TITLE.

The application of musical tests to the study of individual reactions to music.

[Studies in the psychology of musical appreciation with reference to the formation of musical tests, individual reactions (mainly those of children) and psycho-physical measurements.]

by

JOHN MEIKLEJOHN.

VOLUME I.

1940.

PREFATORY NOTE.

The experiments described in this thesis were designed as original investigations into the psychology of musical appreciation, mainly in relation to children. Where any connection with the work of others was found, this has been indicated, but it was a matter of some difficulty to find verifications from other sources.

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INTRODUCTION.

Music is a complex and sophisticated subject with centuries of development behind it. Music of some sort is popular with nearly everyone, and it might be concluded that there is little new to investigate in a subject so highly developed that it appeals to the specialist at one extreme and to the general public at the other. But, as a fact, there is an aspect of music which has so far been almost entirely neglected, especially on the experimental side. This aspect is the study of individual reactions in listening to music - a study which links up Music and Psychology.

It is evident that new attitudes of criticism are developing towards music. Admittedly considerations of musical theory are best left to the musicians, but in other provinces activity is afoot. Some debatable features about the teaching of music have been clarified in recent years by teachers like Curwen, Matthay ("The Art of Touch", "The Visible and Invisible in Piano Technique" - Oxford University Press; etc.), Ching ("Piano Technique" - Murdoch), and so on. While their pronouncements have been by no means universally accepted, their work has brought about a wide adoption of analytical attitudes by music teachers. Interesting work on the presentation of teaching pieces has been published by Tobin, Rowley, Pearce ("The Art of the Piano Teacher" - Winthrop Rogers), Irvine ("Staff Sight Singing" - "Music in Schools", No.17, July 1938; "The Approach to the Sol-fa Syllables" - ibid No.14, April 1938, and "On Music Reading and Music Readers" - The Music Teacher, May 1933), Whittaker ("Class Singing" - Oxford University Press), and others, where their experience with pupils has determined a psychological rather than a logical order. These and other pedagogical studies have all developed from the conviction that the teacher needed a body of established facts, other than purely musical ones, to set his teaching on efficient lines. So far, such work has been done mainly by practising teachers, and, while it is inevitable that musicians should wish to study musical questions themselves, there should be no objection to preserving an open mind, or even a sympathetic attitude, to the opportunities of discovering new data by means of the contributions of other subjects, e.g. Experimental Psychology. It is not too much to say that science has been an invaluable ally of music in acoustical problems, and it may be that psychology will prove just as helpful in opening up new fields of musical progress.

The object of the present investigation is an attempt to provide certain tests for the study of individual reactions in listening to music; and, since the reactions of an individual lack meaning unless compared with others of comparable abilities, thesetests have been applied to groups of individuals, and standards of attainment have been derived. In addition to the direct value of such measurements, if it could be shown that scientific methods and attitudes had a sufficiently wide application to the sphere of music it might lead to a considerable clarification of our views regarding musical perceptions. Such views tend at present to be swayed greatly by personal opinion, an influence which may be of great value, yet one which is attended by the danger of running to extravagant conclusions. The freedom widely claimed by the followers of an art may explain the extreme inconsistencies and arm-chair speculations found even among the hierarchy of musical scholars.[1]

It is well known that results found by the methods of science generally produce a greater definition of standpoint, compelling us to distinguish the factual basis of our beliefs and thoughts, and throwing into relief the assumptions or dubieties. The entry of experimental methods into the subject of psychology is a good example of this. In "Psychology, Briefer Course", 1892, James sums up the content of psychology at a time before experimental work had reached its modern development - 'A string of raw facts; a little gossip and wrangle about opinions; a little classification and generalisation on the mere descriptive level .... but not a single law in the sense in which physics shows us laws, not a single proposition from which any consequence can causally be deduced. .... This is no science, it is only the hope of a science'.[2] But now Experimental Psychology has built up an ever-increasing body of facts, necessitating the examination of theory in the light of these facts and emphasising the need for caution in dealing with the conclusions drawn from the data of a quasi-biological subject.

More directly interesting for the present work is the technique of the mental test. The formation and extension of the mental test have evoked speculation to explain the results while a closer examination of these results has in certain cases caused a drastic revision of the theory and a considerable revision of vocabulary. This process is particularly well exemplified in the testing of intelligence. Out of the many theories of intelligence, Professor Spearman [2] has demonstrated that, when much verbal vagueness has been eliminated and suitable statistical criteria used, only the Two Factor Theory can most satisfactorily explain the present results. (The Nature of Intelligence'.)

[1] Examples quoted widely by P. Scholes.

Clearly this scientific procedure is a great gain to psychology, for any new theory can only be advanced with caution since it must show its superiority in satisfying the mathematical criteria used in testing the current theory. Having reached such a stage in the domain of intelligence, one of the components of the mind, we may reasonably attempt the same lines of attack on other components. The method suggested therefore is this:-
Devise a series of tests for the function. Obtain the performance of a representative selection of the population. Analyse the results and hence improve the tests, if possible, noting any contributions the results offer to the knowledge of the function.

This is a fruitful line of discovery, useful even in the so-called exact sciences in their pioneer stages (e.g. the measurement of electrisity about the time of Coulomb. One method used for determining voltages was to estimate the electric shock experienced by the observer when the electrodes were applied to his arm. Such are the tentative beginnings of science.)

It is true that many musicians have little interest in, and in some cases little tolerance for, systematic analyses of their subject[1], especially in the psychological sphere. Their attitude often consists in affirming that science and music are totally unrelated, and that the methods of science are quite irrelevant to the pursuit of music. Such a negative attitude would no doubt lead to the proposition that the human mind is essentially mysterious and unknowable, whereas the scientific examination of intelligence (to mention but one example) has been illuminating in showing that such analysis is possible. It may be the case that mental functions concerned with music have components which cannot be examined from the point of view of science, yet there is no final proof that this is the case. A supporter of critical analytical thought might fairly ask what these components are and how their delimitation has been made.

Actually, musicians do not reject the testing technique in their own practice, yet music examinations are essentially tests with the important disadvantage that they are very likely to be inefficient. There is no evidence to show that music examinations are superior as measuring instruments to examinations in other subjects, and the records of the latter are certainly unimpressive.[3,4.] (It is noteworthy that the judgments of adjudicators at musical festivals are not decided individually but in conference!) Indeed, the use of oral examinations in music is likely to reduce the efficiency still further. Just

1 Scholes. Op. cit. p.2.

as an intelligence test measures, with much greater consistency and precision, an entity which mankind has been estimating for centuries by crude methods, so it may be possible to devise tests of musical factors which will possess a similar superiority over other music tests; and just as in devising mental tests we need not take up a position entirely divorced from ordinary estimates, but rather seek to endow these judgments with greater accuracy with the aid of mathematical analysis, so we may try by similar methods to put the estimates made by musicians on a surer footing.

In commencing this experimental work the writer made no assumption that the methods of science were appropriate to the subject. The place of science in relation to the various aspects of music has yet to be determined. The procedure was largely tentative, made in the hope that some positive results might be obtained.

THE NEED FOR TESTS IN MUSIC.

We may consider that musical activities can be divided into the following categories:- (a) Composing activities, (b) Pedagogical activities, (c) Executant activities, (d) Listening activities. These clearly overlap in various ways, but the distinction is useful in considering experimental work to test different forms of musical activity. We have seen that dissatisfaction occurs when the teacher considers dispassionately his methods and results. He will realise that his knowledge of aims and techniques is a matter of tradition, authoritative instruction, rough and ready opinion, and the like. One can almost say that for every point of view regarding teaching practice it is possible to find expressed another widely opposed to it.[1] The plain fact is that there is a great lack of objective data bearing on the teaching of music, and until wide experimental work has been done the present uncertain state of affairs will continue. The merits and demerits of a given curriculum or a given mode of teaching technique cannot be adequately estimated without considering the psychological content of the mind of the pupil in its reactions to music. Scant attention has been paid to this side in the past. As in so many other subjects logical order of presentation of subject matter has been the main concern of teachers rather than that understanding order, resulting in insight, on the part of the pupil, which may be called "psychological order of presentation". The work of Curwen gives a good example of this. Curwen's steps to sight-singing proficiency give a systematic introduction to the various intervals (Tonic chord, dominant chord, subdominant chord, etc.) and each step is followed by much practice. The system is invariably dull to teacher and pupil, and is capable of seriously diminishing the pupil's interest in music. Curwen undoubtedly did a great deal to systematise the teaching of the subject, yet it must be admitted that much of his work is suited only to the adult mind, with its capacity for the clear recognition of objectives, together with the very useful adjuncts of strong motives and a wide background of musical experience. Curwen's order could be called a logical order. Yet an infant class would experience little motivation or interest under the Curwen system. But if a teacher built up a psychological order of presentation by getting the children to sing current popular songs, nursery rhymes, simple hymns, using 'learning by ear' to deal with the weak parts, following this by singing these to sol-fa names, the children would soon learn

[1] e.g. Scholes. op. cit.

to associate name with sound without having their interest menaced. Indeed, many a choir of adults would profit by this sort of procedure. Such examples could be multiplied from a great many varieties of musical situations and point to useful modifications in teaching practice. From Pestalozzi to the Gestalt psychologists we can trace with greater conviction the belief that 'wholes' or 'masses' of experience, as distinguished from dissected elements, form primary perceptual material. It is only recently that such views have begun to be absorbed into the pedagogy of music and much remains to be done in this direction. The process will be greatly facilitated as more and more work is done on the experimental side of testing pupils.

More specifically, a strong justification for experimental work is on the vocational side, by the production of suitable standardised tests. One cannot make the acquaintance of music students without failing to note the very wide range of age, intelligence, temperament and education to be found among them. It seems probable that these ranges are wider than in other professions. To 'go in for music' is often a last resort of individuals who have failed in other ventures, a tendency encouraged by the absence, until fairly recently, of recognised standards to be demanded for music teachers. But the establishment of qualifications has not yet prevented the widespread activities of teachers poorly qualified, both musically and educationally, who continue to teach by reason of their willingness to accept small fees. The 'cheap-jack' diploma is not uncommon in music. These features, so regrettable for efficient teaching and for the welfare of the bona-fide musician, are due in some measure to music teaching being largely a private concern rather than the work of the State or of recognised institutions. Again, a considerable number of students take a very long time to obtain a satisfactory professional diploma. A time lasting from eighteen years of age to twenty-four or twenty-six is by no means unusual, while a delay in waiting for a school post may add several years. It is not surprising therefore that many musicians show evidence of strong discontent, regretting their entry into a profession attended by so many disadvantages and menaced still further at present by the effects of mechanically produced music. These considerations show that organised vocational guidance for selecting and training musicians is an important need.

As has been suggested already, the movement called 'musical appreciation' affords another aspect justifying standardised tests. Any scheme of training in appreciation has to establish its worth by producing listeners with added skills in recognising the various structures in music and with widened cultural backgrounds of knowledge which will lead to enhanced enjoyment of music. The criticisms of various aspects[1] and techniques in this movement can be most effectively met by demonstrating beyond question the superiority of those who follow the procedures advocated over those who do not. Such demonstrations call for sound methodical experimentation and standardised tests.

Again, the application of psychological tests offers a first approach to the statistical analysis of basic factors subserving the operations of the mind. Such analysis has shown the existence of a general factor 'g', (Spearman), the factor of purposive consistency 'w' (Webb), the factor of "freedom from inertia" 'c' (Garnett), the factor of perseveration, the factor of oscillation, the mechanical factor 'm' (Cox), the practical factor 'F' (Alexander), together with other group and specific factors the determination of which is still undergoing verification. As an example of the type of work which might be fruitfully applied to questions in music, the investigation of Hargreaves in 'Imagination' might be quoted[5]. By giving separate tests for the two aspects of 'Imagination', namely 'Fluency' and 'Originality', he found that both tests have broad group factors in addition to 'g', together with a small factor common to the two groups. There was no evidence of a general unitary and unique Imaginative factor. 'Fluency' appeared to consist of a speed factor, Memory, and possibly an unknown factor, while 'Originality' consisted of Memory, some element common to 'Fluency' and 'Originality', and possibly an additional and unknown factor.

