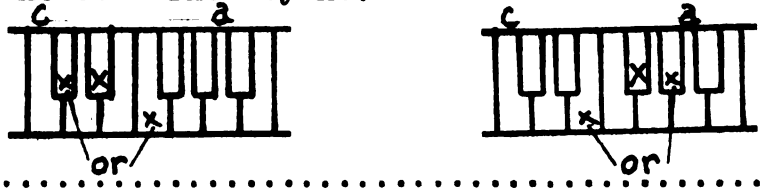
12. The whole-step, as its name implies, is made up of two half-steps. The keys of a whole-step will always have one key between them. Play and sing these keyboard examples.

.....

(keyboard and vocal response)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

13. The distance known as the whole-step is heard as the difference between any one key and a key two half-steps away. This may be higher (right) or lower (left) in pitch. Play and sing these whole-step intervals from the notes marked by Xs.



.....

(keyboard and vocal response)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

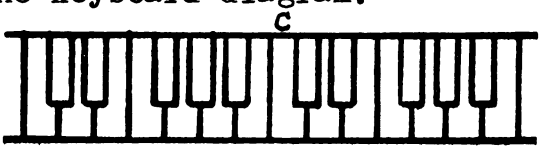
14. The distance from one note to a tone two half-steps higher (right) or lower (left) in pitch is termed a _____-_____.

.....

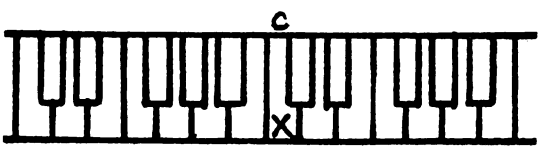
whole-step

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

15. In your study of music you will be using the keyboard extensively. As a point of reference use the white note at the center of the keyboard and immediately to the left of a group of two black notes. This note is labeled by the letter 'c'. Mark this 'middle c' with an X on the keyboard diagram.

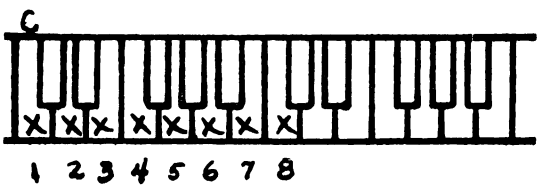


.....



XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

16. On a keyboard instrument, play and sing* the notes identified by Xs on the diagram below and you will have performed the eight-tone scale.



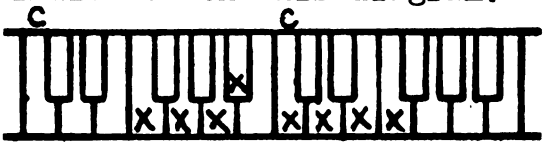
.....

(keyboard and vocal response)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

*note--when requested to sing, it may be easiest to use the neutral syllable 'la'; if the example is out of your voice range, you will need to sing an octave higher or lower.

17. On the keyboard instrument, and by singing, begin in a different location than in frame 16 and perform another eight-tone scale (the first step of this scale is immediately to the left of the group of three black notes) as indicated on this diagram.

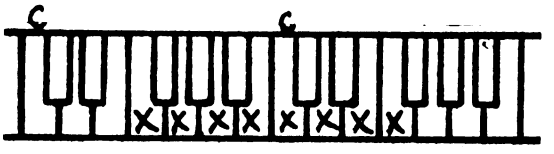


.....

(keyboard and vocal response)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

18. Using the same starting location as in frame 17, play and sing the eight-tone scale using only the white keys as in this diagram.



.....

(keyboard and vocal responses)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

19. The scale played and sang in frame 17 _____ have the same 'sound' as that in frame 18.
(did) (did not)

.....

did not

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

20. The reason the two scales did not 'sound' the same is due to the differing arrangement of whole- and half-steps within the octave. The difference in the 'sound' of the scales heard in frames 17 and 18 can be accounted for by the differing arrangement of _____- and _____-steps.

.....

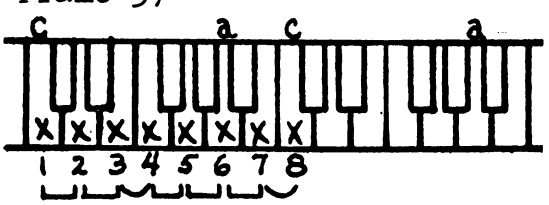
whole

half

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

21. We now return for closer inspection to the scale beginning on 'c'. The distance from the lowest (left) note to the highest (right) note is an _____.

(Refer to frame 5)



Label as whole- or half-steps, the seven intervals between members of the scale. Intervals between 1-2, 3-4, and 5-6 have been labeled for you. (Hint: is there a key between?)

1 whole 2 _____ 3 half 4 _____ 5 whole 6 _____ 7 _____ 8

.....

octave (eighth)

1 whole 2 whole 3 half 4 whole 5 whole 6 whole 7 half 8

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

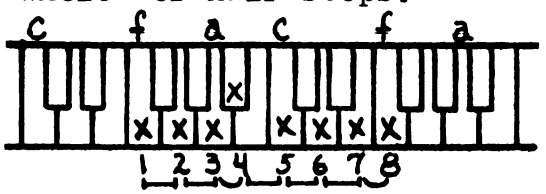
22. Half-steps occur between members ____-____, and ____-____. Whole-steps account for the remaining five (5) intervals.

.....

3-4, and 7-8

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

23. Now consider a scale beginning, not on 'c', but with a note two-and-a-half steps higher (note letter name 'f'). Label the intervals between members of the scale as either whole- or half-steps.



1_____2_____3_____4_____5_____6_____7_____8

.....

1 whole 2 whole 3 half 4 whole 5 whole 6 whole 7 half 8

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

24. This sequence of whole- and half-steps, employing eight pitches within the octave, is termed the major scale. The major scale can be defined as a series of _____ (number) notes whose extreme interval is an octave. _____-steps are located between keys 3-4 and 7-8. All the other intervals are _____-steps.

.....

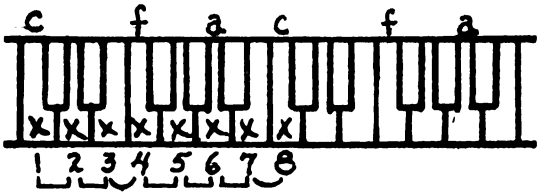
eight (8)

Half

whole

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

25. There are scales having the same, fewer, or a greater number of members, but the sound unit symbolized by this keyboard diagram is known as a _____ _____.

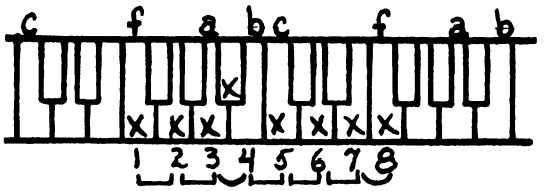


.....

major scale

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

26. In an earlier frame it was determined necessary, when using 'f' as the beginning note of a major scale, to use a black key as step 4.



This was necessary to maintain the proper order of whole- and half-steps of the _____ _____. Play and sing the constructed scale.

.....

major scale

(keyboard and vocal response)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

27. Had we begun at 'f', and played only white keys, the 4th step would have distorted the major scale sequence. It was necessary to flatten (lower a half-step) the white key between the 3rd and 5th steps of the scale. A note is flatted when it is _____ a half-step.

.....

lowered

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

28. The 'b flat' ($b^{\flat}$) became the 4th step of the major scale whose lowest (keynote) tone is '__'.

.....

'f'

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

29. The note a half-step lower than 'c' can be called 'c____'. The note a half-step lower than 'a' is '__ _____'; than 'e' is '__ _____'; etc.

.....

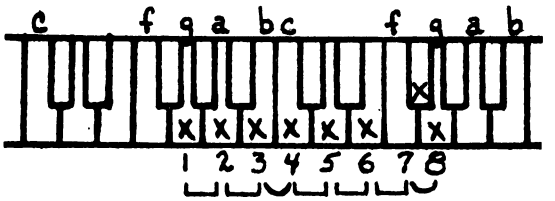
flat ($\flat$)

a flat

e flat

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

30. If a major scale began on the note 'g', the whole- and half-steps being observed as in frames 21-25, the result would be as seen in the diagram below. Play and sing this major scale whose keynote is 'g'.



.....

(keyboard and vocal response)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

31. You have no doubt noticed the one note (7th scale degree) played on a black key. This was necessary to maintain the proper sequence of _____- and _____-steps of the _____ _____.

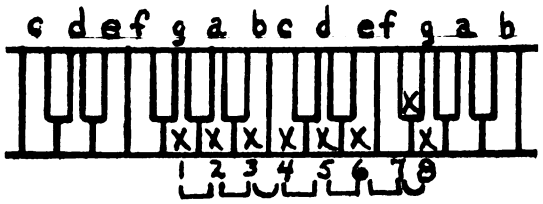
.....

whole- and half-

major scale

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

32. Given 'g' as the keynote and having been asked to play a major scale, you might have played only white notes up through the octave. Play and sing the eight white notes from 'g' up through the octave as in the diagram below. You have heard a scale quite different from the major. It was necessary to raise (sharp) the 'f' a half-step in pitch to realize the major scale.



.....

(keyboard and vocal response)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

33. The 'f' sharp (f#) became the 7th degree of the major scale whose lowest (keynote) pitch is '__'.

.....

g

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

34. A tone a half-step higher than 'f' is called 'f_____'. The note a half-step higher than 'c' is '__ _____'; than 'b' is '__ _____'; etc.

.....

sharp (#)

'c sharp'

'b sharp'

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

35. The half-steps in the major scale occur between steps __-__ and __-__.

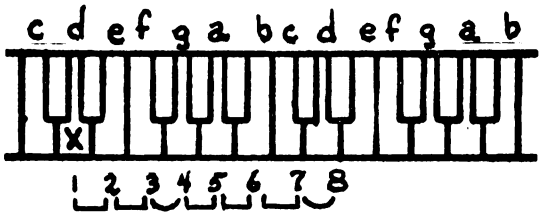
.....

3-4

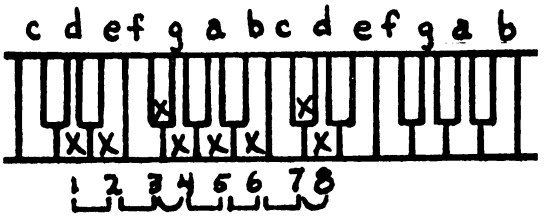
7-8

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

36. Given the keynote 'd', use Xs to indicate the remaining seven notes of the major scale. Play and sing the scale.



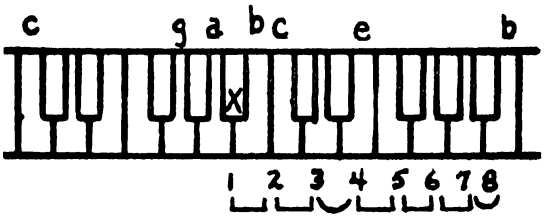
.....



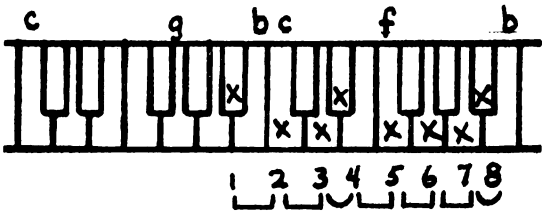
(keyboard and vocal response)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

37. With 'b' flat (b♭) as the keynote locate, by Xs, the other members of the major scale on the keyboard diagram. Play and sing the resulting scale.



.....



(keyboard and vocal response)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

38. What is the keynote of the B flat (B♭) major scale?_____

.....

B♭

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

39. What is the keynote of D* major scale? _____

.....

D

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

40. The keynote is synonomous with the _____ degree (step) of the scale.

.....

first

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

*note--it is customary to use an upper case (capital) character when referring to a major scale by its letter name

41. Regardless of the starting keyboard pitch, if _____-steps are observed between 3-4 and 7-8 and the remaining intervals are _____-steps, the resulting sound unit will be a _____ _____.

.....

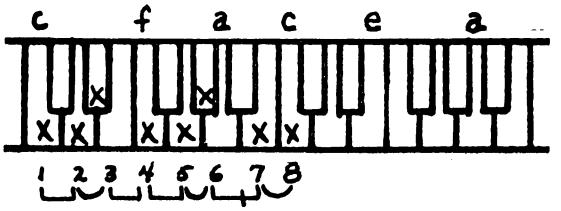
half

whole

major scale

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

42. As suggested in frame 25, there are other ways of arranging the eight notes within the octave. One such arrangement is diagramed below. Play and sing (by numbers) this new arrangement.

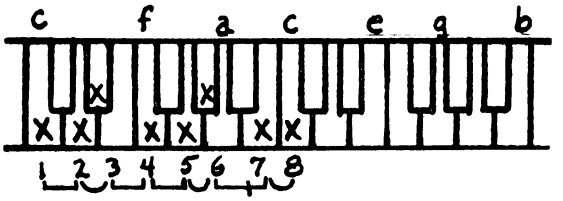


.....