If such fundamentals can be discovered in the mental functions concerned with music, their nature and operation will be of importance in understanding the working of the mind and in analysing the various types of mind in relation to music. A sound scientific foundation will then be possible for vocational guidance. If musical performance or enjoyment depends mainly on training, then the prospective musician can confidently set to work to follow out an efficient training scheme. If, however, there are

[1]Many examples in Scholes. Op. cit.

limits set mainly by innate endowment, the potential musicians should be carefully selected and given suitable training environments, while the handicapped individuals should be advised to give music a place of modified importance in their lives, for, if the process of attaining skill took a very long time, its achievement might come too late in life to be of much value. In such discrimination, standardised tests would be useful. Sir Walford Davies, in one of his broadcast talks on music, stated that almost every individual had the capacities for attaining great enjoyment and intelligent appreciation in listening to music. Assuming this to be true, some evidence on the matter would be illuminating; and, should it prove to be true, here, surely, is the field in which training should be given to those whose innate endowment is not such as to allow them to become musicians in the accepted sense of the term.

A CONSIDERATION OF PREVIOUS WORK.

The outstanding worker in the use of scientific methods in the psychology of music is C.E. Seashore[6]. Seashore's first series of tests is given by five gramophone records, testing (a) the sense of pitch, (b) the sense of intensity, (c) the sense of time, (d) the sense of consonance, (e) musical memory. (In recent years a record for the sense of rhythm has been issued.)

A second series comprises motor tests, which are individual tests to determine the motor equipment of the intending executant. These tests are designed to measure the basic abilities required in listening to sounds and in producing sounds, both instrumentally and vocally. In fact they might reasonably be regarded as tests of sensory capacities; the field is acoustical rather than musical. This, however, is clearly Seashore's aim. He wishes to be able to select individuals with the most promising basic equipment for studying music intensively as a profession or major recreation.

There is another movement, mentioned by Seashore in his preface, which is different from that described and demonstrated in the above volume, namely the introduction of the idea of the relative importance of musical appreciation in comparison with musical performance for the great majority of school children. This is the main field of the present series of investigations. There is no standard of appreciation, even in a broad sense, so that methods of instruction cannot be assessed by standards other than personal ones. In connection with this Seashore says in his preface, "Interpretation and expression are not measured in any exact way: taste and individual differences are constituent factors in any verdict about the relative superiority of rival methods, and these have not been, and in all probability can never completely be, subjected to definite measurement."

The present experiments were undertaken as a first approach to the measurement of these, and related aspects of music.

Test material in music.

1. The Seashore measures of musical talent (6 gramophone records) - Stoelting.

2. The Oregon Music Discrimination Tests (48 preference

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pairs" on gramophone records), devised by Dr. Kate Kevner.

3. The Hildebrand Sight Singing Test - World Book Company.

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4. The Kwalwasser-Ruch test of musical accomplishment - Extension Division, Iowa University.

This mainly comprises tests in the rudiments of music, and is a purely written test. It consists of 10 tests:- (1) Knowledge of musical symbols and terms, (2) Recognition of syllable names, (3) Detection of pitch errors in a familiar melody, (4) Detection of time errors in a familiar melody, (5) Recognition of pitch names (6) Knowledge of time signatures, (7) Knowledge of key signatures, (8) Knowledge of notevalues, (9) Knowledge of rest values, (10) Recognition of familiar melodies from notation.

5. The Beach Music test - Teachers' College, Emporia, Kansas.

This is a knowledge test resembling the Kwalwasser-Ruch test, but a little listening to piano and voice is used for knowledge testing.

6. Musical achievement test - Institute of Educational Research, Teachers' College, Columbia University.
A knowledge test entirely written.

7. The Hutchison Music Tests - Public School Publishing Company, Bloomington, Illinois.

(Like No.6)

8. The Torgerson-Fahnestock Music test - (same publisher).

Part A - Theory; Part B - Practice (Ear Tests). Part B consists in correcting the notation of notes which were played or in writing these notes in notation.

9. Gibson's attainment tests - Music. - Gibson, 54 Queen Street, Glasgow.

Another written test, mainly about simple rudiments.

10. The Kwalwasser-Dykema tests.(Carl Fischer, New York).

These consist of tests for Tonal Memory, Discrimination of Tone Qualities for Compared Instruments, Intensity Discrimination, Feeling for Tonal Movement, Time Discrimination, Rhythm Discrimination, Pitch Discrimination, Taste in Choosing between Compared Melodies, Discrepancy in Pitch Patterns between what is written and what is heard, Discrimination similarly between Rhythmic Patterns. (The writer has examined the Kwalwasser-Dykema tests, but has not had the opportunity of applying them. They test, on the whole, abilities which are more 'musical' than those involved in the Seashore tests* 57. Further, the instructions for certain of these tests need clarification, and the writer considers that several tests do not contain enough items of a difficult nature to differentiate musical subjects from the less musical (e.g. the pitch test). Nevertheless, the tests represent an interesting advance in testing abilities concerned with listening to music. (The Music Supervisor's Journal (America) has a regular 'Test and Measurement Department' - a feature conducted by Professor Dykema.)

A list of previous work on the psychology of music will be found in the bibliography (Numbers 6 to 54). The work of this thesis resembles the testing methods of American psychologists (e.g. Seashore, Dykema, etc.) rather than those of British psychologists, who have, in the main, carried out investigations on the psychology of hearing, the psychology of appreciation and aesthetics, and questions of perception in music, without very much application to the testing of individuals for aptitude surveys.

In the list of work referred to above, it may be noted that most of the work is concerned with comparatively simple activities. From the point of view of method, this procedure is sound, yet it would be of interest to have more work done on the more complex activities of audition.

Setting aside the publications connected with Seashore's work and the controversies aroused by it, we might consider some of the more relevant of the other publications.

(1) H.Lowery[25] has devised 'Cadence and Phrase Tests' to measure abilities of greater complexity than those measured by Seashore. He points out that the latter tests, considered as tests of musical ability, have the defect of not doing justice to those factors covered by the term 'musical interpretation', and thus the tests of differences in pitch, time and rhythm have but a remote connection with the intelligent rendering of music. In the Cadence tests, pairs of cadences are sounded on a piano and the subject is asked to decide which cadence sounds more complete. 25 examples are used.

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* but it has been found that they are less reliable than the Seashore tests.(57)

Phrase Tests.

50 pairs of musical sentences are played and the subject is asked to judge whether the notes in the second sentence of each pair are phrased in the same way, or different from those in the first sentence.

Musical Memory.

Here Lowery[28] tried to obtain a definite test for musical memory, although, of course, memory plays some part in the Cadence and Phrase Tests. Seashore's test of musical memory lays emphasis on the perception of the individual notes in a group, while Lowery's test depends on memorising the outline of the phrases used.

There are ten sets of five examples, each set being preceded by a musical sentence forming the basis of certain examples in the set.

The ten initial sentences are treated in augmentation, diminution, transposition, and different species of ornamentation (i.e. as they might be treated in classical compositions). The subject has to decide in the case of each of the five examples, whether or not the example is founded on the initial theme.

The age of the children was from 12 to 14 years, and the following correlations with intelligence were found:-

Cadence Test 0·44, Phrase Test 0, Memory Test 0·44. (No probable errors were given). With the possible exception of the Cadence Test, which is not greatly different from certain of Seashore's tests, and apart from certain dubieties in the Memory Test, these tests represent a distinct approach towards testing complex functions.

(2) 'Experiments on the analysis of cognitive processes involved in musical ability and in musical education', by James Mainwaring[62]

The following summary is derived from this paper:-

Musical ability necessarily includes a complex group of cognitive processes which show little tendency to significant positive correlation. Very marked individual variation characterises the possession of ability in pitch discrimination and rhythmic perception, and the correlations between them are consistently low. There is little evidence that there is any factor common to both abilities other than the general factor in intelligence. The ability to recall musical experience with sufficient clearness for analysis undoubtedly exists at a very early age, but shows most definite and rapid development during adolescence. The ability to recall the experience apart from the ability to analyse shows no significant correlations with 'g'.

In this paper, a study is made of the subject's ability to analyse certain very fragmentary experiences in music (as is clear from the tests used). There is no intention of studying the reaction to a musical composition as a whole. This analytical study, however valuable in the study of elements, stands in an uncertain position with regard to whole experiences. The main interest to us lies in the fact that Mainwaring's results resemble some of those found during the present investigation, but Mainwaring's work is avowedly a study of cognitive processes in music.

(3) Of a different nature are the following papers:-

(a) A study of the Individual Differences in Attitudes towards Tones, by C. S. Myers and C. W. Valentine.[13]

(b) 'Individual Differences in Listening to Music' by C. S. Myers[21].

These are mainly descriptive, using the introspections of the subjects.

The experiments of the first paper used struck tuning forks, while those of the second used gramophone records. In the first paper it is concluded that the aspects employed by subjects towards sounds may be classified as (a) 'intra-subjective, (b) 'objective', (c) 'character', and (d) 'associative.' With the exception of (c), those aspects are divisible into various sub-aspects. This work is of interest for the aid which it may render in estimating, and checking, the significance of objective results.

THE PRESENT WORK.

A GROUP TEST OF MUSICAL APPRECIATION AND KNOWLEDGE.

Since the work done on musical appreciation is slight, the standpoint of the early intelligence tester has been adopted. That is, as the meaning of 'musical appreciation' is not yet clear, we choose a number of different types of tests in which success is conditioned by the extent of the 'appreciation', as generally understood, of the subjects, and leave the exact formulation of the meaning of 'appreciation' to be decided as a result of further research.

We must also add a qualification. Success also depends, usually, on certain varieties of musical knowledge, so that we must strictly say that we are attempting to measure the joint effects of 'musical appreciation and knowledge'. This point is illustrated by the Meier-Seashore test of Art appreciation, which, indeed, suggested the germ of the present work. There the interpretation of the results is complicated by the fact that the successful performance of the tests may depend on genuine aesthetic judgments, and also on analytical intellectual judgments.

The choice of test material.

It was considered desirable that the material should satisfy the following conditions:-

(1) The music should be of "good" quality, since we seek to determine a standard of appreciation. This was arranged by choosing music from classical, or recognised, composers. In exceptional cases, I was compelled, for special purposes, to use music by little known composers, but this music was still of excellent quality.

(2) The music should be fairly short, (while still consisting of 'whole' structures complete in themselves) in order to present many tests without losing the attention of the subjects. This was done by using short compositions of the folk-song type, complete sections of larger movements, or phrases with a unity of their own.

(3) The subjects should be asked to pass judgment under conditions similar to those which occur when a musical performance is being heard.

(4) It is desirable to test without asking the subjects to sing or hum what they have heard.

(5) The tests should be of a simple nature, and not be affected to an appreciable extent by slight differences in performance if different players administer the test.

(6) The tests should have a rough preliminary check for validity and standard of difficulty. This was done by submitting the tests devised to other five persons. These were intelligent adults, and had all a considerable interest in music. By securing their introspections, and by careful questioning, I was able to obtain an idea of the difficulty of the tests and of the way in which the testees arrived at their decisions.

(7) The music should be unfamiliar (except where a test is being made of recognition of music), and should have a wide range in style so that conclusions may have a general validity.

Note:- It was intended at first that the tests should follow the procedure of the Meier-Seashore Art test, i.e., basing the test on a preference between a standard composition and a modified presentation of the same work. A number of tests were devised on this plan, in which the alterations were made by introducing some progression forbidden by the standard rules of harmony, starting with obvious faults and proceeding to less obvious ones. These tests were applied to a group of children and the children were then questioned about the difficulty they experienced in answering the tests. They seemed to find great difficulty and the results were extremely poor, being very little better than chance responses. This preliminary test led the writer to reject all but a few of these as being much too difficult for children and suggested, on further analysis, the criterion that tests for children should be easily passed by adults with a fair musical acquaintance. That is, if tests cannot be performed easily by such adults, it is generally futile to present them to children.

The choice of subjects.

In all groups random distributions of subjects were obtained. The tests were designed mainly for the age group 12-13 years. This age was taken because it gives a stable stage of development before the normal onset of adolescence, which may introduce emotional disturbances which affect the performances of the subjects.

As for the choice of music, an attempt was made to make it comprehensive in style and character to avoid any biassed consequences. It will be seen later that some church music is used, but it can be observed that if the test calls for the recognition of the piece of music then the latter is chosen from compositions heard often at varied types of public performance, while if the test concerns the appropriate rendering of church music its character does not depend on denominational differences. That is, success depends mainly on general experience, the kind of experience possessed by the great majority of people.

The administration of the test.

(1) The pieces were played on a piano, so that the tone-colour was distinctly restricted. Most of the examples were written for piano or organ, others, although written for piano had a less restricted character and would have made, for example, admirable orchestral pieces. Certain of the tests, although played on the piano, were used for the subject to decide which medium would be most suitable for their rendering. On the whole, the use of piano colour is suitable for this group test.

(2) The answers were recorded in pencil on booklets made of sheets reproduced by a duplicator.

(3) The subjects were unable to see the player and two teachers attended to prevent copying.

The kind of tests to be used.

In order to give the tests a more practical value than might otherwise be the case, it was decided to list the types of questions which would occur under the conditions of an active listening to music. It was interesting to note that these agreed well with the views of a prominent writer, Stewart Macpherson ('Music and its appreciation', page 4) suggests some questions for a proper approach to music, questions which are of an analytical nature, to aid, by cognitive processes, a full appreciation of music:-

(1) "What is the nature of the composition - that is, is it a Sonata, Symphony, Quartet, Fugue, or what?"

(2) "For what instruments is it written? Is it for a complete orchestra, or for stringed instruments, or, perhaps piano alone?"

(3) "What is its approximate date?"

(4) "What are its chief themes or melodies? Can one seize upon these and remember them in such a way that their subsequent development may be clear to one's mind and therefore a source of real interest?"

(5) "How does the composer so develop his ideas?"

(6) "What is the form of the work? Can one follow to any extent the composer's plan?"

(7) "Can one in any sense follow and appreciate the subtle effects of harmony (i.e., the chords) with which the composer supports and enriches his themes or melodies?"

It is to be noted that ability to answer satisfactorily one or all of these questions does not constitute appreciation. There is always something additional, and the exact determination of this additional factor constitutes a real difficulty. However, such a list of questions provides a good testing scheme for preliminary work. Some of these questions are too difficult for ordinary children. For example, the assignment of an approximate date. (This is hardly a test in pure listening, especially when we bear in mind the eclectic spirit of modern musicians. Paderewski's well known 'Minuet' is said to have been expressly written to confound a fellow musician who claimed great skill in detecting period.)

Looking ahead, for the moment, to the test material, it will be seen that:-

Test I (Recognition of Pieces) has some relation to (4).
Test III (Melody preference) has some relation to (4).
Test IV (Form Discrimination) has some relation to (1) and possibly to (6).
Test VII (Names of composers) might, for keen listeners, be considered, as a form of (3).
Test VIII (Appropriateness of performance) has tests having some bearing on (2) and (7).

It was considered that some other questions might be asked, at least for certain kinds of music, and used for the tests.

(a) "Is the name suitable? (That is, can the music evoke imagery or associations related to the name?)"

(b) "Is the name familiar?"

(c) "Who is the composer?"

(d) "Is the music sad, or happy, or what?"

Preliminaries to the first investigation.

A trial battery of tests was made up and applied on three occasions to a large group of children, of ages 11 to 14 years. The results were used to expand certain varieties of tests and reject others. It was found, for example, that tests of the national character of a piece of music were useless for children. There appeared to be no ability to distinguish, say, an obviously Scottish tune from an obviously Italian one (i.e., obvious to the musician). Certain of the instructions were amended to adjust verbal difficulties. Tests yielding 100% correct responses were used as practice examples in the final form of the test. The tests which were retained were those showing consistent results in these experiments, and which were sufficiently graded for difficulty to discriminate the individuals of the group. This somewhat laborious work need not be detailed, but it was exceedingly valuable in placing the final test on a sound experimental foundation. The following principles were used in selecting the tests:-

(1) The tests should become easier as the age of the group increases. That is, the mean scores should increase as age increases.

(2) The tests should not be too easy or they will not grade the subjects. Tests were occasionally found which had 100%, or almost, of all the groups correct. Such tests were rejected, or retained only as practice examples. As the final tests were to be most suitable for the age 12-13, the percentage correct for this age is especially important, but the percentage for the total group 11-14 is useful to give a compound criterion.

(3) Difficult tests should be retained, to discriminate subjects with special abilities. The usual limit for accepting a test item was a 30% pass level (for the 12-13 group) but this was not made rigid. The need, occasionally, for obtaining an adequate number of tests and the desirability of retaining certain difficult tests, played some part in the decisions.

(4) In each test group of the battery it is desirable that the tests should be 'spread' equally, i.e., the difference in percentage correct from one test item to the next should be about the same as we pass down the array of tests.

(5) Where two tests have the same percentage correct for 12-13 and also for 11-14, and a comparison of the percentage for 11-12 and 13-14 does not settle which test is easier, the test with many 'doubtfuls' is probably more suitable, and easier than the test with many 'wrongs'. This is not certain, of course, and the decision really involves one's own judgment after examining the test material and instructions.

After the tests had been selected and arranged, in order of difficulty, they were used for a final test battery.

The constitution of the group test, with the instructions for administering it.

Test I. Recognition of Pieces.

"You are going to hear some tunes played. You will know some of them, but there are some which you could not possibly have heard before. If you have heard the first tune before, put Y in front of the number 1. (Y stands for 'Yes'). If you have not heard the first tune before, put N in front of the number 1. (N stands for 'No'). If you are not sure, put a cross in front."

(Note: It should be pointed out that the mark for a cross is +. The other form of cross may suggest to the subjects that they will be penalised for its use, viz: X).

Practice example: "The Old Folks at Home".

1. 'From Highest Heaven' - H.W. Jones (Novello). MM. ♩ = 112
2. 'The Harp that once through Tara's Halls'. ♩. = 88
3. 'Heraclitus" - C.V. Stanford (Stainer & Bell). 16 bars. ♩. = 80
4. 'The Ash Grove'. ♩ = 92
5. 'O Leave your Sheep'(arr. Kitson, Novello). 19 bars. 𝅗𝅥 = 72
6. 'Puer Nobis'. (arr. G. Shaw, Oxford Univ. Press) ♩ = 112
7. 'So early in the morning'. 8 bars. ♩ = 88
8. 'The Marseillaise'. 4 bars. ♩ = 112
9. 'The Rio Grande'. 8 bars. ♩. = 63
10. 'Onward, Christian Soldiers.' 8 bars. 𝅗𝅥 = 108
11. 'All through the night.' 8 bars. ♩ = 76
12. The chorale of 'The Kings' - Cornelius (O.U.P.) 8 bars ♩ = 66
13. 'Come lasses and lads.' 20 bars. ♩. = 92
14. 'The Three Traitors.' (O.U.P.) 8 bars. ♩. = 66
15. 'The Citizens of Châtres.' (Novello). 10 bars. ♩. = 63
16. 'The Vicar of Bray.' 8 bars. ♩ = 120
17. 'Peace be with you' - Sampson (Novello). 8 bars. ♩ = 116
18. 'Heavenly Gifts' - Rowley (Novello). 12 bars. ♩ = 88

(The 'dummies' in the test are 1, 3, 5, 6, 12, 14, 15, 17, 18.)

Test II. Association with Name.

"This time you have to decide which is the right name for the piece of music you are going to hear. Draw a line under the name which you think is right or more suitable. If you are not sure, put a cross in front of the number of the tune."

Practice example: 'Funeral March' - Chopin. The method of response was demonstrated, using the names 'Funeral March' or 'Come to the Fair'.

1. 'The Wild Horseman' (No repeat) - Schumann (Album for the Young). ♩. = 116
2. 'At Church' (Bars 1-24) - Tschaikowsky (Children's Album). ♪ = 66
3. 'Gypsy Dance' (Bars 1-20) - Schumann (Third Sonata for the Young). ♩ = 80
4. 'Dance of the Elves' - Greig (Lyrische Stucke, No. 4.) From bar 31. ♩ = 160
5. 'Cavalier' - (see manuscript in appendix, page 311)
6. 'Songs of the Sea', No. 5. - Stanford (last chorus). ♩ = 116
7. 'Sea Surge' (last two pages) - Julian Nesbitt (From Hebrid Seas, No. 3.) ♩. 96
8. 'Cradle Song' (Bars 16-23) - Guilmant, (Schott, 'Golden Album for Organ'). ♪ = 96
9. 'Wedding March' (Bars 1-16) - Oehlmer ('Etude', May 1925). ♩ = 76
10. 'The Organ Grinder' - Tschaikowsky (Children's Album). ♩. 80

The test on the subject's booklets had the following form:-

1. 'Hymn of Praise or "The Wild Horseman'.
2. 'The Spinning Wheel' or 'At Church'.
3. 'Gypsy Dance' or 'Song of Joy'.
4. 'Death and the Maiden' or 'Dance of the Elves'.
5. 'Cavalier' or 'Funeral March'.
6. 'On with the dance' or 'Song of the Sea'.
7. 'Sea Surge' or 'Spanish Dance'.
8. 'In Praise of Tears' or 'Cradle Song'.
9. 'Song of the Lark' or 'Wedding March'.
10. 'The Organ Grinder' or 'Dreaming'.

Test III. Melody preference.

"You are going to hear a pair of tunes. If you like the first one better, draw a line under the figure 1. If you like the second one better, draw a line under the figure 2. If you are not sure, put a cross in front of the numbers. You will hear them played again to help you to make up your mind."

See manuscript for tests. (Appendix, page 313)

Test IV. Form discrimination.

"This time you have to make up your mind as to whether the piece of music is a Dance, a Song, a March or a Hymn. Draw a line under the name which you think it is. If you are not sure, put a cross at the beginning. (Before each test item the question was asked, "Is this a Dance, Song, March or Hymn?")

No practice example.

1. 'March in D' - Rebikoff. 8 bars. ♩ = 116
2. 'No. 2 of 5 Ecossaises in A .' - Schubert Dance. 16 bars. ♩ = 132
3. 'Waltz' - Tschaikowsky (Children's Album). Dance. Bars 1-16. ♩. = 120
4. 'Strutting out' ('Etude', March 1925) Dance. 16 bars. ♩ = 132
5. 'March' - Bach ('Dramma per Musica' arr. Grace.). 12 bars. ♩ = 120
6. 'Praise to the Holiest' - Somervell (Boosey) Hymn. ♩ = 88
7. Song 'My Secret' - Schumann, Song. 10 bars. ♩. = 56
8. 'March Militaire' - Buck (Year Book Press) March. 8 bars. ♩ = 66
9. 'The Butterfly' - Cornelius (Clarendon Song Book I.) Song. ♩ = 76

Test V. Emotional-tone discrimination.

"This time you have to decide whether the piece of music is Gloomy, or Sad, or Peaceful, or Cheerful, or Joyful. Draw a line under the name which you think it is. If you are not sure, put a cross at the beginning. Remember that Gloomy means very sad, very sorrowful or very unhappy. Peaceful means soothing or restful. Joyful means very happy or triumphant.

Examples: (a) Gloomy - Funeral March, Chopin. (10 bars) ♩ = 66
(b) Joyful - See manuscript in Appendix, page 316.) ♩ = 120

1. 'Sanctus' (Last section) - Bach (Mass in B minor) - Joyful. ♪ = 116
2. Excerpt from Academic Festival Overture - Brahms - Joyful. 𝅗𝅥 = 69
3. Song 'Gossip Joan'. - Cheerful. ♩ = 120
4. Scherzo - Schumann - Joyful (Bunte Blätter, 8 bars) 𝅗𝅥. = 63
5. 'Blessed art Thou, O God' - Mozart. - Peaceful. 10 bars. ♪ = 88

6. 'Ecossaise' - Schubert. - Cheerful. ("5 Ecossaises", No. 1. 16 bars.) ♩ = 120
7. No. 4 of 'Six Variations in G' - Beethoven - Peaceful. ("Tranquillo", 8 bars) ♪ = 88
8. Sinfonia 'I stand with one foot in the grave' - Bach - Sad. ♪ = 80
9. End of choral (Orgelbuchlein) - No. 6, page viii. Bach - Gloomy. (4 bars) ♩ = 50
10. 'Tyrolese Folk Song - Tschaikowsky (Children's Album), 16 bars - Cheerful. ♩ = 126

Note: In tests 6, 7, 8, 9 there is a sequence Cheerful, Peaceful, Sad, Gloomy. This was the result of previous experimentation.

Test VI. Knowledge of Names of Pieces.

"Here is a list of names. Some are the names of pieces of music and some are not. If a name is the name of a piece of music, put a Y in front of it. (Y stands for 'Yes'). If you do not know if it is the name of a piece of music, put N in front of it. (N stands for 'No'). (This latter instruction should be read very slowly and emphasised). If you have an idea that it is the name of a piece of music, but are not sure, put a cross in front of it."