(keyboard and vocal response)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

43. Identify the whole step intervals used in this scale by labeling with the whole number one (1).



1___2___3___4___5___6___7___8

.....

1 1 2___3 1 4 1 5___6___7___8

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

44. We saw five (5) whole steps in the major scale, but only _____ in this arrangement. The whole-steps occur between degrees ___-___, ___-___, and ___-___.

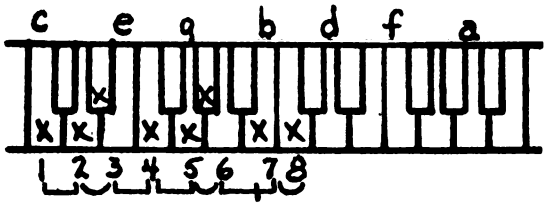
.....

three (3)

1-2, 3-4, and 4-5

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

45. Now identify the locations of half-steps in this scale by labeling them with the fraction one-half ($\frac{1}{2}$).



1___2___3___4___5___6___7___8

.....

1___2 $\frac{1}{2}$ 3___4___5 $\frac{1}{2}$ 6___7 $\frac{1}{2}$ 8

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

46. Whereas only two (2) half-step intervals exist in the major scale, three (3) are found in this harmonic minor scale. The three occur between degrees ___-___, ___-___, and ___-___.

.....

2-3, 5-6, and 7-8

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

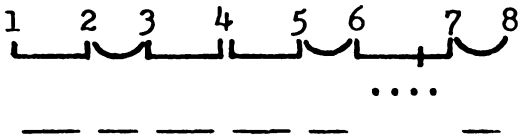
47. You have now identified six of the seven intervals of the harmonic minor scale, whose keynote is 'c'. There are ____ whole-steps and ____ half-steps.

.....

3 whole-steps and 3 half-steps.

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

48. Referring to the previous frames, note by whole number (1) or fraction ($\frac{1}{2}$) the location of whole- and half-steps in the harmonic minor scale.



1 $\frac{1}{2}$ 1 1 $\frac{1}{2}$ · · · $\frac{1}{2}$

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

49. The interval between degrees ___ and ___ has not yet been analyzed. It is different from either the whole- or half-step because it has a ~~(wider)(narrower)~~ pitch compass.

6 and 7

wider

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

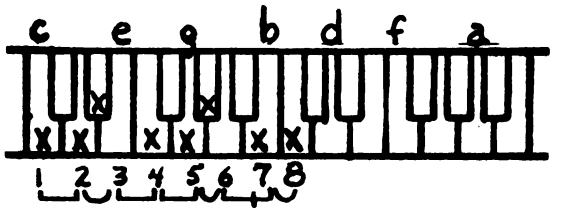
50. The step-and-a-half (a♭ to b) that exists between the sixth and _____ degrees of the harmonic _____ scale give it a uniquely different sound than the major scale.

seventh

minor

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

51. Give the entire intervallic sequence of the 'c'* harmonic minor scale using the numerical symbols ½, 1, and 1½.



1—2—3—4—5—6—7—8

.....

1 ½ 1 1 ½ 1½ ½

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

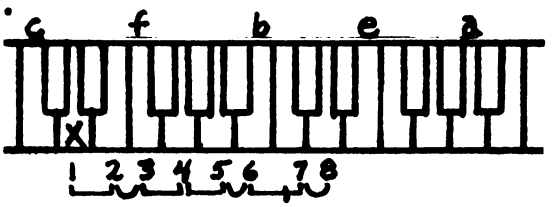
52. Just as a major scale can use any keyboard pitch as the keynote, so may a harmonic _____ scale begin at any tone.

.....

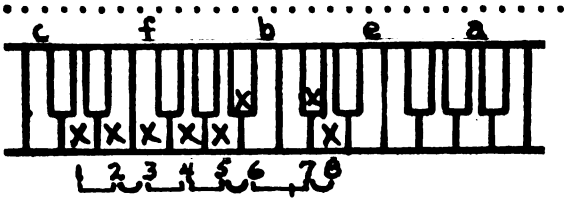
minor

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

53. Use 'd' as the keynote for the harmonic minor scale and identify the other seven members by Xs. Play and sing the scale.



.....



(keyboard and vocal response)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

*note--it is customary to use a lower case character when referring to a minor scale by letter name

54. This 'd' harmonic minor scale could be symbolized by using letter names for the eight members. When spelled the _____ _____ scale would appear as follows (fill-in the missing letters).

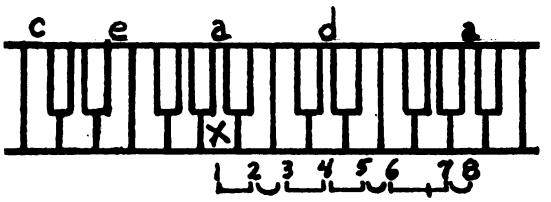
d _ _ _ _ $b^{\flat}$ $c^{\#}$ _

.....

(d) e f g a ($b^{\flat}$) ($c^{\#}$) d

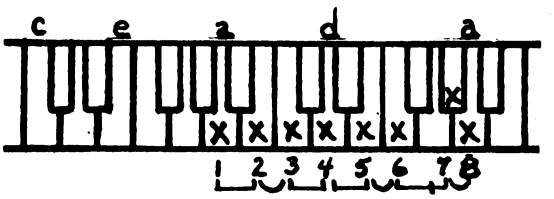
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

55. Use Xs to denote the members of the 'a' harmonic minor scale and complete its spelling.



a _ _ _ _ _ $g^{\#}$ _

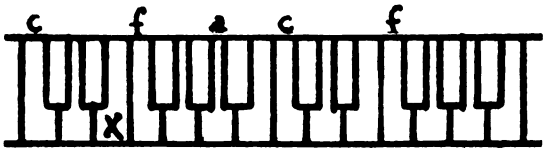
.....



(a) b c d e f ($g^{\#}$) a

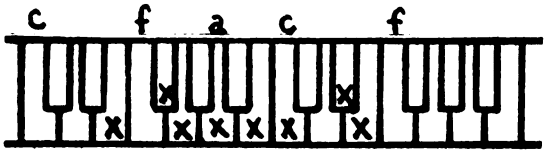
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

56. Do the same with the 'e' harmonic minor scale.



e $f^{\#}$ __ __ __ __ $d^{\#}$ __

.....



(e) ($f^{\#}$) g a b c ($d^{\#}$) e

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

57. Summarize the study of major and harmonic minor scales by showing a comparison of their interval sequences. Place the numerical symbols for the scale in the spaces provided.

major scale: 1 2 3 4 5 6 7 8

__ __ __ __ __ __ __

harmonic minor scale: 1 2 3 4 5 6 7 8

__ __ __ __ __ __ __

.....

major scale: 1 2 3 4 5 6 7 8

1 1 ½ 1 1 1 ½

harmonic minor scale: 1 2 3 4 5 6 7 8

1 ½ 1 1 ½ 1½ ½

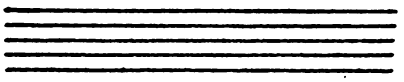
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

58. The information covered in the previous frames increases in usefulness when recorded for purposes of visual interpretation. Musical notation has become a finely developed art, although new symbols and altered forms of traditional characters are being introduced regularly.

.....

(no written response required)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

59. The five-line staff is the frame upon which musical symbols are placed. These _____ (number) horizontal lines form the musical _____. The staff looks like this: 

.....

five (5)

staff

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

60. At the left margin of the staff is located a clef, a symbol that acts as a point of reference in pitch relationship. A symbol placed on a staff to determine pitch reference is termed a _____.

.....

clef

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

61. In this study you will be most concerned with only two of the clefs. One of these is associated with instruments generally performing at or above middle 'c' (e.g., flute, violin, soprano, etc.) and is known as the treble or G clef (𝄞). The _____ or G _____ is normally used with instruments playing in the upper half of the keyboard range.

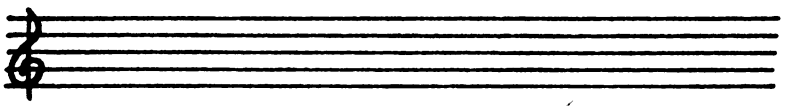
.....

treble

clef

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

62. The treble clef would be seen as in the example below. Construct five or six treble clefs on the staff space.



.....

(construction of treble clefs on the staff)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

63. The G or treble clef encircles the second staff line which symbolizes the 'g' above 'middle c'. Lines and spaces of the staff are always numbered from the bottom. The letters used in music are limited to the seven (7) initial members of the alphabet (i.e., 'a' through 'g'). Each line and space has its own alphabetical indicant.

.....

(no written response required)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

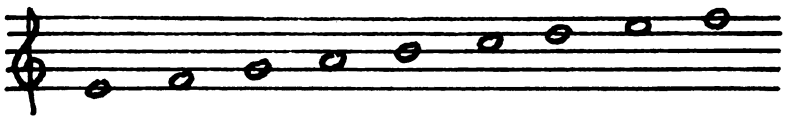
64. The alphabetical sequence is terminated by 'g' on the _____ line and resumes with 'a' on the second space.

.....

second

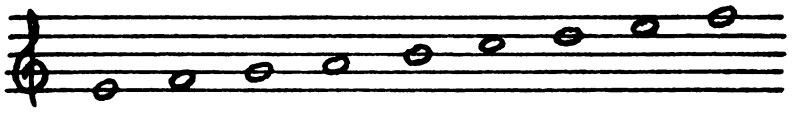
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

65. Working up and down from 'g', fill in the missing letters that represent pitches on the staff.



_ _ g _ _ c _ _ _

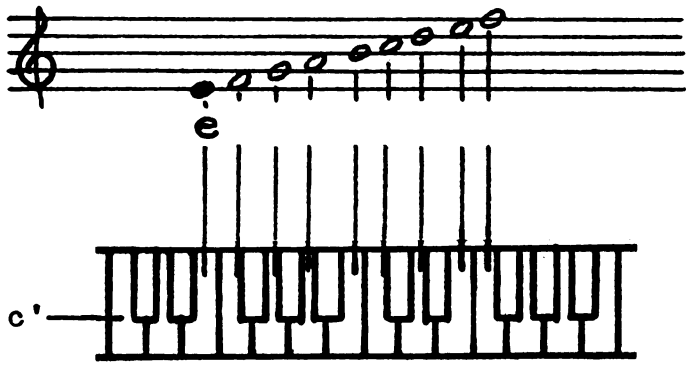
.....



e f (g) a b (c) d e f

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

66. The letters you have placed have their representative counterparts on the white notes of the keyboard. Complete the letter/note combinations as begun in the diagram below and play the series.



.....

(e) f g a b c d e f

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

67. Supply the letters for the following notes:

— — — — — — —

.....

e g a b b a c

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

68. The bass or F clef (𝄢) is generally used with instruments or voices that perform below 'middle c' (e.g., bassoon, string bass, tuba, bass, etc.). The sign used in musical notation for pitches in the lower half of the keyboard range is the _____ or F _____.

.....

bass

clef

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

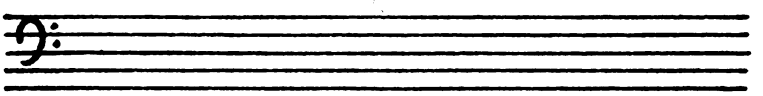
69. The fourth line of the staff lies between the two dots of the ____ or bass clef. The letter name assigned to this line is 'f' and it is the first 'f' below 'middle c'.

.....

F

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

70. An F or _____ clef has been placed on the staff; construct five or six clefs similar to it on the remaining space.



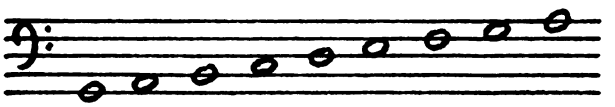
.....

bass

(construction of bass clefs)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

71. Moving up and down from the 'f' on the fourth line, supply the missing letters that represent pitches.



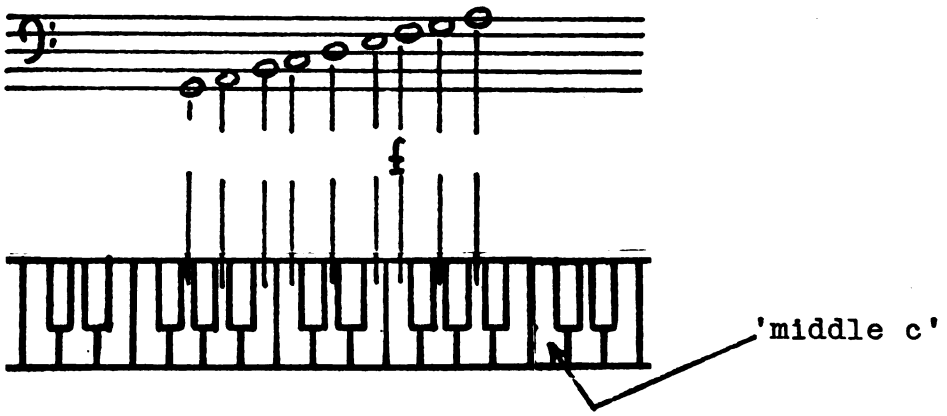
g _ _ _ _ _ _ _ _ a

.....