Practice examples: The method of recording the answers, is demonstrated by means of the names 'God save the King' and 'The abilities of man'.

(Note the 30 'dummies' (d)).

1. A-hunting we will go.
2. The Lessons of Nature. (d)
3. The First Nowell.
4. Leaves of Grass. (d)
5. The Cloister and the Hearth. (d)
6. Ye banks and braes.
7. A hundred pipers.
8. O dear what can the matter be.
9. The old folks at home.
10. The world of ice. (d)
11. The last rose of summer.
12. The spirit of the age. (d)
13. Ode to evening. (d)
14. The cold harbour. (d)
15. Thoughts in a garden. (d)
16. The minstrel boy.
17. Ungava. (d)
18. Wae's me for Prince Charlie.

19. The Ash Grove.
20. Scots wha hae'.
21. Rubaiyat. (d)
22. Mystery at Geneva. (d)
23. Ho-ro my nut brown maiden.
24. The Grettir Saga. (d)
25. The Death of Jason. (d)
26. The Diamonds. (d)
27. It was a lover and his lass.
28. Drink to me only with thine eyes.
29. Shenandoah.
30. Lavengro. (d)
31. Oft in the stilly night.
32. 'Tis folly to be wise. (d)
33. The Crown of Wild Olive. (d)
34. The Rift in the Lute. (d)
35. A man's a man for a'that.
36. Since first I saw your face.
37. On wings of song.
38. Unto this last. (d)
39. The flowers o' the forest.
40. The Bohemian Girl.
42. Where the bee sucks. ← 41. Lochnagar.
43. Shakuntula. (d)
44. The Mirror of Perfection. (d)
45. The Mill on the Floss. (d)
46. The Return of the Native. (d)
47. Good King Wenceslas.
48. All people that on earth do dwell.
49. The Bay of Biscay.
50. The Wild Duck. (d)
51. The Rio Grande.
52. Runnymede. (d)
53. Ashenden. (d)
54. Turn ye to me.
55. The lass with the delicate air.
56. Orlando Furioso. (d)
57. The Maiden's Prayer.
58. The Marble Faun. (d)
59. Ravenshaw. (d)
60. The Kingdom of Christ. (d)

Test VII. Knowledge of Names of Composers.

"Here is a list of names. Some are the names of men who wrote music and some are not. If a name is the name of a man who wrote music, put a Y in front of it. If you do not know if it is the name of a man who wrote music, put N in front of it. If you have an idea that it is the name of a man who wrote music, but are not sure, put a cross in front."

1. Sullivan.		26. Tschaikowsky.	
2. Devereux.	(d)	27. Crashaw.	(d)
3. Verstegan.	(d)	28. Dekker.	(d)
4. Reinartz.	(d)	29. Humboldt.	(d)
5. Elgar.		30. Sylvester.	(d)
6. Quarles.	(d)	31. Haydn.	
7. Kohler.	(d)	32. Mozart.	
8. Pavlov.	(d)	33. Seidlitz.	(d)
9. Rossini.		34. Sedley.	(d)
10. Stanford.		35. Couperin.	
11. Schubert.		36. Donne.	(d)
12. Koffka.	(d)	37. Wagner.	
13. Tamurlane.	(d)	38. Handel.	
14. Mazuma.	(d)	39. Wootton.	(d)
15. Montessori.	(d)	40. Souza.	
16. Cibber.	(d)	41. Liszt.	
17. Wyat.	(d)	42. Purcell.	
18. Witter.	(d)	43. Bach.	
19. Steiner.	(d)	44. Cowley.	(d)
20. Schumann.		45. Gluck.	
21. Dryden.	(d)	46. Chopin.	
22. Verdi		47. Mendelssohn.	
23. Beethoven.		48. Rachmanninoff.	
24. Arne.		49. Strauss.	
25. Barbauld.	(d)	50. Brahms.	

Test VIII. Discrimination of Appropriate Conditions of Performance.

(See test manuscript in appendix, page 317.)

1. "You have to make up your mind whether this tune would be sung by a man or a woman. Draw a line under the name which you think is right. If you are not sure, put a cross at the beginning."

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2. "You will hear a tune played in two different ways, and you have to make up your mind about which you like better. If you like the first one better, draw a line under FIRST. If you like the second one better draw a line under SECOND. If you are not sure, put a cross at the beginning. You will hear them played again to help you to make up your mind."

"This time you have to make up your mind whether the tune would sound best when performed by a Singer, or a Violin, or by Trumpets. Draw a line under the name which you think is right. If you are not sure, put a cross at the beginning."

3. 'The Arkansas Traveller' (American fiddle tune, Etude, December, 1924). 16 bars — Violin. ♩ = 126

4. Coronation March ('Le Prophete', Meyerbeer), 9 bars. - Trumpets. ♩ = 76

5. 'La Cinquantaine' (Old French tune) - Violin. 16 bars. ♩ = 92

6. 'In Praise of Tears' - Schubert - Singer. 5 bars. ♩ = 60

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7. "You will now hear a hymn tune played in two different ways. You have to decide which one would sound better in a church. Draw a line under the one you think it is. If you are not sure, put a cross at the beginning. You will hear them played again to help you to make up your mind."

8. Same instructions as 7.

9. "You will now hear two different tunes which are sung to the same words in a church. The words are rather sad and solemn. You have to decide which tune is more suitable for the church. Draw a line under the one which you think it is. If you are not sure, put a cross at the beginning. You will hear them played again to help you to make up your mind."

The choice of the group test material.

For Test I, a long list of several hundred songs was made up from well-known song-books and lists of songs known to children, and then reduced to a small number by a chance method. A similar procedure was adopted to give a list of dummies (i.e., unfamiliar items) derived from small works like anthems, carols, and similar compositions, unlikely to have come within the experience of children. Each set was arranged in approximate order of difficulty experimentally, and then the two sets were interlocked by a chance method, yielding a series roughly increasing in difficulty.

For Test II, a long list of pieces each of which seemed to have a suitable and strongly associated name, according to the composer's title and style of composition, was devised, and then reduced by a chance method to a small list. To each name was added another of varying degrees of dissimilarity. These name-pairs, after being analysed and arranged on the basis of experiment, formed the test.

For Test III, well known melodies of accepted 'shape' and aesthetic worth were taken, and each was distorted to give a melody which could be compared with the original for pleasing qualities.

In Test VI, lists of songs were made up from song-books and lists of songs remembered by children, and then reduced by chance methods. (Songs make more suitable material than instrumental compositions.) A list of dummies was made up from names of books and poems, and the two lists treated as in Test I.

For Test VII, the dummy names were made up from lists of authors of various types.

In all tests requiring subjective judgments the tests were submitted to musicians and other adults for verification.

Scoring:- It is desirable that the test should have a true zero point. That is, subjects who answer by chance alone should have a zero score.

Tests I, II, III:-	Correct answer,	+ 1.
	Wrong answer,	- 1.
	Doubtful,	0.
Test IV:-	Correct answer,	1.
	Wrong answer,	0.
	Doubtful,	0.

Only three doubtful answers were recorded, so no serious injustice is done by this method.

In items 6, 7 and 9, half credit was given if the subject confused Song and Hymn. An experienced person would not make this confusion in these tests, but there is some justification for children not making a clear distinction, especially if they hear hymn tunes of an unsuitable nature, e.g., certain mission hall tunes. It was felt that such confusion deserved more credit than zero score.

No correction was made here for guessing. The presence of four possibilities, and also the opportunity given of recording 'doubtful', does, however, reduce the effect or likelihood of guessing.

Test V:-	Correct answer,	1.
	Wrong answer,	0.
	Doubtful,	0.

Only two doubtful answers were recorded, so, as in Test IV, doubtful answers received zero score.

An interesting result occurred in this test, which had also been noted in the second experiment. To illustrate, the first four answers are Joyful, Joyful, Cheerful, Joyful. Many subjects gave Cheerful, Cheerful, Peaceful, Cheerful. That is, they gave correctly the change in emotional tone, but started at a different point. Now it is important to notice such changes when listening to a composition, notably in long compositions; in fact, at least as important as noticing the general emotional tone of the work. (The above observation may be useful in devising new tests). It was felt, therefore, that it was scarcely fair to give such subjects zero, since their attempt was much better than others. The general plan was made of giving half credit if the subject underlined the word on either side of the correct one. For example, if the correct word was Cheerful, he obtained $\frac{1}{2}$ for Peaceful, or for Joyful.

(The general question of correcting for guessing is still a vexed problem. Such correction may fail to be fair to a single individual, especially with a small test list, although it is satisfactory if the scores in several tests be averaged. There seems to be little uniform agreement as to the correct procedure. In 'Aptitude Testing', page 443, Clark L. Hull maintains that arbitrary procedures are all unsound, and says that if errors have any significance, their effect on the criterion of the aptitude can only be determined by finding the optimum weighting by experiment, supplemented by statistical analysis. On page 316, he says that the use of the formula "Rights - $\frac{\text{Wrongs}}{N - 1}$" before computing reliability coefficients is more likely to produce a loss than a gain, but in the case of validity coefficients there is a slight tendency for a gain to result.)

Tests VI, VII:-	Correct answer,	+ 1.
	Wrong answer,	- 1.
	Doubtful 'musical item',	+ $\frac{1}{2}$.
	Doubtful 'dummy',	- $\frac{1}{2}$.

Hence if a subject marked all the items with 'Y' or all with 'N', or all with + (i.e., doubtful), his total score would be zero. This would also occur if he distributed his 'Y', 'N' and + responses at random.

Test VIII.

In items 1, 2, 7, 8, and 9, there are two possible answers, so 'Rights - Wrongs' was taken as the sub-total for these.

In numbers 3, 4, 5, and 6, there are three possible answers, so 'Rights - $\frac{\text{Wrongs}}{2}$' was taken as the sub-total.

The total score for this test was obtained by adding the two results so obtained.

A consideration of the tests.

Test I. Recognition of Pieces.

In this test the subject has to decide if he has heard a piece before. Memory for music is thus the important factor. As the pieces are common ones, the effects of specific training are neutralised to a considerable extent, and the important basic factors are probably the group of activities tending to facilitate the learning and recognition of music, i.e., the subject's interests connected with music.

Test II. Association with name.

Here the subject is aided by the mental 'sets', or attitudes he adopts towards the two names, and it is a question of deciding which is more suited to the piece when it is heard. There are, no doubt, various ways of deciding the answer, but the person with the richest equipment of imagery and associations has a great advantage. The complex factors in this test make it a promising one, for these are used to a considerable extent in listening to actual compositions. The ordinary instrumental training, in itself, has probably little influence in this test. (It is a common observation that 'the public likes music with a name', so it is possible that certain names have special appeals. This might influence the test results, but probably only slightly. The difficulty would be minimised by increasing the length of the test.)

Test III. Melody preference.

This is undoubtedly a difficult test; (both to answer and to devise satisfactorily). It may be answered correctly with the aid of knowledge acquired by training, using intellectual judgments founded on certain melodic principles, or it may be answered correctly as the result of a reaction to the melody as a whole, using the vague understanding of the shape, flow, or "singable" qualities of melodies which most people with an ordinary acquaintance with music possess.

Test IV. Form discrimination.

The question here, although simple in appearance, is clearly related to the full appreciation of music under ordinary circumstances. The results must seem disappointing, for the children must have had many opportunities of hearing pieces in such forms, yet it is possible that at this age it is difficult to abstract from particular examples the broad differences in rhythm, flow, and general structure that characterise Dances, Songs, Marches and Hymns. (My own observations with adults, even efficient singers and instrumentalists, lead me to conclude that form appreciation is perhaps hardest of all. This kind of test, because of its application to all ages, may prove to be valuable for future work).

Test V. 'Emotional-tone' discrimination.

It might be thought that the deciding factor here is a change in the emotional state, mood, or feeling attitude of the child to correspond with the name, i.e., that the subject answers 'gloomy' if the music makes him feel gloomy. This view has to be regarded with caution. Myers (page 13) experimenting with adults, found that music had only slight effects of this subjective nature, i.e., they gave such answers with little or no conscious feelings to correspond with the answers. Undoubtedly there are certain musical compositions which actually make us feel joyful, yet the experienced listener will agree that these are distinctly few, and still fewer are those which actually make us feel gloomy. (The geniuses among the composers are apparently more responsive). There is rather only a tendency for the music to have this subjective influence, and the effect is usually, for example, only a slight diffuse pleasurable excitement instead of a marked change to an emotional state of a pleasant nature. We seem rather to refer the effect to the intention of the composer. (Not without significance is the expression "That music sounds joyful".) Hence although there is an emotional effect, our judgments have more of an intellectual nature than we might at first accord them. (That is, our judgments are influenced more by cognitive factors than one would expect from cursory introspection. Speed, rhythm and figure are important influences.)

Tests VI and VII. "Names of Pieces" and "Names of Composers".

Although appreciation of music makes us more interested in the names connected with musical compositions, thus tending to fix in our minds the names we encounter, and so tending to increase the score in these tests, these are better regarded almost wholly as tests of knowledge. One reason for their inclusion was the possibility that it might be found that they could be used as rough preliminary tests of "musical appreciation and knowledge".

Test VIII. "Appropriateness of performance".

The above name is suitable for the general character of these tests. The subject has to decide which is the most effective way, of those suggested, of performing the music.

Here associations and imagination play a large part, although a correct decision can be made by processes of analysis and the use of certain principles.

With the possible exception of Tests VI and VII., it will be seen that the tests were designed so that the average subject, using his ordinary experience of music, has little or no disadvantage in performing the tests, compared with subjects having an instrumental training. I mean by the latter, the usual technical training, where the pupil learns the instrument in the same way as he learns the typewriter. (The piano especially, is very often taught in this way). A more artistic training, including the interpretative and expressive aspects of music, is sometimes given, but is usually deferred, often with little reason, until the pupil is a capable executant, and this kind of training would increase the score in these tests.

Note on the use of 'dummy' tests.

It may be thought that Tests I, VI and VII, with their component dummy tests are unnecessarily complicated. Why not ask directly 'Have you heard this piece of music before?' But this suggests that the examinees will gain credit by always responding 'Yes', so that we have to secure accurate results by putting these tests into the form of discrimination between recognised and unrecognised.

In Test VII it would be natural to ask the testees to write out a list of composers. But this introduces several difficulties. (1) We might get a list of musicians, performers, conductors, dance band celebrities, composers of various degrees of quality and fame, and it would be awkward to settle whether the subject genuinely knew them to be composers. (2) A list of wrong and trivial names might seem sufficiently imposing to the subject to cause him to stop or relax effort.

By giving a definite list we have the advantages of (1) fixing the nature of the task; (2) obtaining not only the names that the subject can remember at the moment but the others beyond the threshold of consciousness; this gives a better sampling of the subject's general working equipment of names.

TABLE I.

Group A = 29 subjects (11 to 12). Group B = 122 subjects (12 to 13). Group C = 42 subjects (13 to 14).

TEST	GROUP	MEAN	σ	P.E.	$P.E_M$	r with pooled result (with Probable Errors)
I	A	9·72	3·21	2·17	·40	·35 ± ·11 (s)
	B	9·27	3·22	2·17	·20	·53 ± ·04 (s)
	C	10·24	2·90	1·96	·30	·50 ± ·08 (s)
II	A	6·24	2·05	1·38	·26	·24 ± ·12
	B	6·79	1·87	1·26	·11	·39 ± ·05 (s)
	C	6·76	2·03	1·37	·21	·47 ± ·08 (s)
III	A	1·79	2·80	1·89	·35	·44 ± ·10 (s)
	B	2·82	2·64	1·78	·16	·19 ± ·06 (s)
	C	1·86	3·13	2·11	·33	·43 ± ·08 (s)
IV	A	4·12	1·28	·86	·16	·50 ± ·09 (s)
	B	5·09	1·24	·84	·08	·45 ± ·05 (s)
	C	4·95	1·16	·78	·12	·38 ± ·09 (s)
V	A	6·93	1·22	·82	·15	·50 ± ·09 (s)
	B	6·63	1·36	·92	·08	·49 ± ·05 (s)
	C	7·26	1·01	·68	·11	·32 ± ·09 (s)
VI	A	20·52	9·42	6·35	1·18	·38 ± ·11 (s)
	B	25·35	9·46	6·38	·58	·44 ± ·05 (s)
	C	27·43	8·44	5·69	·88	·25 ± ·10
VII	A	·52	4·53	1·71	·32	·07 ± ·12
	B	1·60	5·21	3·51	·32	·21 ± ·06 (s)
	C	1·82	5·32	3·59	·55	·23 ± ·10
VIII	A	3·19	2·11	1·42	·26	·58 ± ·08 (s)
	B	2·35	2·41	1·63	·15	·46 ± ·05 (s)
	C	1·87	2·16	1·46	·23	·17 ± ·10

Correlations which are significant have s written after them. Significant levels for values of r will be found in Fisher's book[69], Table VA.

As for the criticism of making the task easy by presenting the names, it can be answered that the guesses of the ignorant subject are corrected for when scoring. The interpretation of the results is, of course, altered by putting the test in this form, but it is reasonable to suppose that this is the most useful form.

Similar difficulties would occur in Test VI if we asked for a list of pieces to be written down. The objections to the test in such a form would be even stronger in this case, since the subjects know more about pieces than composers.

If a test is too difficult, however, (i.e., when the subjects have little ability to answer correctly many of the questions) the use of dummy tests may be a disadvantage since the subject is liable to rely mainly on guessing. In this case the positive small answer due to positive discrimination may be seriously affected by the remaining chance score which is only zero if the chance correction is perfect. In actual practice there is a small distribution of scores about the zero which may be comparable with the positive scores obtained by the subjects. To sum up: this form of the test has advantages, as has been explained above, but it is at its weakest in the case of subjects who find the test difficult.

Results.

The tests were applied to a group of children with the following distribution:- 11-12 years, 29 children; 12-13, 122 children; 13-14, 42 children.

The Seashore tests were given on the afternoon of that day, and the National Intelligence test on the following day. The estimate of two teachers with respect to the musical interest of the children,(that is, as distinguished from their technical ability or knowledge,) was obtained.

Table I shows the mean score, standard deviation, etc., for each group. The correlation of each test with the pooled result is also shown, the pool being obtained by dividing the score of each individual by the corresponding standard deviation and adding the resulting figures. Such a pool was taken as being likely to be a better measure of general musical capacity than any single test. (This matter will be discussed later, page 42).

The relation between success and age.

It will be seen that there is little evidence for maintaining that success in the tests increases with age. However, Groups A and C are small compared with Group B, and their smallness makes it possible that they are not representative samples. A difference between groups that is barely significant when the groups are small may become significant with larger groups, so in such cases a suggestion of significant increase may be tentatively regarded as a possible understatement of a significant increase.

It must be allowed that the ability to make discriminations in these tests may cover a wide range of age. In fact the classification of subjects on an age basis is only justified if (1) maturation of function with age occurs or if (2) increasing contact of the subject with the environment (assumed to be more or less constant in character) leads to increasing ability in the function measured. We may deny or affirm such possibilities a priori, but the results appear antagonistic to them. The effect of age will be discussed later when a wider range of age is available (page 78).

THE DISTRIBUTION OF SCORES.

Graphs and distribution tables are in Appendix, Pages 320 and 324.

The graphs and score distributions show that the functions measured conform satisfactorily to the normal distribution. The distributions are at least as good as those obtained from many widely-used tests[27A]. To this extent the tests may be judged to be satisfactory.

It may also be asked: "Do the tests deal fairly with the best and worst scores?". Let us consider the results for the whole group.

Test I. 5 individuals had a score of 16 out of 18.
1 individual had a score of 1 out of 18.

Test II.	13	had	a	score	of	10	out	of 10.
	3	"	"	"	"	0	"	" 10.
Test III.	2	"	"	"	"	9	"	" 9.
	1	"	"	"	"	-7	"	" 9.
Test IV.	1	"	"	"	"	8½	"	" 9.
	3	"	"	"	"	2	"	" 9.
Test V.	3	"	"	"	"	9½	"	" 10.
	1	"	"	"	"	0	"	" 10.

No scores between 1 and 3½ were obtained.

Test VI.	1	had	a	score	of	50	out	of 60.
	1	"	"	"	"	3	"	" 60.
Test VII.	2	"	"	"	"	14½	"	" 50.
	1	"	"	"	"	-12½	"	" 50.
Test VIII.	6	"	"	"	"	7½	"	" 9.
	1	"	"	"	"	-3½	"	" 9.

Tests III, VII and VIII have the disadvantage of negative scores which suggest guessing as a result of insufficient ability. It would be desirable to lengthen these tests by the addition of more easy items. While the good distribution of Test VI may be due to its being a test of knowledge, it is likely that the large number of items is a more important explanation of its discriminating power. Probably these tests would be greatly improved by being extended, but of course the time of application would be considerably increased.

Test I and Test II require the addition of more difficult items. However, it is evident that the tests are designed on sound lines so far as our present considerations are involved.

THE CORRELATION OF EACH TEST WITH THE POOLED RESULT.

These correlations have already been tabulated (p. 32). The descending order of size is seen in the lists on page 356 of Appendix.

Age 11 - 12.- The descending order of tests influencing the pooled result is Appropriateness of Performance, Emotional Tone Discrimination, Form Discrimination, Melodic Preference, Names of Pieces, Recognition of Pieces, Association with Name, Names of Composers.

Age 12 - 13.- Descending order is Recognition of Pieces Emotional Tone Discrimination, Appropriateness of Performance, Names of Pieces, Form Discrimination, Association with Name, Names of Composers and Melodic Preference.

Age 13 - 14.- Descending order is Recognition of Pieces, Appropriateness of Performance, Names of Pieces, Form Discrimination, Emotional Tone Discrimination, Names of Composers, Association with Name, Melodic Preference.

The results for Age 12 - 13 are probably more accurate, by virtue of the size of the group, than those for the other groups. These results suggest that Tests I, V, VIII, VI (viz. Recognition of Pieces, Emotional Tone Discrimination, Appropriateness of Performance, Names of Pieces) are rather better measures of broad general ability (or pool of abilities) than the other tests. (Some points relating to this matter will be discussed later - page 68 and page 76).

THE CORRELATIONS OF THE TESTS WITH INTELLIGENCE.

GROUP A

TEST	r with I.Q.	r with M.A.
I	·23 ± ·12	·16 ± ·12
II	−·32 ± ·11	−·34 ± ·11
III	−·20 ± ·12	−·20 ± ·12
IV	−·13 ± ·12	−·23 ± ·12
V	·18 ± ·12	·20 ± ·12
VI	·12 ± ·12	·14 ± ·12
VII	·04 ± ·13	·11 ± ·12
VIII	·05 ± ·12	·03 ± ·13

GROUP B

TEST	r with I.Q.	r with M.A.
I	·20 ± ·06 (s)	·12 ± ·06 (s)
II	·10 ± ·06	·18 ± ·06 (s)
III	−·13 ± ·06	−·11 ± ·06
IV	·00 ± ·06	·03 ± ·06
V	·18 ± ·06 (s)	·19 ± ·06 (s)
VI	·36 ± ·05 (s)	·35 ± ·05 (s)
VII	·05 ± ·06	·04 ± ·06
VIII	·02 ± ·06	·04 ± ·06

GROUP C

TEST	r with I.Q.	r with M.A.
I	·15 ± ·10	·12 ± ·10
II	−·10 ± ·10	−·01 ± ·10
III	−·14 ± ·10	−·10 ± ·10
IV	·09 ± ·10	·09 ± ·10
V	−·07 ± ·10	−·10 ± ·10
VI	·01 ± ·10	−·01 ± ·10
VII	−·23 ± ·10	−·15 ± ·10
VIII	·16 ± ·10	·20 ± ·10

TOTAL GROUP

TEST	r with I.Q.	r with M.A.
I		·22 ± ·05 (s)
II		·07 ± ·05
III		−·14 ± ·05
IV		−·00 ± ·05
V		·20 ± ·05 (s)
VI		·27 ± ·05 (s)
VII		·04 ± ·05
VIII		·03 ± ·05

Significant correlations are marked (s).

The correlations of the tests with intelligence.

The correlations shown on page 37 are the correlations of the test scores with the intelligence quotients of the subjects. It can be disputed if this is a sound procedure. Is the I.Q. a measure of intelligence? Only subject to certain qualifications. For example, a four year old child and a fourteen year old may each have an I.Q. of 100. It would be absurd to regard these as equivalent for the performance of certain tasks. The I.Q. of 100 merely states that these individuals have the same relation to the general ability shown by a random sample of individuals of four and fourteen years of age respectively. Actually 'mental age' is a much better measure of intelligence. Nevertheless, the I.Q. gives a measure of superior or inferior intelligence within a given age group, so that the results are not irrelevant. The correlations with mental age are also shown.