(g) a b c d e f g (a)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

72. As with the treble clef, the bass clef letters represent pitches located on the keyboard. Complete the letter/note links in the diagram and play them.



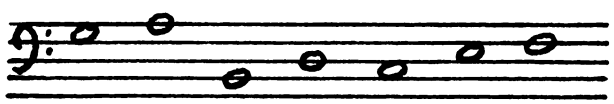
.....

g a b c d e (f) g a

(keyboard response)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

73. Supply the letters for the following notes:



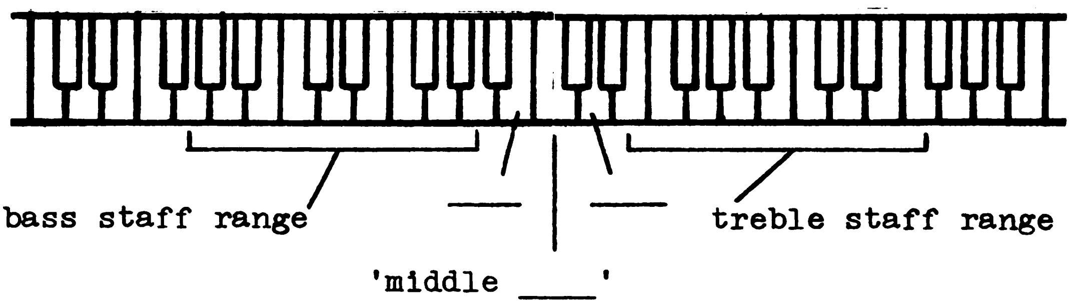
— — — — — — —

.....

g a b d c e f

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

74. Although many notes exist above the treble clef and below the bass staff there are only three (3) white keys between the two staffs. Locate these notes on the keyboard and fill-in the missing letters. Play them.



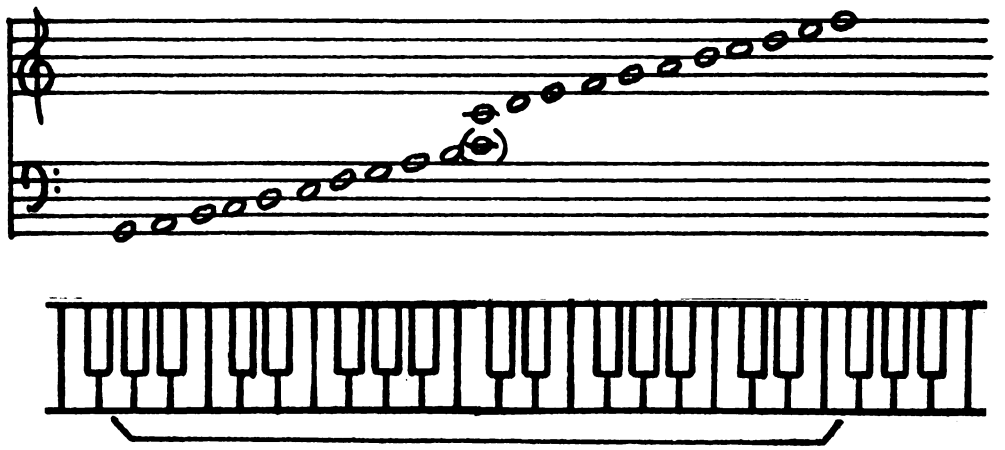
....

b, c, d

(keyboard response)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

75. It is often desirable to place the G and F clefs together as when a pianist or choral group performs. The combined symbol is termed the great staff. The three notes between the staffs are lettered ___, ___, and ___. Play the entire series on the keyboard.



The range of the _____ _____ is nearly three (3) octaves.

.....

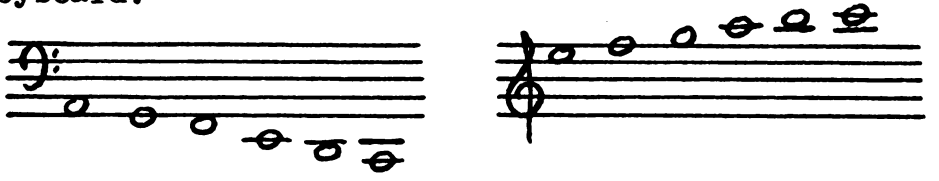
b, c, d

(keyboard response)

great staff

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

76. The leger line supplied through 'middle c' is a partial staff line that extends the downward range of the treble clef (or upward range of the bass clef). Give the letter names of the notes located beyond the staff range on the following diagrams. Play these on the keyboard.



a g _ _ _ _ e f _ _ _ _

.....

(a) (g) f e d c

(e) (f) g a b c

(keyboard response)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

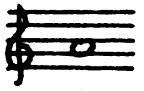
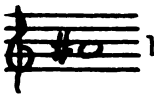
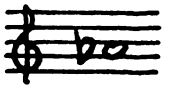
77. In relating the great staff to the keyboard, we have studied only the white notes. In frames 24-34 you saw that each white tone could be sharped (♯) by _____ it a half-step or flatted (♭) by _____ it a half-step.

.....

raising

lowering

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

78. Placing a sharp in front of note (#o) raises the pitch; thus this 'a'  with a sharp  becomes an '__ _____'. A flat placed similarly  _____ the tone and it becomes an '____ _____'.

.....

'a sharp'

lowers

'a flat'

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

79. Locate 'd#' (third line of the F clef) and 'e♭' (third space F clef) on the keyboard. Are they the same note? _____

.....

yes

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

80. A black note, then, can have _____ letter names; it behaves as a _____ to the white note on its left and as a _____ to the one on the right.

.....

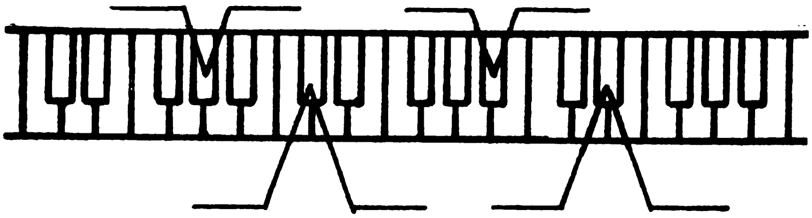
two (2)

sharp

flat

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

81. In the spaces provided, label each selected black note with its two letter names.

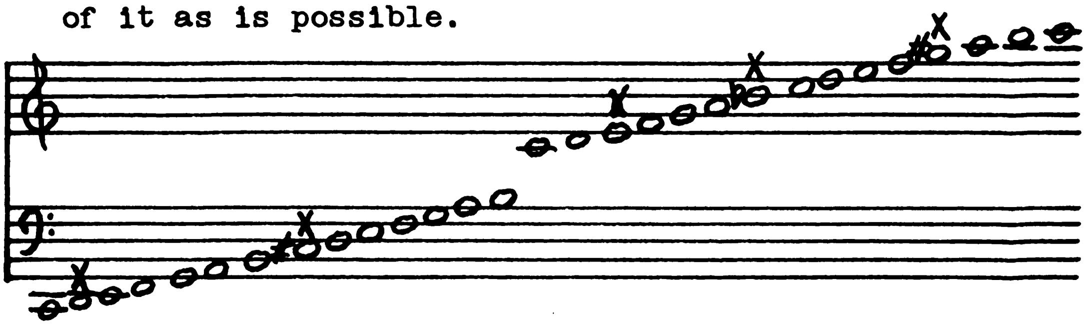


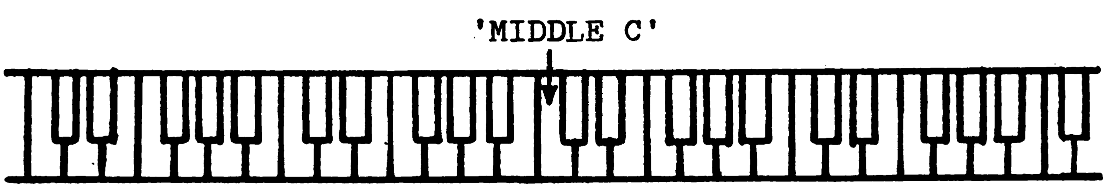
. . . .

g♯ or a♭; c♯ or d♭; a♯ or b♭; d♯ or e♭

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

82. Although there are notes higher and lower than those on the __________ staff below, this four-octave range will easily serve our study purposes. For each note marked by an X, draw a connecting line to its keyboard location. Play the entire series and sing as much of it as is possible.





. . . .

great

(keyboard and vocal response)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Name_____

Section_____

MUSIC 135

PROGRAMED MATERIAL--SERIES M

INTERVALS

.....

Instructions:

(a) this programed study has been structured to progress systematically and will offer maximum benefit if followed sequentially

(b) Use a 4 X 6 card or something similar to cover the printed answer while you write-in your response

(c) you may wish to refer to previous frames to reinforce your learning; some frames will direct you to earlier material for reference and review

(d) if a frame appears vague or ambiguous, please write a few words stating the source of confusion and how it may be eliminated

(e) it is important that you use a keyboard instrument as you study

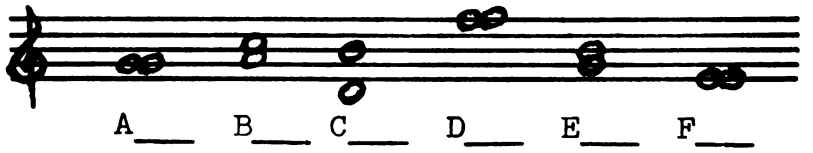
1. The distance between two pitches is called an interval. An interval can be expressed in sound or symbolized by notation. An _____ is the distance between any two musical tones.

.....

interval

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

2. A note that is repeated, that is, played again without changing pitch, is said to comprise a unison or prime. Check the letter of two-note groups that are unison. A repeated note is called a _____ or _____.



.....

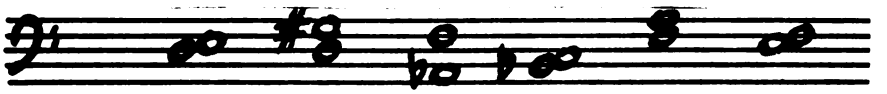
A, D, F

unison

prime

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

3. Intervals may occur by step or leap. An interval by step would be from one letter name degree to the next, either up or down. The notes 'g' to 'a' and 'f' to 'e' would be examples of a _____, even though the latter is only a half-step. Check the intervals of a step in the examples below.



A___ B___ C___ D___ E___ F___

.....

step

A, D

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

4. An interval by leap would occur when nonadjacent letters of the staff are used. The notes 'g' to 'b' and 'f' to 'c' are examples of a _____. Check the intervals of a leap from these examples.

A___ B___ C___ D___ E___

.....

leap

A, B, E

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

5. A commonly accepted way of labeling intervals is by the letter-number system. A capital M (major), the lower case m (minor), and a P (perfect) are the letters used in this system. The numbers two through eight are used to identify the interval. The intervals studied are as follows:

unison or prime (repeated note)

M2 - 1 step

m3 - 1½ steps

M3 - 2 steps

P4 - 2½ steps

P5 - 3½ steps

M6 - 4½ steps

M7 - 5½ steps (½ step less than an octave)

P8 - 6 steps

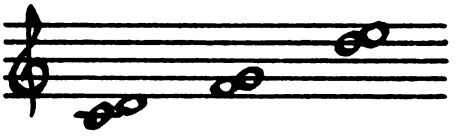
.....

(no written response necessary)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

6. Please consider the major scale whose keynote is 'c'. From the first degree ('c') to 'd' is a whole step or major second (M2). A _____ step is the name of the distance between the first and second steps of a major scale.

Examples:

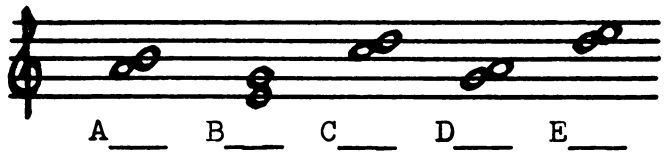


.....

whole

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

7. Play and sing the five intervals below. Place an X below those intervals that are a M2.



.....

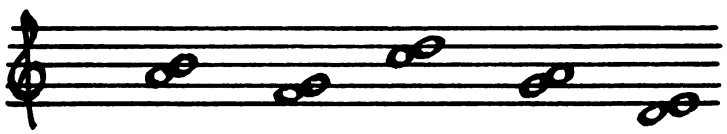
A, C, D, E

(keyboard and vocal response)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

8. From the given note, write in another note higher to create the interval of a M2. Play and sing each interval.

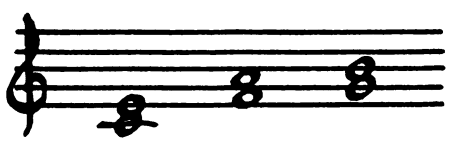
.....