The only correlations which are significant are those for Group B, for tests I, II, V and VI, and for the total group, for tests I, V and VI, yet it is clear that all the correlations are small. Hence intelligence has little influence on success in these tests. These results agree with those obtained by other investigators, e.g., the results of the Meier-Seashore Art Test, the Seashore Tests of Musical Talent, the results of Walton[58] ($r = .00 \pm .08$), Jasper[59] ($r = .04 \pm .07$), Daniels[60], Williams[61], Lowery[25], Mainwaring[62]. (The writer worked out a correlation of school marks in Art with intelligence measures for 87 pupils and found $r = .13 \pm .07$).

These low correlations in the preceding tables may or may not be unexpected. One can find music teachers arguing about the influence of intelligence, yet speculations on these matters call for experimental verification and the results prove that the functions measured by the tests are little influenced by intelligence * and may be due to a general musical factor, several group factors, or many specific factors.

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* J. L. Mursell ('Principles of Musical Education', Chapter 4, Macmillan) maintains that intelligence is an important component of musical talent. His book is educational rather than psychological and he offers little evidence for his view. Of course intelligence is important for the scholastic side of music, but the above results show that its importance in appreciation is much more doubtful.

Inter-correlations between the tests.

GROUP A

	I	II	III	IV	V	VI	VII	VIII
I	–	–·07 ± ·12	·18 ± ·12	·22 ± ·11	·17 ± ·12	·04 ± ·13	(S) –·36 ± ·11	·22 ± ·12
II		–	·10 ± ·12	–·06 ± ·12	·09 ± ·12	–·05 ± ·12	–·29 ± ·11	·07 ± ·12
III			–	·09 ± ·12	·14 ± ·12	–·04 ± ·13	–·08 ± ·12	–·00 ± ·13
IV				–	·06 ± ·12	·09 ± ·12	·03 ± ·13	·07 ± ·12
V					–	(S) ·35 ± ·11	–·16 ± ·12	–·15 ± ·12
VI						–	·08 ± ·12	·18 ± ·12
VII							–	–·10 ± ·12
VIII								–

GROUP B

	I	II	III	IV	V	VI	VII	VIII
I	–	·09 ± ·06	·05 ± ·06	(S) ·23 ± ·06	(S) ·20 ± ·06	(S) ·18 ± ·06	·02 ± ·06	·09 ± ·06
II		–	–·06 ± ·06	·08 ± ·06	(S) ·30 ± ·06	·11 ± ·06	(S) –·18 ± ·06	–·06 ± ·06
III			–	–·07 ± ·06	–·04 ± ·06	–·14 ± ·06	–·08 ± ·06	–·06 ± ·06
IV				–	·06 ± ·06	·06 ± ·06	–·00 ± ·06	·09 ± ·06
V					–	·15 ± ·06	–·11 ± ·06	(S) ·18 ± ·06
VI						–	·04 ± ·06	·15 ± ·06
VII							–	·10 ± ·06
VIII								–

GROUP C

	I	II	III	IV	V	VI	VII	VIII
I	–	·05 ± ·10	·06 ± ·10	·09 ± ·10	·01 ± ·10	·21 ± ·10	(s) –·30 ± ·09	·20 ± ·10
II		–	–·06 ± ·10	–·04 ± ·10	–·05 ± ·10	–·06 ± ·10	·07 ± ·10	–·07 ± ·10
III			–	–·21 ± ·10	–·14 ± ·10	–·12 ± ·10	–·02 ± ·10	–·10 ± ·10
IV				–	·03 ± ·10	–·03 ± ·10	·03 ± ·10	·23 ± ·10
V					–	·20 ± ·10	·20 ± ·10	–·01 ± ·10
VI						–	(s) –·30 ± ·10	·15 ± ·10
VII							–	–·14 ± ·10
VIII								–

WHOLE GROUP (ALL P.E.s are ·05)

	I	II	III	IV	V	VI	VII	VIII
I	–	·05	·05	(s) ·20	(s) ·19	(s) ·16	–·10	·13
II		–	–·01	·07	(s) ·17	·07	–·13	–·09
III			–	–·04	–·06	–·12	–·08	–·07
IV				–	·08	·11	·03	·10
V					–	·11	·09	(s) ·18
VI						–	·05	·07
VII							–	·02
VIII								–

The correlations which are significant are those for Group A, $r_{17} = -\cdot 36$, $r_{56} = \cdot 35$, Group B, $r_{14} = \cdot 23$, $r_{15} = \cdot 20$, $r_{16} = \cdot 18$, $r_{25} = \cdot 30$, $r_{27} = -\cdot 18$, $r_{58} = \cdot 18$, Group C, $r_{17} = -\cdot 30$, $r_{67} = -\cdot 30$, and Total Group, $r_{14} = \cdot 20$, $r_{15} = \cdot 19$, $r_{16} = \cdot 16$, $r_{25} = \cdot 17$, $r_{58} = \cdot 18$.

The intercorrelations are evidently all small. When the partial correlations with mental age are removed, by Yule's formula, the resulting intercorrelations are very little different from the raw intercorrelations.

When the tetrad difference criterion is applied to these intercorrelations, it is found that the tetrad differences do not differ significantly from zero. Hence the functions measured by these tests have a small common factor which may be 'g' (Spearman), and, since the saturations with this factor are low, they are largely independent of each other.* We may draw the following conclusions, assuming that the tests are measuring functions concerned with musical appreciation (i.e., purposive and systematic listening to music) and of importance for making appreciation more organised, complex and efficient:-

Musical appreciation presupposes a certain minimum efficiency of sensory processes (pitch discrimination, sense of consonance and the like - the sort of functions measured by the Seashore tests.)

On the basis of this equipment is built up a set of functions such as are measured by the tests already described. (These functions determine the recognition or non-recognition of musical material, the suitability of the name of the composition, the emotions evoked by the music, the attitude set up in anticipation by the name, judgments of form and structure, the suitability of tone colour, and the like).

Eight representative functions of this type have been used, delimited by the common experience of what is helpful in musical appreciation. It might be maintained that far more than eight functions should have been used. It was not supposed, in devising the tests, that the eight functions were unitary or independent of each other, nor that the functions were relatively simple in their organisation. The low intercorrelations are illuminating in this connection. It appears from these that the functions are almost entirely independent of each other, so that no overlapping factors have been discovered. This has important consequences. It means that we cannot combine the results of different appreciation tests as the intelligence tester combines the results of tests of widely different types. The latter have always various saturations of the general intellective factor 'g' so that the pooling of results accentuates the effect of 'g' and diminishes the effect of non-overlapping components.

* See page 79 for note on factorial analysis.

We can only regard appreciation tests as giving a sample of a range of functions. The pooling of such results has not a sound theoretical basis, for the range of functions may prove to be large, in which case a pooled result is not measuring 'musical appreciation' in general, but a particular modification of it, determined by the nature of the pool.

However, practical considerations help to determine reasonably useful ranges of functions for pooling, as, for example, the range of functions covered by the present tests. The profile method of recording measurements is suggested by these considerations.

Secondly, if 'musical appreciation' is to be trained in individuals and developed into wider fields, some clarity of attitude in teaching technique is required. In the first place, the results of the inter-correlations between the tests show that we cannot assume that the pupil who is trained in certain aspects of musical appreciation will consequently acquire 'on his own' the modes of successfully dealing with other aspects, i.e., there is little or no transfer of ability from one type of analysis to another. Suppose we consider this in more detail. The results of the Seashore tests show that ability in pitch discrimination is largely independent of ability in tonal memory, sense of consonance, sense of intensity, or the sense of time. Consequently a course of musical training which was largely made up of tasks designed to train pitch discrimination would be a barren one. Pupils would improve, slightly in Seashore's opinion, in such tasks, but would not improve in the other four abilities. Similarly a training based on any one of the five would not affect the remaining four abilities. This result, of course, is very obvious if we regard these abilities as simple sensory abilities, with little central elaboration and interpretation.

A teacher would need to be an unusually strong advocate of the old doctrine that a given study 'trains the mind', in a general sense, before he would initiate the system hypothetically referred to above. But it is striking that the functions measured by the tests previously described should show results similar to the Seashore tests. The ability to associate successfully a composition with a name has little relation to the ability to describe its emotional-tone, or form, and the like. We cannot therefore neglect in teaching any side of appreciation. Every ability which it is desired that pupils should possess should be trained separately. We cannot rely on transfer taking place. No doubt the differing opinions of musicians on the effectiveness of certain compositions is related to these considerations. High ability in certain sides of appreciation may co-exist with weaknesses in other sides. Consequently, the aim of the appreciation movement should be to give a broad training in all the aspects. This will provide a sub-stratum of training which will make for uniformity of taste in fundamentals. Such a training will lead the listeners to attend to music with certain broad attitudes of expectation. If any components of the music disappoint this preliminary plan of listening, the hearer will be led to question the omissions and additions and may in consequence understand more fully the aims of the composer. As examples of the constituents of this broad training, the varieties of operations used in the preceding group test could be used, although it could not be claimed that these varieties were complete. Limitations of time will prevent the 'front' of training from being extended much, yet it is important to realise that this is necessary if new abilities in appreciation are wanted.

Thirdly, the effect of intelligence may be considered. The correlations of the test results with mental age have been seen to be low. This leads to the conclusion that a person with intelligence not of a high order may become an effective musician. The Seashore tests show that elementary functions have little relation to intelligence so that such a person may reach a high technical level of skill in playing or singing without great difficulty. (His training may have to be prolonged, however, because of the handicap of average or less than average intelligence. This is an open question, but we could reasonably expect the intelligent learner to devise 'short-cuts' from time to time during his course. This would probably be very noticeable in the process of reading music, learning harmony, counterpoint, form, history, and the other scholastic aspects of music.) On the appreciative side the results of page 38 suggest that a person of humble intelligence may be proficient in the tasks covered by the tests. Probably the only handicaps resulting from a low intelligence will be prolongation of certain studies and lack of initiative in attempting new ventures and solving new difficulties.

As in all occupations, however, intelligence is important for some tasks. One cannot expect a musician of humble intelligence to go far on the paths of composition, arranging, editing, teaching or organising. Nevertheless, it appears that functions other than intelligence are generally more important in the field of music. This is particularly important for the use of music as a cultural subject. Pupils in schools should be able to do well in music in spite of the handicap of low intelligence. Low classes should achieve much the same success as higher classes of the same grade. This applies to the sensory training, and the appreciation side of music. Musical appreciation should therefore fill a considerable part of the school time of the dull pupil. As the age of compulsory attendance is raised in the future, this matter will call for attention. Since the Meier-Seashore results (page 38) have little relation to intelligence, we may claim that there is experimental evidence for the desirability of incorporating more musical and art appreciation in the time-tables of the average and backward child. The reason for this is not the common pedagogic one that if pupils are unable to progress in 'useful' subjects like English, Mathematics, Sciences, or Languages, then they might as well spend a good deal of their time on 'non-essentials' like Music, Art, Handwork, and Gymnastics. The reason is that low intelligence is a severe handicap in the first group but very little of a handicap in the second, unless the scholastic side of these subjects is treated, so that the pupils' time can be profitably used in developing a true basis for cultural and leisure activities. Further, since dull pupils are disheartened by failure in academic subjects, the emotional stimulus of success obtained by them in music and the arts is of vital importance in the development of personality. (The value of music as an end in itself is, of course, not to be lightly regarded.) These considerations, together with the fact that every side of musical appreciation had better be trained separately, opens up a very wide field of activity for the teachers of music.

<u>The magnitude of the inter-correlations between the tests for the whole group.</u>

The following list shows the size of the significant inter-correlations arranged in descending order.

$r_{14} = \cdot 20 \pm \cdot 05$ (Recognition and Form Discrimination)
$r_{15} = \cdot 19 \pm \cdot 05$ (Recognition and Emotional-tone discrimination)
$r_{58} = \cdot 18 \pm \cdot 05$ (Appropriateness of performance and Emotional-tone Discrimination)
$r_{25} = \cdot 17 \pm \cdot 05$ (Association with Name and Emotional-tone Discrimination)
$r_{16} = \cdot 16 \pm \cdot 05$ (Recognition and Names of Pieces).
etc.