(keyboard and vocal response)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

9. In the C major scale the interval from 'c' to 'e' is a major third (M3). Two whole-steps constitute the interval of a _____.

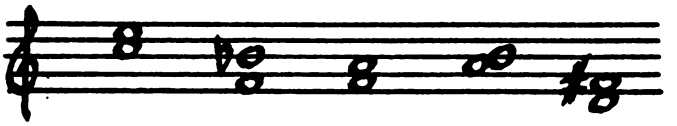
Examples: 

.....

M3 (major third)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

10. Play and sing the five intervals below. Check the intervals that are M3s.



A___ B___ C___ D___ E___

.....

(keyboard and vocal response)

A, C, E

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

11. From each of the given notes, place a note above that creates a M3. Play and sing each interval as a check against error.

.....

(keyboard and vocal response)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

12. Although the minor third (m3) interval can not be notated as the distance from the first to the third degrees of the major scale, its continual use in melody and harmony dictates its inclusion in our study. A step and a half (i.e., 'c' to 'e♭') is the distance of a m3 (minor third). By this we see its distance is a half-step greater than the _____ but a _____ _____ smaller than the M3.

.....

M2

half-step

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

13. This interval (m3) between the M2 and M3 is generally considered a decreased _____. In terms of distance it would consist of _____ steps.

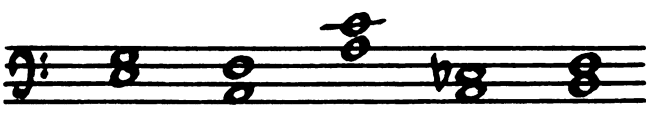
.....

M3

1½

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

14. Play and sing these intervals and check those that are m3s.



A___ B___ C___ D___ E___

.....

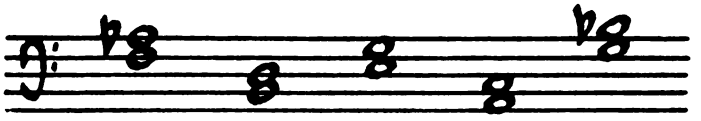
(keyboard and vocal response)

A, C, D, E

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

15. Above the notes on this staff, place another that will form the m3. Confirm your notation by singing and playing each interval.

.....



(keyboard and vocal response)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

16. The perfect fourth (P4) is the interval illustrated by the first and fourth degrees of the major scale. In the key of C the 'c' to _____ would comprise the two-and-a-half step sound. A M3 plus a _____-step constitute the P4.

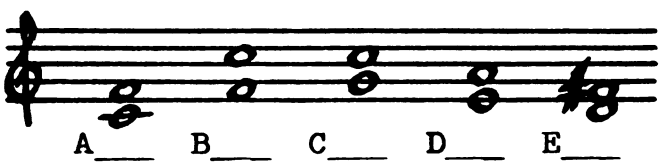
.....

'f'

half

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

17. Check any of the following intervals that are P4s. Play and sing each.



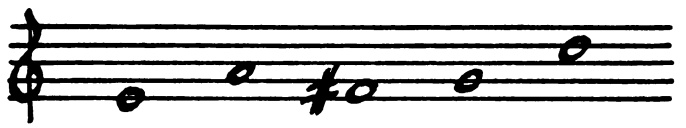
.....

A, C, D

(keyboard and vocal response)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

18. Above the given notes place another that will construct a series of P4 intervals. Test each by playing and singing.



.....

(keyboard and vocal response)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

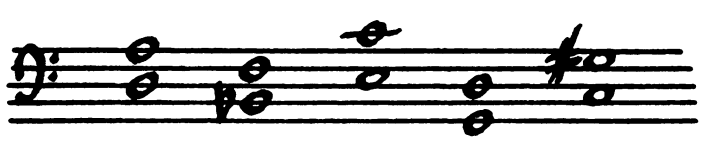
19. The P4 (2½ steps) plus a whole-step yields the interval of a perfect fifth (P5). A range of _____ steps produces a P5. An example would be the distance from 'c' to 'g'.

.....

3½

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

20. Play and sing the five intervals below, checking those that qualify as P5s.



A___ B___ C___ D___ E___

.....

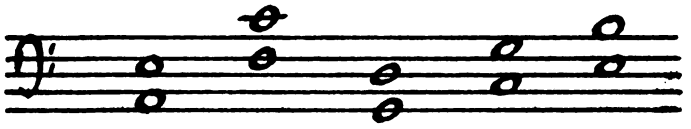
(keyboard and vocal response)

A, B, D

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

21. The tones on this staff are the lower ones of the P5 intervals you are to construct. Confirm each one by playing and singing the notes.

.....



(keyboard and vocal response)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

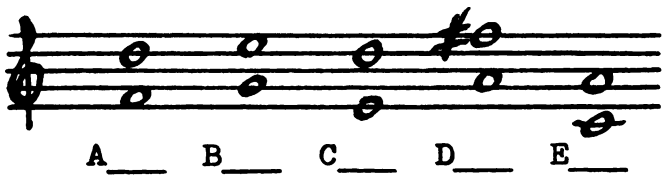
22. Four-and-a-half steps or one step greater than the P5 produces the major sixth (M6). This interval is realized from 'f' to 'd' or 'c' to _____.

.....

'a'

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

23. Some of these intervals exhibit the sound of the M6. Analyze which ones are M6s and place an X below them. Play and sing all M6 intervals (4½ steps).



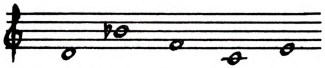
.....

C

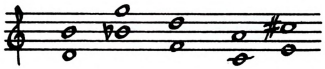
(keyboard and vocal response)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

24. Add a note above each of these tones that will constitute a M6 interval. Confirm your choice by playing and singing each interval.



.....



(keyboard and vocal response)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

25. One half-step short of an octave or five-and-a-half steps bring us to the major seventh (M7). The _____ is a half-step less than the octave. The notes 'c' to 'b' or 'g' to _____ illustrate the M7.

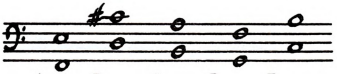
.....

M7

'f#'

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

26. Analyze the intervals on this staff and mark with an X the one or ones qualifying as the M7. Sing and play each.



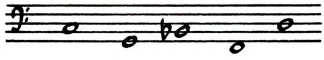
.....

A, B, E

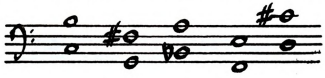
(keyboard and vocal response)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

27. Above each given note on this staff place another to construct a M7 interval. Test each interval by playing and singing.



.....



(keyboard and vocal response)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

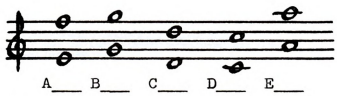
28. Six whole steps ('c' to 'c', 'f' to 'f', etc.) constitute the octave (8va) interval. The distance between the first and eighth degree of the major scale is the _____.

.....

octave

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

29. Which of these intervals are octaves? Play and sing each one.



.....

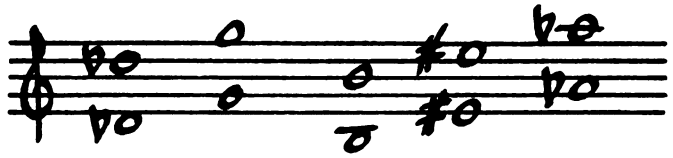
B, C, D, E

(keyboard and vocal response)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

30. These notes are the lower ones to the interval of an octave. Add the higher pitch and confirm your choice at the keyboard and vocally.

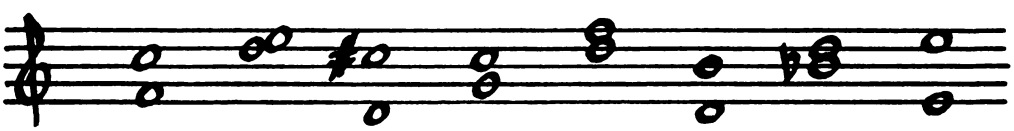
.....



(keyboard and vocal response)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

31. Label the intervals on these staffs by letter (M, m, or P) and number (2, 3, 4, etc.). Confirm each by playing and singing.



A. A___ B___ C___ D___ E___ F___ G___ H___

B. A___ B___ C___ D___ E___ F___ G___ H___

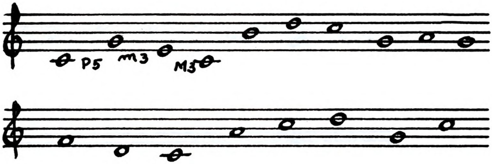
.....

A. A P5 B M2 C M7 D P4 E m3 F M6 G M3 H P8

B. A P4 B M7 C M2 D P5 E P8 F m3 G M6 H M3

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

32. After singing and playing this series, analyze and label the intervals between the notes. The first ones have been done to illustrate the technique.



....

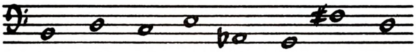
(keyboard and vocal response)

(P5), (m3), (M3), M7, m3, M2, P4, M2, M2

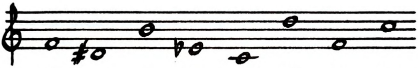
m3, M2, M6, m3, M2, P5, P4

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

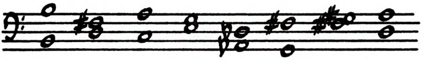
33. From these letter/number symbols, write the staff notation for each interval directly above the given notes. Play and sing them to verify your choices.



P8 M3 M6 m3 P4 M7 M2 P5



M3 M6 m3 P8 P5 M2 M7 P4



P8 M3 M6 m3 P4 M7 M2 P5

M3 M6 m3 P8 P5 M2 M7 P4

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Name_____

Section_____

MUSIC 135

PROGRAMED MATERIAL--SERIES R

MAJOR AND MINOR TRIAD CONSTRUCTION

.....

Instructions:

(a) this programed study has been structured to progress systematically and will offer maximum benefit if followed sequentially

(b) use a 4 X 6 card or something similar to cover the printed answer while you write-in your response

(c) you may wish to refer to previous frames to reinforce your learning; some frames will direct you to earlier material for review and reference

(d) if a frame appears vague or ambiguous to you, please write a few words stating the source of confusion and how it may be eliminated

(e) it is important that you use a keyboard instrument as you study this material

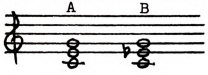
1. In the musical sense of the term, a triad ia a sound unit of three tones. Our particular interest is with two types: the major triad and the minor triad. A major or minor triad has _____ members with intervals of two thirds (M3 and m3) encompassed by a fifth (P5).

.....

three

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

2. Play these two triads:



Do they have different sound qualities? (1)_____

Analyze the intervals. In triad A: 'c' to 'e' is a (2)_____; 'e' to 'g' is a (3)_____; 'c' to 'g' is a (4)_____. In triad B: 'c' to 'e♭' is a (5)_____; 'e♭' to 'g' is a (6)_____; 'c' to 'g' is a (7)_____.

.....

(keyboard response)

(1) yes (2) M3 (3) m3 (4) P5 (5) m3 (6) M3 (7) P5

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

3. From earlier instruction you will recall the letter/number system of labeling intervals. A capital M signifies a major interval, a lower case m stands for _____, and a capital P symbolizes a perfect interval. The numbers two (2) through eight (8) are used to identify the interval distance. The intervals studied are as follows:

unison or prime (repeated note)

M2 - 1 step

m3 - 1½ steps

M3 - 2 steps

P4 - 2½ steps

P5 - 3½ steps

M6 - 4½ steps

M7 - 5½ steps (½ step less than an octave)

P8 - 6 steps (octave)

. . . . . .

minor

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

4. Which interval remains constant for both triads in frame 2? _____

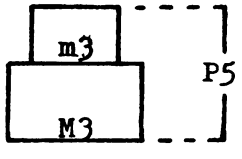
. . . . . .

the outer (P5)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

5. From the root or generating tone of a triad, we can follow this scheme in constructing a major quality triad.

major triad:

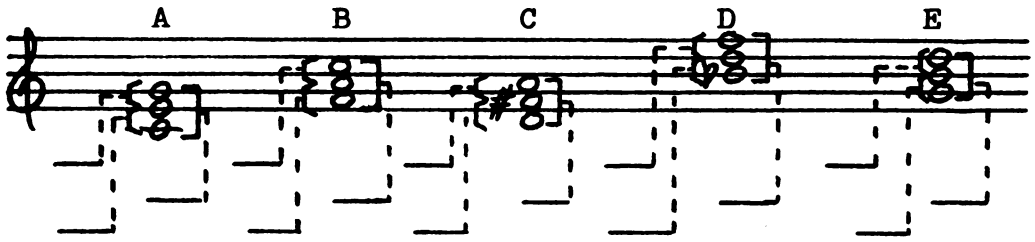


. . . . . .

(no written response required)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

6. Analyze, label, play and sing the intervals of these triads. Is the quality major?_____



.....

A. m3 P5 M3 B. m3 P5 M3 C. m3 P5 M3 D. m3 P5 M3 E. m3 P5 M3

(keyboard and vocal response)

yes

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

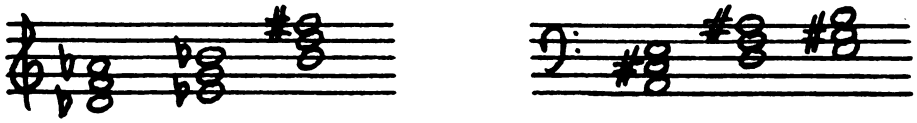
7. You have observed that the notes of a triad are located on consecutive spaces or lines of the staff. This placement corresponds to using every other letter in the alphabetical system of labeling notes. In frame 6, triad B is spelled 'f'-'a'-'c'. Triad D is spelled 'b♭'-'d'-'___', not 'a♯'-'d'-'f'. From the root note a triad is always spelled using alternate letters of the staff.

.....

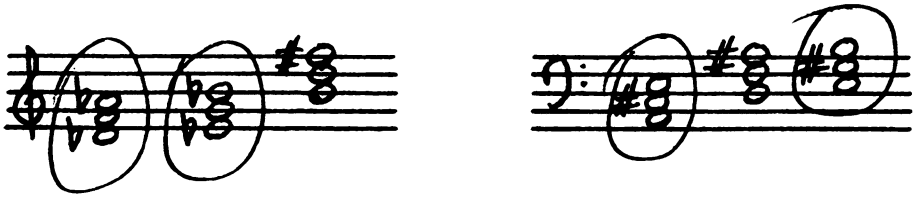
'f'

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

8. Through cognitive and aural analysis, determine which of these triads are major in quality. Circle those that are major.



.....



(keyboard and vocal response)

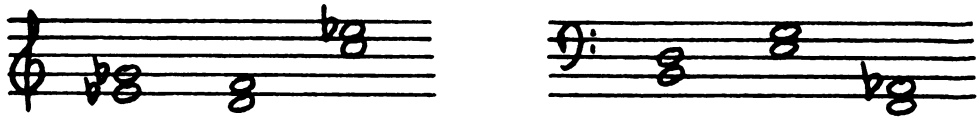
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

9. Add a note above each of the two-note groups that will complete a major (M) triad.

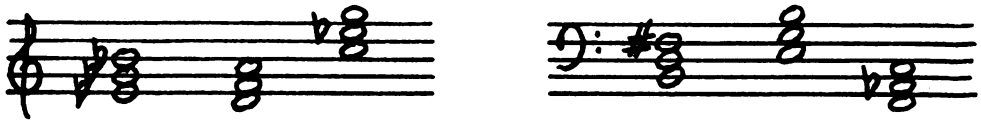
.....

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

13. Place a third note above these two-note groups that will complete a minor triad (m3).



.....

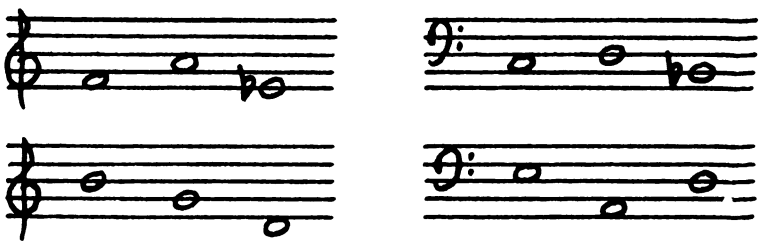


XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

14. Only the roots of M and m triads are notated on the staffs below. Complete the triad construction.

major triads:

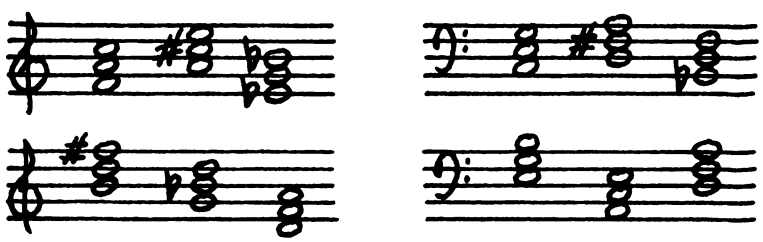
minor triads:



.....

major triads:

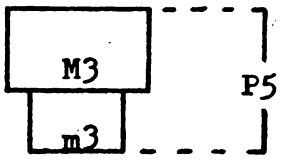
minor triads:



XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

10. From the generating tone of B triad in frame 2, we may deduce the construction scheme of a minor quality triad (m).

minor triad:

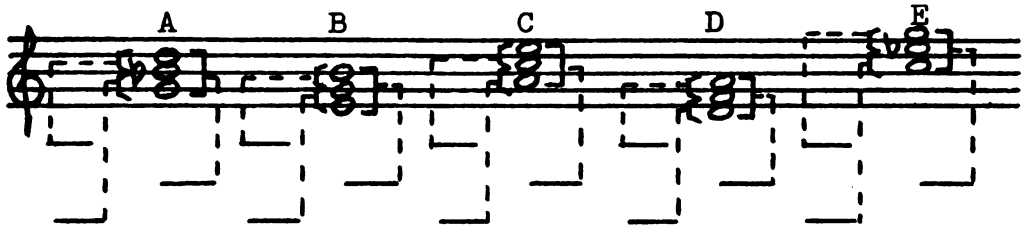


.....

(no written response required)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

11. Analyze, label, play, and sing the intervals of these triads. Are they major or minor?_____



.....

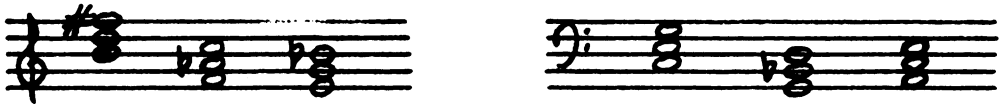
A. M3 P5 m3 B. M3 P5 m3 C. M3 P5 m3 D. M3 P5 m3 E. M3 P5 m3

(keyboard and vocal response)

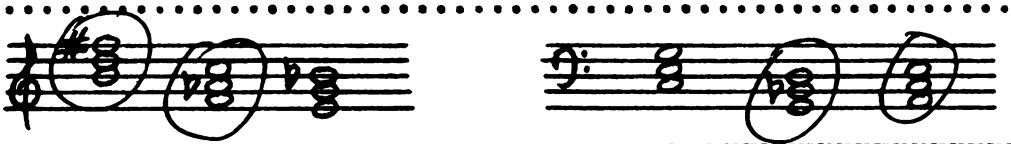
minor

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

12. Through aural and mental analysis, ascertain which of the following chords are minor in quality. Circle them.



.....



XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Name _____

Section_____

MUSIC 135

PROGRAMED MATERIAL--SERIES B

MAJOR AND MINOR TRIAD TERMINOLOGY

.....

Instructions:

(a) this programed study has been structured to progress systematically and will offer maximum benefit if followed sequentially

(b) use a 4 X 6 card or something similar to cover the printed answer while you write-in your response

(c) you may wish to refer to previous frames to reinforce your learning; some frames will direct you to earlier material for reference and review

(d) if a frame appears vague or ambiguous, please write a few words stating the source of confusion and how it may be eliminated

(e) it is important that you use a keyboard instrument as you study

1. In musical context, a triad is a chord of three tones consisting of superimposed thirds (2) and an outside range of a fifth. A triad has _____ members with intervals of two _____ (M3 and m3) and an outer compass of a fifth (P5).

.....

three

thirds

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

2. From previous instruction you will remember the letter/number system of labeling intervals. A capital M signifies a major interval, a lower case m stands for _____, and a capital P symbolizes a perfect interval. The numbers two (2) through eight (8) are used to identify the interval distance. The intervals studied are these:

unison or prime (repeated note)

M2 - 1 step

m3 - 1½ steps

M3 - 2 steps

P4 - 2½ steps

P5 - 3½ steps

M6 - 4½ steps

M7 - 5½ steps (½ step less than an octave)

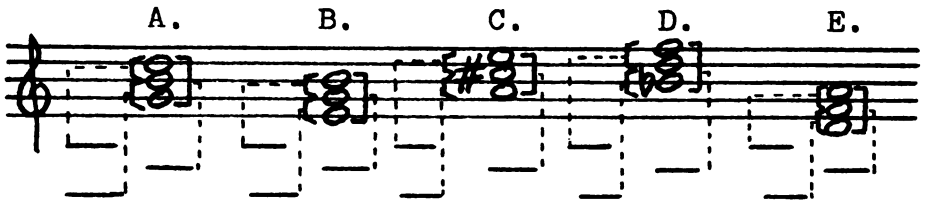
P8 - 6 steps (octave)

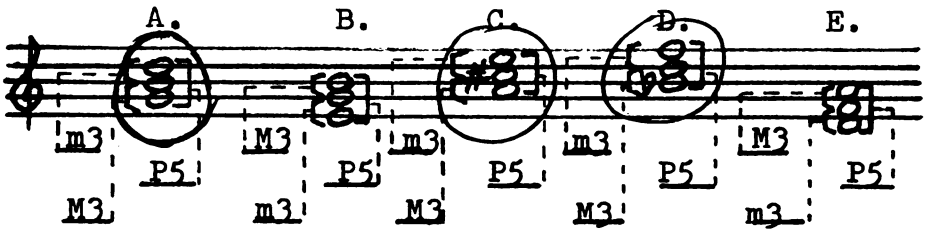
.....

minor

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

3. Analyze, label, play, and sing the intervals of the following triads. Circle the ones that are major in quality.





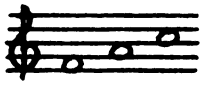
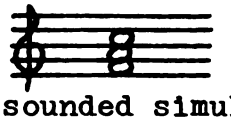
(keyboard and vocal response)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

4. You have no doubt noticed that the notes of a triad are located on consecutive spaces or lines of the staff. This placement on the staff corresponds to using every other letter in the alphabetical system of notation. In frame 3, triad A is spelled 'g'-'b'-'d'. Triad C is spelled 'a'-'c$^{\#}$'-'___'; not 'a'-'d$^{\flat}$'-'e'. From the root note a triad is always spelled using alternate letters of the staff.

'e'

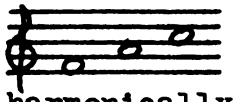
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

5. When two or more notes are played on a keyboard instrument they may be performed either separately (melodically) or simultaneously (harmonically).
This  is an example of triad members being played separately or _____; and this  is an example of triad members being sounded simultaneously or _____.

.....

melodically
harmonically

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

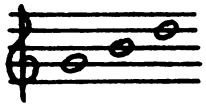
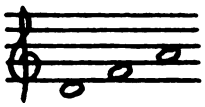
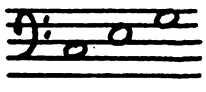
6. Play and sing these notes of the major triad:  Are they notated melodically or harmonically? _____

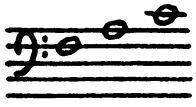
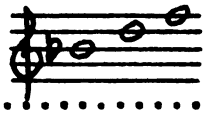
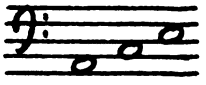
.....

(keyboard and vocal response)
melodically

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

7. After having played and sung these triads, identify those that are major in quality by printing a capital M in the space provided.

A.___  B.___  C.___ 

D.___  E.___  F.___ 

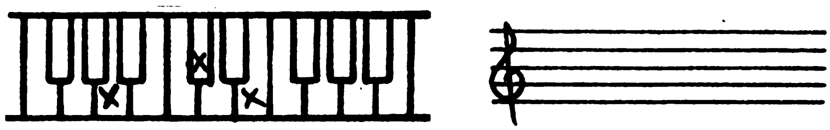
.....

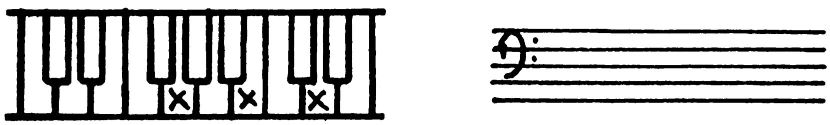
(keyboard and vocal response)
A.__M__ B.___ C.__M__ D.__M__ E.__M__ F.___

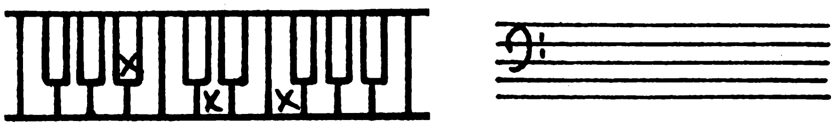
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

8. From the keyboard diagrams, transfer the M triads to melodic staff notation. (Remember that notes of a triad are located on consecutive lines or spaces of the staff.)

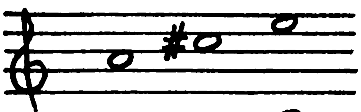
A. 

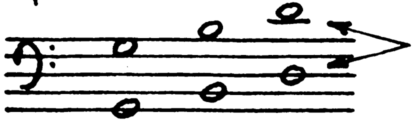
B. 

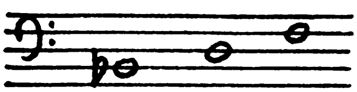
C. 

D. 