The first five of the list are the only significant correlations. The remainder are not significant within the limits of their sampling errors, so that only speculative results could be drawn from them. It is impossible to say if r_{14}, is greater than r_{25}, or any of the other three, r_{15}, and r_{58}, and r_{16}. There is no significant difference between them. It can be said that there is a slight relation between Recognition and Form Discrimination, Names of Pieces and Emotional-tone Discrimination, and also between Emotional-tone Discrimination and Appropriateness of Performance and Association with Name. These relations may be due to the ability of the subjects to form an imaginal pattern of what the music should sound like and comparing that pattern with the perception of the music presented. This somewhat nebulous pattern formation would explain the existence of the relations and also the slightness of the relations.

<u>The relation of the test-results to the age of the subjects.</u>

It was seen that the table on page 32 made it difficult to discover if the results of the test increased when the age of the subjects increased. It was decided to examine this point by calculating the correlation coefficient between the pooled results of the eight tests and the chronological ages of the subjects for the whole group. It was found that $r = \cdot 39 \pm \cdot 04$.

When the correlation was worked out between the pooled result and the mental ages of the subjects, it was found that $r = \cdot 30 \pm \cdot 04$. This correlation method is only justified if the two sets of variates are each distributed normally. The graphs of the scores distributions indicate that this is true for the test scores, while the ages in the range for the total group are roughly normal. The correlation results are acceptable, roughly, and further justification will be shown later. (Page 78).

It can be concluded therefore that there is a small but significant relation between the musical functions measured by the test and chronological age, and a relation of the same nature between these functions and mental age. The above values of r are consistent with the fact that there is a high degree of relationship between chronological age and mental age.

There is no significant difference between the two correlation coefficients so that it is impossible to say whether increasing power of musical appreciation depends more on intelligence than on chronological age (the latter may be a measure of experience in music).

Nevertheless the results show that there is an increasing development with age of the power of musical appreciation in so far as this is measured by the tests. The Seashore tests appear to test functions which reach a more or less completely developed form at an early age[6,63]. Adolf Nestle[64] found that the sense of pitch is fully developed by the eighth year, that age exerts a considerable influence on the sense of pitch and the composing of melodies, girls reaching a maximum of melodic skill by the eleventh year, boys by the twelfth year, and that at puberty there is a temporary decline. Reimers[64] found that there is a considerable advance in the development of the sense of pitch in boys between 7 and 14 years of age. Stanton[63] considers that no significant changes in musical ability after the tenth year can be expected, no matter how excellent the training. Révész[64] found that age exerts an influence on the development of musical ability from 7 to 12 years, and that practice and technical skill have very slight effects.

Prager[64], who studied the reproduction and recognition of sound, speech and song rhythms found that performance undergoes no fundamental changes after 9 to 10 years of age, with the exception of speech rhythms where an advance from 50% to 76% success in performance was found in the range 9 to 15 years.

In these accounts we are confronted by a common difficulty in the psychology of music - the meaning of 'musicality', musical ability, musical talent, and similar general terms. Also, tests involving performance (reproduction vocally or by movement, or executant performance) introduce further complications. To clarify this matter, I suggest the terms Sensorial Musical Ability (in the audition meaning), Musical Appreciation (embracing central operations above the sensorial level) and Executant Ability.

From the results of Seashore and similar workers, it seems highly probable that Sensorial Musical Ability does not increase much after an age level of 10 to 12 years. The effect of training is dubious. Probably disagreement on the latter point is due to the methods of training employed and the methods of measuring improvement.

Musical Appreciation in the above sense comes into the work of Révész, Prager, Nestle, (although their terminology is confusing) and the present investigation.

Our results on page 45 establish definitely that Musical Appreciation increases, although slightly, with age. (Part of this demonstration will be found later on page 78).

<u>The reliability of the tests.</u>

Reliability coefficients were worked out for each test by dividing the test scores into halves and working out the correlation between the half scores for each test. In Test I, for example, the scores of each subject in the component tests 1, 3, 5, etc., were added and written out, while a corresponding series of results was found for the components 2, 4, 6, etc. The correlation between these two lists was calculated.

Strictly, this does not give the reliability of Test I but of the half test. To correct for this, the formula for the reliability coefficient r' in terms of the r calculated above is $r' = \frac{2r}{1+r}$

The values of r' are shown below:-

GROUP	TESTS I	II	III	IV	V	VI	VII	VIII
A	·42 ± ·10	·30 ± ·13	·30 ± ·13	·53 ± ·07	·55 ± ·07	·60 ± ·06	-·30 ± ·13	·10 ± ·20
B	·17 ± ·08	-·08 ± ·10	·24 ± ·08	-·11 ± ·10	·55 ± ·03	·43 ± ·05	-·21 ± ·08	·23 ± ·08
C	·69 ± ·03	·29 ± ·12	·50 ± ·07	-·04 ± ·18	·43 ± ·09	·55 ± ·05	·43 ± ·09	-·10 ± ·17
WHOLE GP.	·32 ± ·05	·04 ± ·10	·31 ± ·05	·07 ± ·08	·50 ± ·04	·49 ± ·04	·08 ± ·08	·17 ± ·07

The probable error of r' is not found from the same formula as in the case of a computed r.

The formula is $$\text{P.E.} = \frac{\cdot 6745(1 - r^2) \times 2}{\sqrt{N}(1 + r)^2}$$

$$= \text{Usual P.E.} \times \frac{2}{(1+r)^2}$$

The following correlations are significant, using the criterion of 3 × Probable Error.

GROUP A (11-12)

VI r = ·60 ± ·06
V r = ·55 ± ·07
IV r = ·53 ± ·07
I r = ·42 ± ·10

GROUP B (12-13)

V r = ·55 ± ·03
VI r = ·43 ± ·05
III r = ·24 ± ·08
VIII r = ·23 ± ·08 is almost significant

GROUP C (13-14)

I r = ·69 ± ·03
VI r = ·55 ± ·05
III r = ·50 ± ·07
V r = ·43 ± ·09
VII r = ·43 ± ·09

WHOLE GROUP

V r = ·50 ± ·04
VI r = ·49 ± ·04
I r = ·32 ± ·05
III r = ·31 ± ·05

In group A, no difference in the correlations is significant. In group B, r_5 and r_3 differ significantly, proving that test V has higher reliability than test III. In group C no difference is significant. In the whole group, test V differs significantly from test III, but no other difference is significant. There is a slight amount of evidence for believing that these results for the reliability coefficients tend to show the gradations in size suggested by the values of r, but the sizes of the probable errors cast doubt on this assumption so that we can only accept the gradations tentatively. Tests V and VI appear to have a fairly high reliability while tests I and III appear to have a rather low reliability.

The changes in the reliability of test I are peculiar. There is a significant difference between the values of r for groups B and C, but not for groups A and B. It is possible that the children of age 12-13 are at a stage where doubt in recognition supervenes to a considerable extent. That is, children in group A probably know less but are clearer about not knowing the dummies than those of group B, while group C probably know more and consequently have less tendency to guess the response to a dummy item. The superior knowledge of children in group C probably account for the significant reliability of test VII in group C. The results for tests II and VIII appear to be of slight value because the reliabilities are low.

It is interesting to compare these results with those found by other investigators. Here are the reliabilities of the Seashore tests[40]:-

Sense of pitch	$r = \cdot 71$
Sense of Intensity	$r = \cdot 65$
Sense of Time	$r = \cdot 48$
Sense of Consonance	$r = \cdot 43$
Tonal Memory	$r = \cdot 59$
Sense of Rhythm	$r = \cdot 29$

The test for sense of rhythm is the most 'musical' test of the series for it concerns the perception, recall and analysis or comparison of rhythmic patterns. It may be noted that its reliability is the lowest of the set. Now the tests in the writer's group test which appear most to resemble the working operations used in musical appreciation are tests II, III, IV, V and VIII, since these tests call for active cognition on the part of the subject, and the reliabilities of these tests are generally low, with the exception of test V.

This suggests that small reliability is inherent in tests of aesthetics and although this is a disquieting thought for the investigator, the result may just have to be accepted. This does not mean that investigations on aethetics should be shunned. It may be that widespread investigation is needed to clear up the difficulties, and the place of aesthetics is such that investigation on a broad scale is highly desirable, yet the prospect of success seems dubious so far.

The results for reliability show that if we lay more emphasis on the coefficients for the older children, who will tend to give more definite judgments, then the reliability of the group test is comparable with that of the Seashore test, (excepting II, IV and VIII of the group test).

The Meier-Seashore Art Judgment Test gives a reliability coefficient of ·71 to ·85.

It will be seen that the values of r for test VI are usually fairly high (page 47). This may be due to the fact that the test is comparatively long, consisting as it does of 60 items. It is of interest to know what length each test should be to have its reliability increased, say to a value of ·8.

This can be found by using the Spearman-Brown prophecy formula[65,66].

$$r_{nn} = \frac{nr}{1 + (n - 1)r}$$

where r is the given reliability coefficient and r_{nn} is the reliability coefficient when n parallel forms of the test are used to form a longer test (i.e., n forms similar in range of difficulty, covering the same ground and of equal reliability).

If we use this formula to calculate n for each test, using the values of r for the whole group (page 47), these values become, approximately:-

	I	II	III	IV	V	VI	VII	VIII
n	9	96	9	46	4	4	46	20.

Test I would then consist of 162 items, taking about 90 minutes.
Test II " " " " 864 " " " 8 hours.
Test III " " " " 81 " " " 45 mins.
Test IV " " " " 414 " " " 4 hours.
Test V " " " " 40 " " " 20 mins.
Test VI " " " " 240 " " " 35 mins.
Test VII " " " " 2300 " " " $5\frac{1}{2}$ hrs.
Test VIII" " " " 180 " " " 100 mins.

These conclusions show the need for lengthening the tests considerably, but it would be necessary to do testing work at intervals, to avoid fatigue. The time for lengthened tests in each of the cases of III, V, VI would be possible, but the others would involve an impracticable length of time. In the case of VII, the selection of 1100 composers suitable for testing would be absurd. Moreover repetitions of the same test instead of lengthening it with new material would inevitably lead to practice effects. The practicable solution is to lengthen each test to about five times its present length (except Test VII) and increase the number of items of average difficulty. At present the hardest items are sufficiently selective in action. The tests would then take about half-an-hour each and each would be performed at one sitting with a generous interval of time to follow.

Reliability coefficients found by re-testing.

A random group of the older children were re-tested after an interval of one year. Unfortunately only 20 cases were obtainable, so the results are no more than suggestive. The values of the re-test correlations are shown below.

TEST	I	II	III	IV	V	VI	VII	VIII
r	·69	−·10	·20	·10	·29	·27	·06	·47
$P.E._r$	·08	·15	·15	·15	·14	·14	·15	·12

Of these, only the values of r for Tests I and VIII are significant. The other values are evidently small. The results suggest that repeated testing is desirable to obtain dependable measures of musical abilities. The mean values of the scores are listed below. 'a' refers to the first test, 'b' to the re-test.

TEST	I		II		III		IV		V		VI		VII		VIII	
	a	b	a	b	a	b	a	b	a	b	a	b	a	b	a	b
MEANS	9·05	10·6	5·2	6·1	2·8	2·4	5·16	5·05	6·75	7·1	26·6	25·6	1·5	2·55	1·7	3·05

Apparent increases occur in the means for Tests I, II, V, VII, VIII, but these differences are not significant. Hence although the possibility of increase in ability during a year is suggested, it has not been proved.

The value of the reliability coefficient for Test I is quite high, and since Test I is a test for recognition of melodies this value is explicable, partly at least, as a memory effect. Test VIII (Appropriateness of Performance) has a significant value of the reliability coefficient, and the increase in size of the mean in the above table suggests that a development of discriminatory aesthetic functions (or 'taste') has occurred.

The validity of the test.

The question may now be raised, "Do these tests really measure musical abilities?"

1. In the first place, 'musical ability' or 'musical abilities' is difficult to explain. Attempts to do so soon raise philosophical questions as to what music is or should be, the value of programme music as compared with absolute music, and so on. In order to make the tests of practical value a certain range of abilities concerned with purposive and systematic listening to music have been considered and tests for these have been studied, as described in previous pages. The fact that these abilities are assumed in several of Stewart Macpherson's questions on page 17 gives encouragement to the view that these abilities are of practical importance in listening to music.