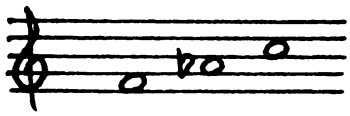
A. 

B. 

C.  either

D. 

9. Play and sing the notes of this minor (m) triad.

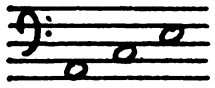
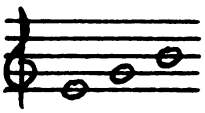


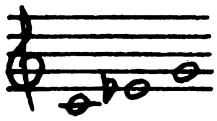
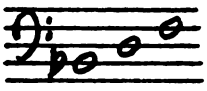
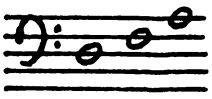
.....

(keyboard and vocal response)

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

10. Play and sing the following triads. Identify those that are minor by placing a small m in the space provided.

A.___  B.___  C.___ 

D.___  E.___  F.___ 

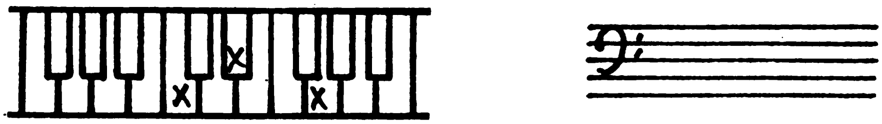
.....

(keyboard and vocal response)

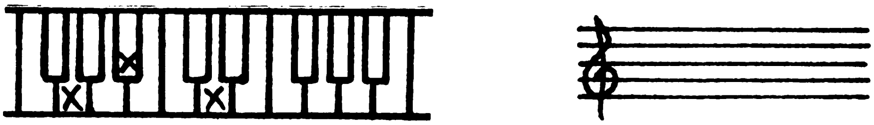
A.__m__ B.__m__ C.____ D.__m__ E.____ F.__m__

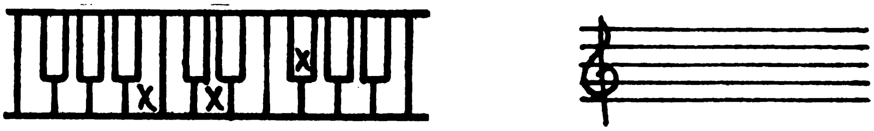
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

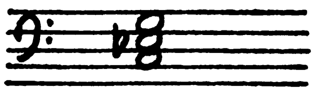
11. From the keyboard diagrams, transfer these minor triads to harmonic staff notation.

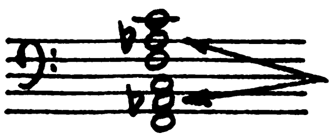
A. 

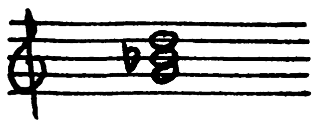
B. 

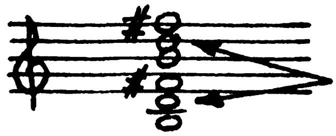
C. 

D. 

A. 

B.  either

C. 

D.  either

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

APPENDIX B

SELF-CONSTRUCTED TESTS

Name _____
Section _____

Harmonic Element Survey Pretest
(HESPRE)

on I

btest A--Sound Unit Comparison
Instructions. You will hear three units of sounds. Some of these will have only two tones(interval) while others will have three(triads). Two of these three units may or may not sound alike. You are to decide which, if any, of the two units sound alike and place an X to the left of the statement that corresponds with what you have heard. Each item will be heard twice: in one the tones are sounded separately and in the other, simultaneously. Two examples are recorded. Here is example A:

EXAMPLE A

___a. units 1 and 2 sounded alike

___b. units 1 and 3 sounded alike

___c. units 2 and 3 sounded alike

___d. none of the units sounded alike

EXAMPLE B

___a. units 1 and 2 sounded alike

___b. units 1 and 3 sounded alike

___c. units 2 and 3 sounded alike

___d. none of the units sounded alike

Item 1:

___a. units 1 and 2 sounded alike

___b. units 1 and 3 sounded alike

___c. units 2 and 3 sounded alike

___d. none of the units sounded alike

Item 2:

___a. units 1 and 2 sounded alike

___b. units 1 and 3 sounded alike

___c. units 2 and 3 sounded alike

___d. none of the units sounded alike

Item 3:

___a. units 1 and 2 sounded alike

___b. units 1 and 3 sounded alike

___c. units 2 and 3 sounded alike

___d. none of the units sounded alike

Item 4:

___a. units 1 and 2 sounded alike

___b. units 1 and 3 sounded alike

___c. units 2 and 3 sounded alike

___d. none of the units sounded alike

Item 5:

___a. units 1 and 2 sounded alike

___b. units 1 and 3 sounded alike

___c. units 2 and 3 sounded alike

___d. none of the units sounded alike

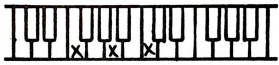
Subtest B--Aural transfer to Keyboard

Instructions. In this section, as in Subtest A, you will hear a two-or three-tone unit. You are to match the sound unit with one of the three keyboard diagrams, if any matches. Record your choice by placing an X to the left of the correct diagram. Each sound unit will be heard four times: once with the tones sounded separately, once simultaneously, and then a repeat of each. There are two practice examples. Here is Example A.

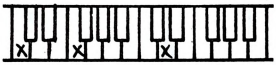
EXAMPLE A

___a.

X b.



___c.

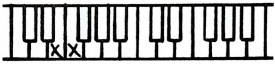


___d. none of the above

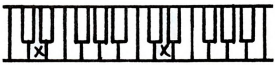
EXAMPLE B

___a.

___b.

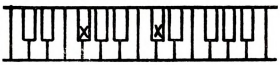


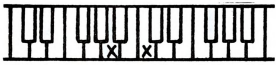
___c.

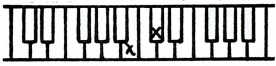


___d. none of the above

Item 1:

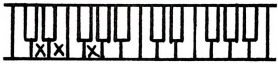
___a. 

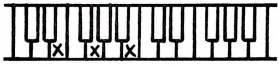
___b. 

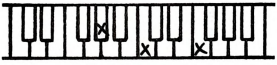
___c. 

___d. none of the above

Item 2:

___a. 

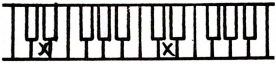
___b. 

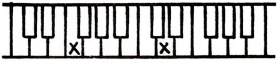
___c. 

___d. none of the above

Item 3:

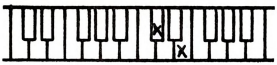
___a. 

___b. 

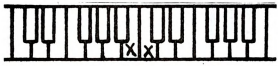
___c. 

___d. none of the above

Item 4:

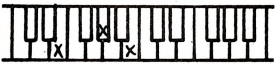
___a. 

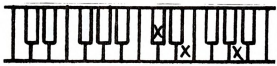
___b. 

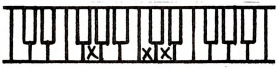
___c. 

___d. none of the above

Item 5:

___a. 

___b. 

___c. 

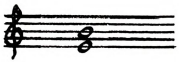
___d. none of the above

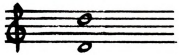
on II

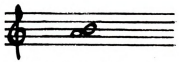
btest A--Aural Transfer to Staff Notation

Instructions. You will hear a two- or three-note sound unit. You are to select the musical staff notation which, if any, agrees with what you have heard. Register your choice by placing an X to the left of the letter representing the correct staff notation. Each item will be heard four times. At first hearing, the notes will be heard separately--the second, simultaneously. This will be repeated. There are two examples. Here is Example A.

EXAMPLE A

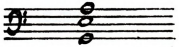
___a. 

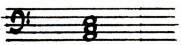
___b. 

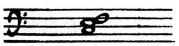
X c. 

___d. none of the above

EXAMPLE B

___a. 

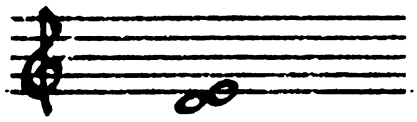
___b. 

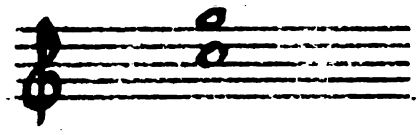
___c. 

___d. none of the above

tem 1:

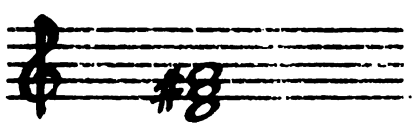
___a. 

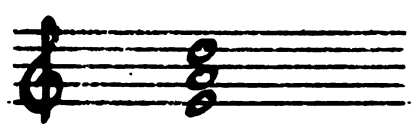
___b. 

___c. 

___d. none of the above

tem 2:

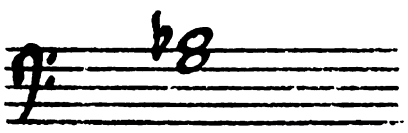
___a. 

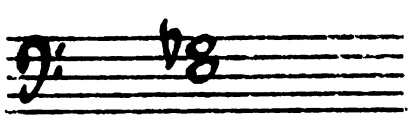
___b. 

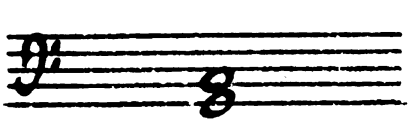
___c. 

___d. none of the above

tem 3:

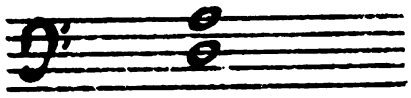
___a. 

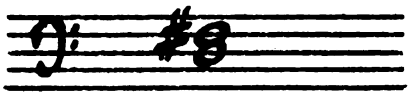
___b. 

___c. 

___d. none of the above

tem 4:

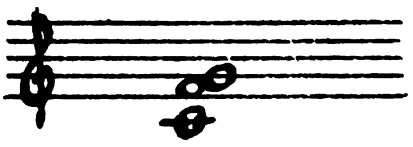
___a. 

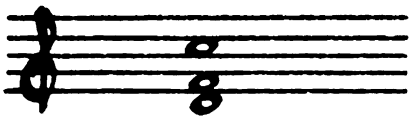
___b. 

___c. 

___d. none of the above

tem 5:

___a. 

___b. 

___c. 

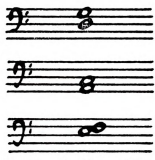
___d. none of the above

on III

btest A--Transfer of Keyboard to Staff Notation

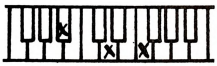
Instructions. Two or three pitches are identified by Xs on a keyboard diagram. Play these notes on your keyboard and choose the staff notation that corresponds with what you have played, if any matches. Mark an X in the blank by the answer of your choice. Here are two examples.

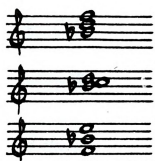
EXAMPLE A



___a.
___b.
___c.
___d. none of the above

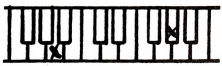
EXAMPLE B

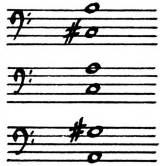




___a.
___b.
___c.
___d. none of the above

em 1:





___a.
___b.
___c.
___d. none of the above

em 2:

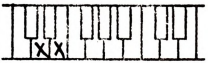
___a.

___b.

___c.

___d. none of the above

em 3:



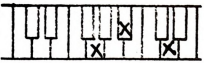
___a.

___b.

___c.

___d. none of the above

em 4:



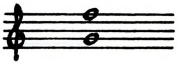
___a.

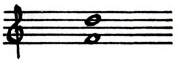
___b.

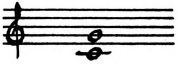
___c.

___d. none of the above

em 5:

___a. 

___b. 

___c. 

___d. none of the above

Name_____
Section_____

Harmonic Element Survey Posttest
(HESPST)

tion I

Subtest A--Sound Unit Comparison

Instructions. You will hear three units of sounds. Some of these will have only two tones (interval) while others will have three (triad). Two of these units may or may not sound alike. You are to decide which, if any, of the two units sound alike and place an x to the left of the statement that corresponds with what you have heard. Each item will be heard twice; in one the tones are sounded separately and in the other, simultaneously. Two examples are recorded. Here is example A:

EXAMPLE A

___a. units 1 and 2 sounded alike

_x_b. units 1 and 3 sounded alike

___c. units 2 and 3 sounded alike

___d. none of the units sounded alike

EXAMPLE B

___a. units 1 and 2 sounded alike

___b. units 1 and 3 sounded alike

___c. units 2 and 3 sounded alike

___d. none of the units sounded alike

Item 1:

___a. units 1 and 2 sounded alike

___b. units 1 and 3 sounded alike

___c. units 2 and 3 sounded alike

___d. none of the units sounded alike

Item 2:

___a. units 1 and 2 sounded alike

__ b. units 1 and 3 sounded alike

___c. units 2 and 3 sounded alike

___d. none of the units sounded alike

Item 3:

___a. units 1 and 2 sounded alike

__ b. units 1 and 3 sounded alike

__ c. units 2 and 3 sounded alike

___d. none of the units sounded alike

Item 4:

__ a. units 1 and 2 sounded alike

_ b. units 1 and 3 sounded alike

___c. units 2 and 3 sounded alike

___d. none of the units sounded alike

Item 5:

___a. units 1 and 2 sounded alike

___b. units 1 and 3 sounded alike

___c. units 2 and 3 sounded alike

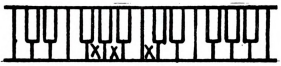
___d. none of the units sounded alike

ubtest B--Aural to Keyboard Transfer

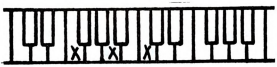
Instructions. In this section, as in Subtest A, you will hear a two- or three-tone unit. You are to match the sound unit with one of the three keyboard diagrams, if any matches. Record your choice by placing an X to the left of the correct diagram. Each sound unit will be heard four times: once with the tones sounded separately and once simultaneously and then a repeat. There are two practice examples. Here is Example A.

EXAMPLE A

___a.



__X__b.

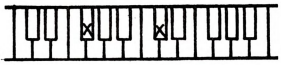


___c.

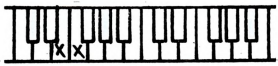
___d. none of the above

EXAMPLE B

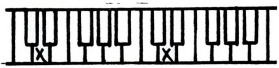
___a.



___b.

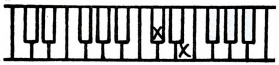


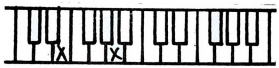
___c.

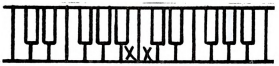


___d. none of the above

Item 1:

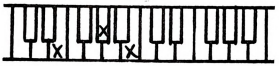
___a. 

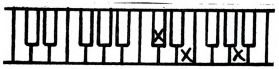
___b. 

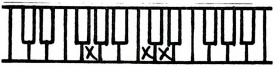
___c. 

___d. none of the above

Item 2:

___a. 

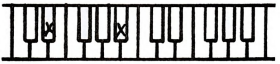
___b. 

___c. 

___d. none of the above

Item 3:

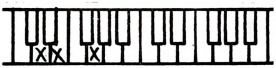
___a. 

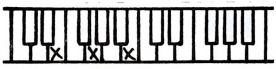
___b. 

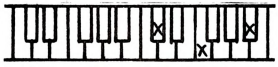
___c. 

___d. none of the above

Item 4:

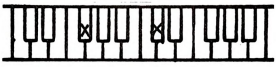
___a. 

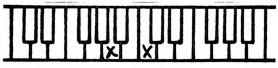
___b. 

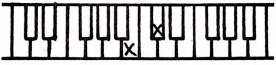
___c. 

___d. none of the above

Item 5:

___a. 

___b. 

___c. 

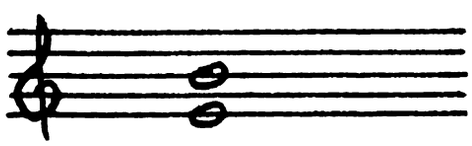
___d. none of the above

ion II

ubtest A--Transfer: Aural to Staff Notation

Instructions. You will hear a two- or three-note sound unit. You are to select the musical staff notation which agrees with what you have heard. Register your choice by placing an X to the left of the letter representing the correct answer. If none agree with what you have heard, the correct answer will be "d" (none of the above). Each item will be heard four times. At first hearing the notes will be heard separately--the second, simultaneously. This will be repeated. There are two examples. Here is example A.

EXAMPLE A

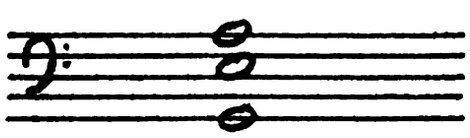
___a. 

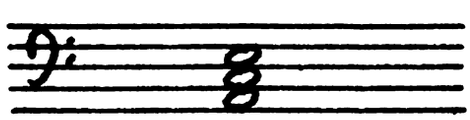
___b. 

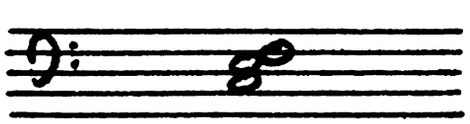
X c. 

___d. none of the above

EXAMPLE B

___a. 

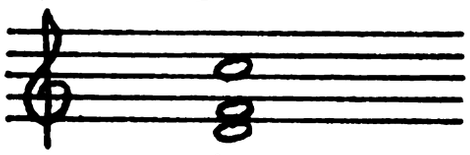
___b. 

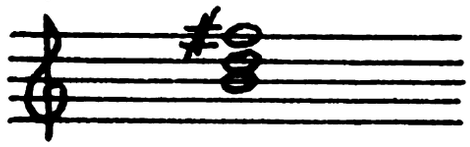
___c. 

___d. none of the above

Item 1:

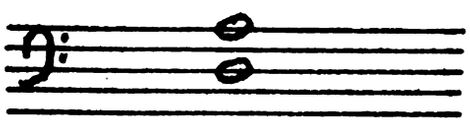
___a. 

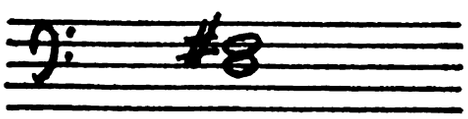
___b. 

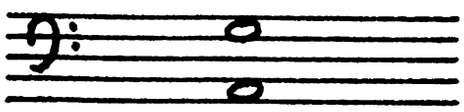
___c. 

___d. none of the above

Item 2:

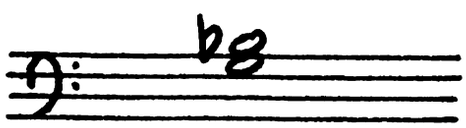
___a. 

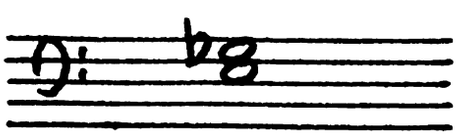
___b. 

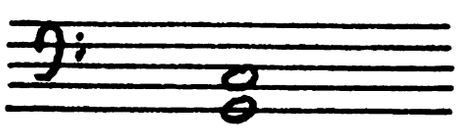
___c. 

___d. none of the above

Item 3:

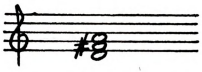
___a. 

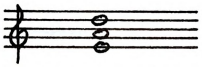
___b. 

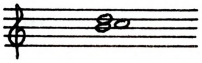
___c. 

___d. none of the above

Item 4:

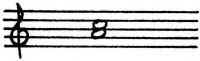
___a. 

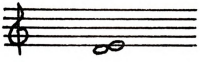
___b. 

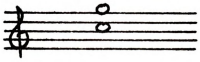
___c. 

___d. none of the above

Item 5:

___a. 

___b. 

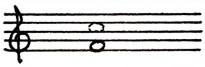
___c. 

___d. none of the above

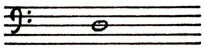
ubtest B--Interval and Triad Construction

Instructions. This section of the test is designed to measure your ability to notate intervals and triads on the G or F staff from a sound unit. The lowest note of the interval or triad will be given. When you hear the sound unit write in the remaining note(s) above the one given. Each item will be heard four times--twice melodically and twice harmonically. Here is the first of two examples.

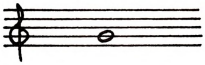
EXAMPLE A



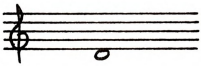
EXAMPLE B



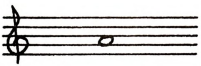
Item 1:



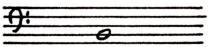
Item 2:



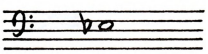
Item 3:



Item 4:



Item 5:

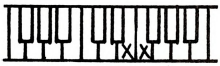


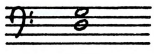
ion III

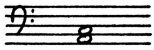
ubtest A--Transfer: Keyboard to Staff Notation

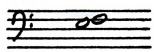
Instructions. Two or three pitches are identified by Xs on a keyboard diagram. Play these notes on your keyboard and choose the staff notation that corresponds with what you have played. Mark an X in the blank by the answer of your choice. Here are two examples.

EXAMPLE A



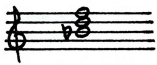
___a. 

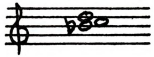
___b. 

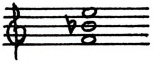
_X_c. 

___d. none of the above

EXAMPLE B

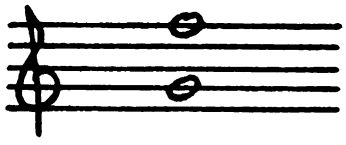
___a. 

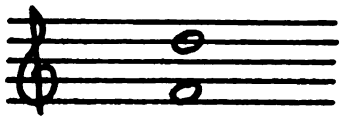
___b. 

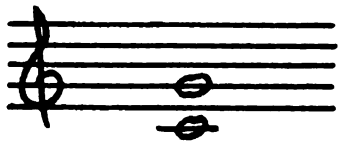
___c. 

___d. none of the above

Item 1:

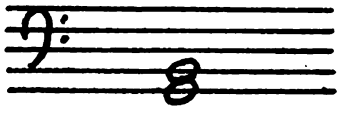
___a. 

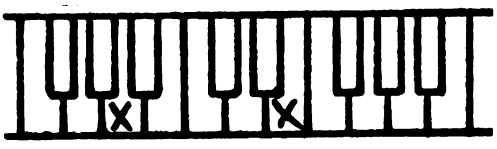
___b. 

___c. 

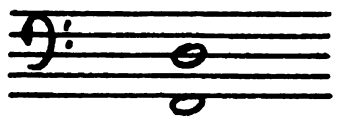
___d. none of the above

Item 2:

___a. 

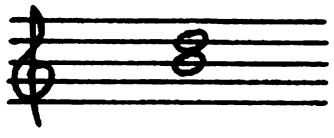


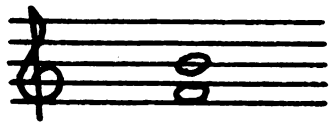
___b. 

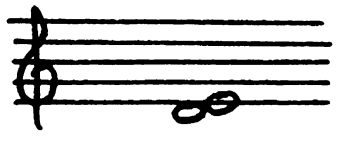
___c. 

___d. none of the above

Item 3:

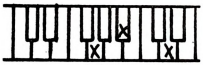
___a. 

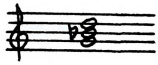
___b. 

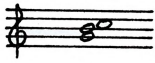
___c. 

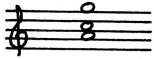
___d. none of the above

Item 4:



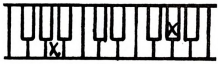
___a. 

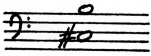
___b. 

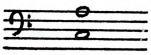
___c. 

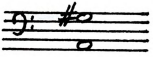
___d. none of the above

Item 5:



___a. 

___b. 

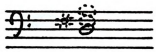
___c. 

___d. none of the above

Subtest B--Staff Notation from Letter/Number Symbols
Instructions. In this phase of the test you are to notate a specified interval or triad given the letter/number symbol and the lowest pitch. Here are two examples.

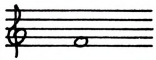
EXAMPLE A

Complete a major triad above the given note



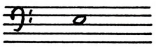
EXAMPLE B

Complete a M7 above the given note



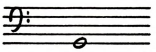
Item 1:

complete a M3 above the given note



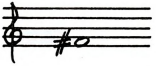
Item 2:

complete a m triad above the given note



Item 3:

complete a P5 above the given note

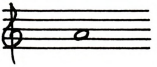


Item 4:

complete a P4 above the given note

Item 5:

complete a M2 above the given note



Name_____
Section_____

Harmonic Element Survey Retention Test
(HESRTN)

ion I

Subtest A--Interval and Triad Recognition

Instructions. Decide which, if any, of the sound units are alike in interval or, in the case of triads, alike in quality. Each sound unit will be played twice.

EXAMPLE

___a. units 1 and 2 sounded alike

___b. units 1 and 3 sounded alike

___c. units 2 and 3 sounded alike

___d. none of the units sounded alike

Item 1:

___a. units 1 and 2 sounded alike

___b. units 1 and 3 sounded alike

___c. units 2 and 3 sounded alike

___d. none of the units sounded alike

Item 2:

___a. units 1 and 2 sounded alike

___b. units 1 and 3 sounded alike

___c. units 2 and 3 sounded alike

___d. none of the units sounded alike

Item 3:

___a. units 1 and 2 sounded alike

___b. units 1 and 3 sounded alike

___c. units 2 and 3 sounded alike

___d. none of the units sounded alike

Item 4:

___a. units 1 and 2 sounded alike

___b. units 1 and 3 sounded alike

___c. units 2 and 3 sounded alike

___d. none of the units sounded alike

Item 5:

___a. units 1 and 2 sounded alike

___b. units 1 and 3 sounded alike

___c. units 2 and 3 sounded alike

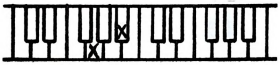
___d. none of the units sounded alike

Subtest B--Sound to Keyboard

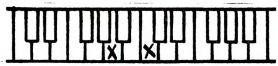
Instructions. Match the sound unit heard to the corresponding keyboard diagram. Each sound unit will be heard three times.

EXAMPLE

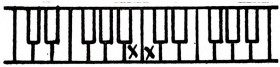
___a.



___b.



___c.

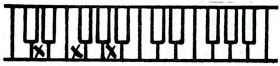


___d. none of the above

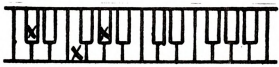
Item 1:

___a.

___b.

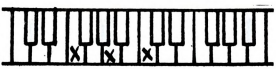


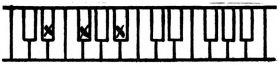
___c.

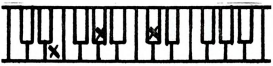


___d. none of the above

Item 2:

___a. 

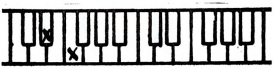
___b. 

___c. 

___d. none of the above

Item 3:

___a. 

___b. 

___c. 

___d. none of the above

Item 4:

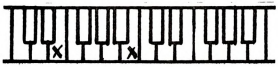
___a. 

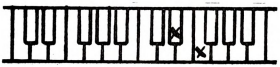
___b. 

___c. 

___d. none of the above

Item 5:

___a. 

___b. 

___c. 

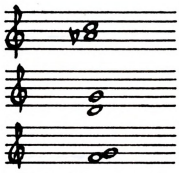
___d. none of the above

on II

ubtest A--Matching: Sound to Notation

Instructions. Match the sound you hear with the appropriate staff notation. Each sound will be heard three times.

EXAMPLE



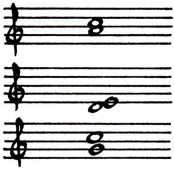
___a.

___b.

___c.

___d. none of the above

Item 1:



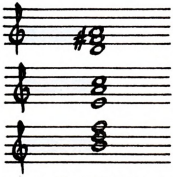
___a.

___b.

___c.

___d. none of the above

Item 2:



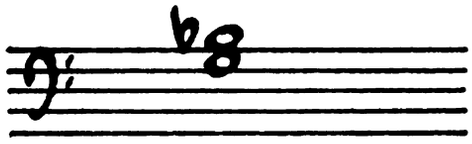
___a.

___b.

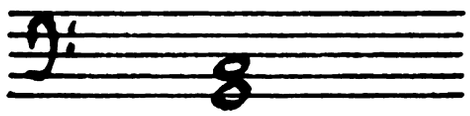
___c.

___d. none of the above

Item 3:

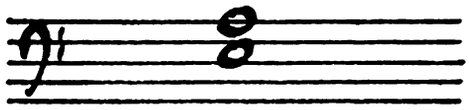
___a. 

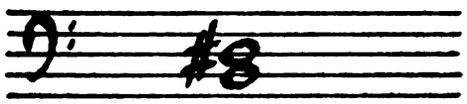
___b. 

___c. 

___d. none of the above

Item 4:

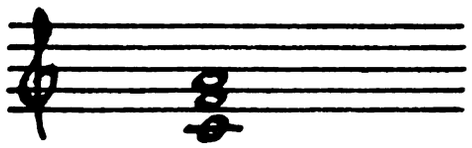
___a. 

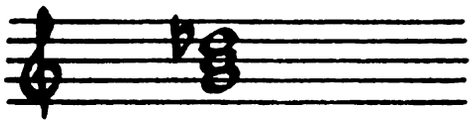
___b. 

___c. 

___d. none of the above

Item 5:

___a. 

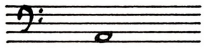
___b. 

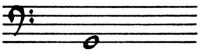
___c. 

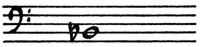
___d. none of the above

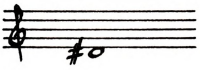
Subtest B--Notation

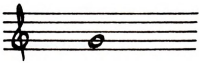
Instructions. The lowest note of an interval or triad is given. You are to notate the remaining note(s). Each item will be played three times.

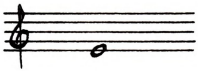
EXAMPLE 

Item 1: 

Item 2: 

Item 3: 

Item 4: 

Item 5: 

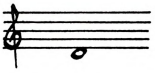
ion III

Subtest B--Notation

Instructions. From the given letter/number symbol, complete the notation above the note on the staff.

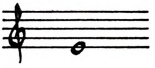
EXAMPLE

Complete a major triad above the given note.



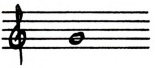
Item 1:

Complete a M3 above the given note.



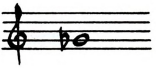
Item 2:

Complete a minor triad above the given note.



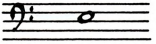
Item 3:

Complete a P5 above the given note.



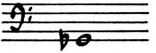
Item 4:

Complete a m3 above the given note.



Item 5:

Complete a major triad above the given note.



Name_____
Section_____

Harmonic Element Survey Delayed Retention Test
(HESDRT)

ion I

Subtest A--Interval and Triad Recognition
Instructions. Decide which, if any, of the sound units are alike in interval or, in the case of triads, alike in quality. Each sound unit series will be played twice.

EXAMPLE:

___a. units 1 and 2 sounded alike

___b. units 1 and 3 sounded alike

___c. units 2 and 3 sounded alike

___d. none of the units sounded alike

Item 1:

___a. units 1 and 2 sounded alike

___b. units 1 and 3 sounded alike

___c. units 2 and 3 sounded alike

___d. none of the units sounded alike

Item 2:

___a. units 1 and 2 sounded alike

___b. units 1 and 3 sounded alike

___c. units 2 and 3 sounded alike

___c. none of the units sounded alike

Item 3:

___a. units 1 and 2 sounded alike

___b. units 1 and 3 sounded alike

___c. units 2 and 3 sounded alike

___d. none of the units sounded alike

Item 4:

___a. units 1 and 2 sounded alike

___b. units 1 and 3 sounded alike

___c. units 2 and 3 sounded alike

___d. none of the units sounded alike

Item 5:

___a. units 1 and 2 sounded alike

___b. units 1 and 3 sounded alike

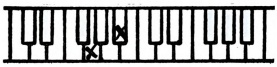
___c. units 2 and 3 sounded alike

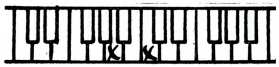
___d. none of the units sounded alike

Subtest B--Matching Sound to Keyboard

Instructions. Match the sound unit heard to the corresponding keyboard diagram, if any matches. Each sound unit will be heard three times.

EXAMPLE

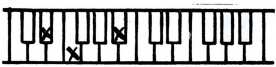
___a. 

___b. 

___c. 

___d. none of the above

Item 1:

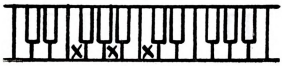
___a. 

___b. 

___c. 

___d. none of the above

Item 2:

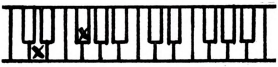
___a. 

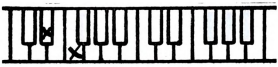
___b. 

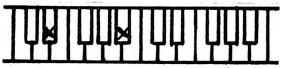
___c. 

___d. none of the above

Item 3:

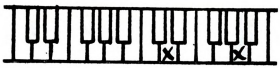
___a. 

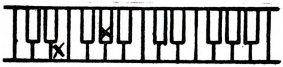
___b. 

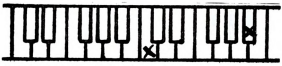
___c. 

___d. none of the above

Item 4:

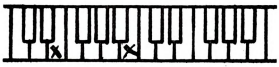
___a. 

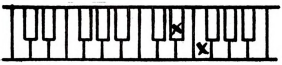
___b. 

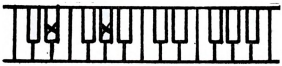
___c. 

___d. none of the above

Item 5:

___a. 

___b. 

___c. 

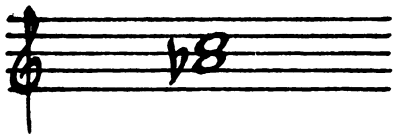
___d. none of the above

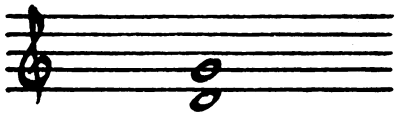
Section II

Subtest A--Matching Sound to Notation

Instructions. Match the sound you hear with the appropriate staff notation. In the event that none match, place an X in option 'd'. Each sound will be heard three times.

EXAMPLE

___a. 

___b. 

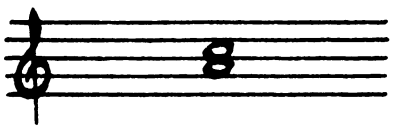
___c. 

___d. none of the above

Item 1:

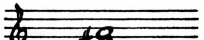
___a. 

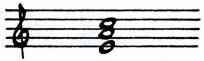
___b. 

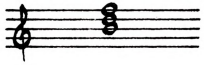
___c. 

___d. none of the above

Item 2:

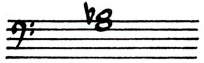
___a. 

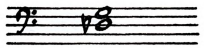
___b. 

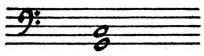
___c. 

___d. none of the above

Item 3:

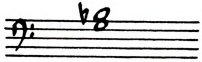
___a. 

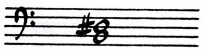
___b. 

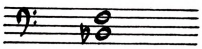
___c. 

___d. none of the above

Item 4:

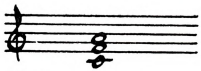
___a. 

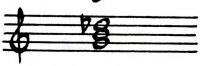
___b. 

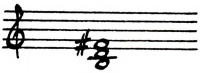
___c. 

___d. none of the above

Item 5:

___a. 

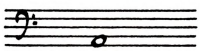
___b. 

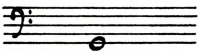
___c. 

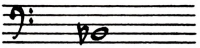
___d. none of the above

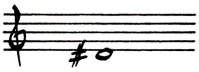
Subtest B--Notation

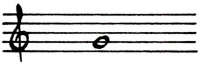
Instructions. The lowest note of an interval or triad is given. You are to notate the remaining note(s). Each item will be played three times. Above the given note construct the interval or triad that you hear.

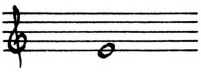
EXAMPLE 

Item 1: 

Item 2: 

Item 3: 

Item 4: 

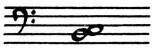
Item 5: 

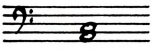
Section III

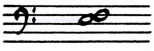
Subtest A--Keyboard to Staff Notation Transfer

Instructions. Two or three pitches are identified by Xs on a keyboard diagram. Choose the staff notation that corresponds with what you have seen on the keyboard diagram. Mark an X in the blank by the answer of your choice.

EXAMPLE

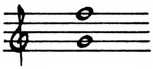
___a. 

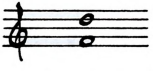
___b. 

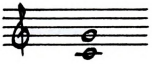
___c. 

___d. none of the above

Item 1:

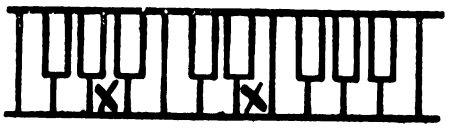
___a. 

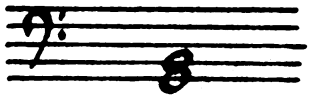
___b. 

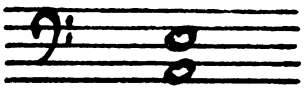
___c. 

___d. none of the above

Item 2:



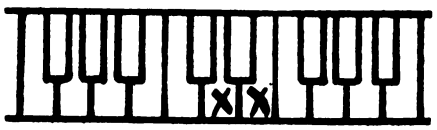
___a. 

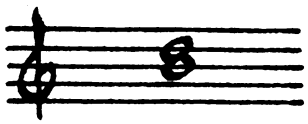
___b. 

___c. 

___d. none of the above

Item 3:



___a. 

___b. 

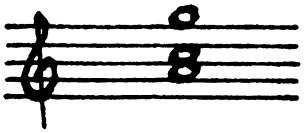
___c. 

___d. none of the above

Item 4:

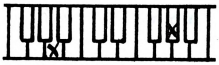
___a. 

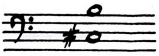
___b. 

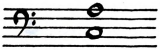
___c. 

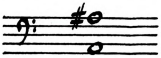
___d. none of the above

Item 5:



___a. 

___b. 

___c. 

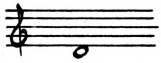
___d. none of the above

Subtest B--Notation

Instructions. From the given letter/number symbol, complete the notation above the note on the staff.

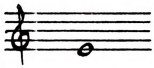
EXAMPLE

Complete a major triad above the given note.



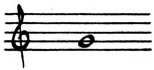
Item 1:

Complete a M3 above the given note.



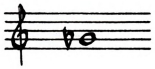
Item 2:

Complete a minor triad above the given note.



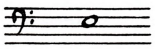
Item 3:

Complete a P5 above the given note.



Item 4:

Complete a m3 above the given note.



Item 5:

Complete a major triad above the given note.