2. One way of measuring the validity of the tests is to examine the correlation of the test results with teachers' estimates of musical ability, but one immediately encounters the difficulty as to what manifestations of musical ability the teacher should pay attention in framing estimates. The teachers were told to lay the main emphasis on musical interest on the appreciative side but, of course, they should take some account of performing ability (e.g., solo singing, playing, choir work, concert activities, etc.) in so far as these appeared to develop, or be associated with, special musical interest on the part of a given individual. Two teachers gave estimates and these were coalesced into one list after discussion. The estimates arranged the children into the four groups A, B, C and D - a descending order of musical appreciation. Significant correlation was found between this classification and the pooled result of the group test. Bi-serial $r = \cdot 2$. Mean square contingency coefficient, $C = \cdot 19$. However, neither of these coefficients indicates more than a low degree of relationship. In a preliminary experiment with the same music tests applied to 45 subjects, a significant correlation was found between a teacher's estimate and the pooled result of the music tests, r being $\cdot 34$. This still indicates a low degree of relationship.

Nevertheless it was quite clear from scanning the A, B, C, D classification and the results of the music tests that these were agreeing very well with regard to the superior and inferior pupils. The discrepancies were nearly all concerned with the 'middle' pupils - those whose attainment was about average. For the purposes of vocational guidance and selection one is usually most concerned with the superior pupils, and this should be much more true in the case of musical guidance and selection so that the low correlation mentioned above under-estimates the value of the music tests for selecting superior pupils. The table below shows the mean scores obtained by groups A, B, C, and D (the teachers' classification) in the various music tests.

GROUP	I	II	III	IV	V	VI	VII	VIII	Pooled result
A	12·0	5·1	3·2	5·1	7·1	33·5	6·6	2·2	22·8
B	9·8	6·6	2·4	4·7	7·1	25·4	1·4	2·4	21·0
C	9·4	5·7	2·7	4·8	6·6	24·7	1·4	2·5	20·2
D	8·6	6·6	1·8	4·3	6·7	22·5	1·5	2·1	19·5

The tests showing steady concomitant variation with the teachers' estimates are Test I (Recognition of Pieces), Test VI (Names of Pieces) and the pooled result of all the tests. It is interesting to note that Test I and VI are concerned with songs so that the estimates of the teachers are probably based mainly on vocal performance or interest in songs. The other tests do not show steady gradations but Tests III (Melodic Preference), IV (Form Discrimination), V (Emotional-tone Discrimination) and VII (Names of Composers) exhibit quite good gradations.

3. Significant correlation is found between the pooled result of the music tests and the pooled result of the Seashore tests (page 61), but again the correlation is low.

4. Agreement is found between the music test results and those for the contrapuntal test (page 92).

5. The question of validity in relation to school estimates is discussed in connection with the results for secondary pupils (page 68).

6. The low correlations with teachers' estimates do not necessarily condemn the music tests, since it is likely (as the relations for Test I and Test VI, mentioned before, suggest) that the estimates and the music tests are measures of functions which have little in common. The science of testing musical abilities is not, in the writer's opinion, sufficiently developed to settle questions of validity definitely - a difficulty which confronts every branch of testing in its early stages.

The order of difficulty of the tests.

The appendix, pages 357 to 361 contains an analysis of the difficulty of the tests as revealed by the scores. Such an analysis is useful (1) to observe the knowledge of the pupils in the various aspects of music so that various strengths and weaknesses can be noted. This form of survey is of prime importance to the teacher, and, in spite of the labour involved, is worth doing for the possibility of acquiring information relative to teaching practice. (2) to give an index of difficulty for each test item, for devising new forms of these tests. This is useful for selecting dummy items, which is a troublesome business without such a guide.

The difficulty of each test item was obtained by calculating the total score made by the group. Rights, Zeros, and Wrongs were collected to give Rights - Wrongs, to correct for chance scoring, and the result expressed as a percentage of the total possible score which is, of course, equal to the number of individuals in the group.

For example, in Test I, no. 1, age 11-12, 20 were correct, 5 doubtful and 4 wrong. The total score for the group was therefore 20 - 4 or 16. The total possible score was 29 × 1, so the percentage score for the group was $\frac{16}{29} \times 100$ or 55·2%. This percentage is a measure of the number of significant correct decisions made by the group for Test I, no. 1. The descending order determined by these percentages was taken as a measure of increasing difficulty for the tests.

The tables in the Appendix show that certain tests are more successfully performed as the age of the group increases.

In Test I, these are 'Heraclitus', "The Kings" Chorale', 'Peace be with you', 'From Highest Heaven', 'Puer Nobis', which are all dummy tests.

It may also be noted that considerable uncertainty exists in the performance of dummy items. The median index of success is roughly 60%, whereas subjects with clearly defined memory patterns would score 100%. It is clear that within the age range studied such clearly defined memory patterns do not exist. A similar conclusion is obtained by observing the fluctuations of the scores for the music items. In many cases the percentage scores decrease with age. This may be due to insufficient assimilation as the experience of the child widens. One reason for this is the fact that the pressure of the school curriculum causes music to be treated less thoroughly as the qualifying examination draws near, and it is probable that children treat the subject with less attention.

It is of interest to note that 'All through the night' and 'Rio Grande' have low scores, yet these had all been taught in school. This suggests that extra-school environmental influences have a major influence in memorising music. This is not very surprising. The radio, cinema, children's games, gramophone and 'whistling' have omnipresent influence outside the school activities. There may also be certain repressing forces at work, as we shall consider later, apart from those due to examination pressure or anti-school attitudes. The low result for 'Onward Christian Soldiers' is due to some extent to lack of church contacts, a fact which was verified by later questioning.

In Test II, the items whose successful performance increases with age are 'Sea Surge', 'Wedding March', 'Song of the Sea'.

Consistently high are the scores for 'The Wild Horseman', 'At church', 'Cavalier'.

The low scores for 'The Organ Grinder' are probably due to the steady disappearance of organ grinders from the experience of children. Such a possibility must be kept in mind in forming tests. If the child forms an expectation pattern based on 'Church organ' instead of 'Organ Grinder', the perception of incongruity experienced after hearing the music will tend to make him react in favour of the alternative name 'Dreaming'.

The results of Test III are substantially those which would be expected.

In Test IV the low scores of 'March Militaire' and the Bach March are surprising. They cast doubt on the assumption which is commonly made by musicians that the March form is easily recognised.

In Test VIII (page 361), the results for 'Arkansas Traveller', Coronation March, Hymn (item 7) and 'Rock of Ages' are surprising. It seems clear that the task of discriminating the appropriate conditions of performance is difficult for the average child between 11 and 14 years of age, probably not because of any great inherent difficulty of the task, but because the child lacks the proper criterion for deciding the issue. For example, the mechanical dexterity possible in violin playing decides the issue for 'Arkansas Traveller', the loudness and timbre of trumpets decides it for 'Coronation March', and the perception of thinness or emptiness in harmony decides the answer for Hymn (item 7). The very poor result for 'Rock of Ages', is probably due to the hearing of bad 'jingly' hymn tunes of the Moody and Sankey type together with the failure of the child to realise the suitability of the Bach tune for 'sad and solemn words'.

In the results for Test VI, page 359, some of the names had been definitely encountered in school. The test percentages for these were 97%, 95%, 91%, 86%, 78%, 65%, 54%, 38%, 21%. 7 of these are above the median of the percentage results and 2 are below, yet this does not significantly alter the conclusion already suggested in Test I, page 54, namely that extra-school experience is probably a major influence. The median percentage result for the dummies is about 30%, as compared with 60% for the dummies in Test I, leading to the conclusion that children have very imperfect recollection of the names of pieces of music. In Test VII, page 360, the median percentage score for the 'dummies' is 0%. This is striking when one reflects that the result should be 100%: that is, if the instructions are understood, as they should be, especially since practice examples were given. The subjects certainly appeared to understand the instructions. (The instruction primarily affecting 'dummy' items was "If you do not know that the name is the name of a piece of music, put N". One would expect that this instruction should lead to 100% success with 'dummy' items.) Indifference to names of pieces, and, to a greater extent, to names of composers, is quite common among people of musical interests, especially those whose interests are largely executant, e.g., choir singers.

In Test VII, pages 360 to 361, the results indicate the very slight knowledge which children of these ages possess about composers. The high position of Sullivan is doubtless due to observing references, in speech or advertisement, to 'Gilbert and Sullivan'. The low average scores (page 32) and the low reliability are explicable because of scanty knowledge.

By analysing the results in these ways it is possible to note the tests which promise well for test formation, the 'content' of the child mind for musical information, the ability of the child to perform musical judgments, and individual differences in psychological structure.

<u>The comparison of the scores for sex-difference. (Total group).</u>

The mean scores, etc., are shown on page 56

$$V = \text{coefficient of variation } \left(V = \frac{100\sigma}{\text{Mean}}\right).$$

The mean scores show close agreement for boys and girls. An index of this agreement can be taken as:-

$$100\left(\frac{M_G - M_B}{M_B}\right) \qquad \begin{array}{l}(M_G = \text{mean for girls})\\(M_B = \text{mean for boys})\end{array}$$

SEX DIFFERENCES (WHOLE GROUP)

BOYS

TEST	I	II	III	IV	V	VI	VII	VIII
MEAN	10·01	6·62	2·23	4·79	6·75	26·54	1·23	2·44
σ	3·11	2·15	2·89	1·17	1·27	9·71	5·21	2·46
P.E.	2·10	1·45	1·95	·79	·86	6·55	3·51	1·66
$P.E._M$	·24	·16	·22	·09	·10	·74	·40	·19
V	31	32	130	24	19	37	422	101

GIRLS

TEST	I	II	III	IV	V	VI	VII	VIII
MEAN	9·23	5·79	2·63	4·59	6·85	23·86	1·98	2·32
σ	3·18	1·93	2·78	1·27	1·31	9·11	5·06	2·28
P.E.	2·14	1·30	1·88	·86	·88	6·14	3·41	1·54
$P.E._M$	·20	·12	·18	·08	·08	·58	·32	·15
V	34	33	157	28	19	38	256	99

$$V = \frac{100\,\sigma}{MEAN}$$

This index will be zero if the means are equal and will be large if the means differ a good deal.

The agreement measured in this way is roughly 8% over all the tests, except in Test VII where it is 58%. This suggests that girls may be superior to boys in discriminating the names of composers, possibly because of the greater interest of the female in persons, yet the test of significant difference is satisfied only by the results of Test II. Hence it can be concluded that boys are definitely superior to girls in this test. The processes involved in this test (verbal associations, mood-tones, imaginative operations, eduction of relations, etc.) may be influenced by genuine sex differences in affective organisation. If suggested (but not definite) information is accepted from Tests V and VIII, then girls tend to be slightly superior to boys in discriminating emotional tones, but rather more inferior in discriminating the conditions of appropriate performance. These views could be reconciled by considering that boys make more definite and direct judgments while girls may hesitate as a result of emotional influences.

With the exception of Test II, there is no significant difference between the results for boys and girls.

<u>The variation of the scores for boys and girls.</u>

Girls vary a little more than boys in the scores for Tests I, II, III, IV, VI; equal variations are found in Test V; girls vary less than boys in Tests VII and VIII. The differences in variation are remarkably low. Only in Test VII is there a striking difference. The latter suggests that girls have more definite knowledge of names of composers than have boys. The wide variation, especially in the case of boys, may be explained by the fact that definite scoring took place over a limited range of the test scale.

The order for increasing variation in test scores is found to be the following:- V, IV, I and II (equal), VI, VIII, III, VII.

One might have speculated that practice, skill and interest in rhythmic movement - rather commoner in boys than girls - would have given boys an advantage over girls in the tests. This advantage has not been established except in Test II, This rhythmic experience of boys, i.e., marching, athletics, might explain the results of Test II, and explain why boys are generally less variable in the tests than girls are. As a rule boys tend to be a little more variable than girls in biometric distributions. It was noted that the intelligence scores of the two classes were of this nature, a fact which makes the results in music tests more surprising.

RESULTS OF THE SEASHORE TESTS

GROUP	S_1		S_2		S_3		S_4		S_5		S_6	
	MEAN	$P.E_M$	MEAN	$P.E_M$	MEAN	$P.E_M$	MEAN	$P.E_M$	MEAN	$P.E_M$	MEAN	$P.E_M$
A	68·6	3·4	83·9	1·1	82·8	2·2	64·8	1·0	51·7	1·6	66·9	1·4
B	59·0	1·8	82·0	·7	84·3	·6	62·5	·6	47·4	1·0	65·7	·7
C	61·2	2·8	80·8	1·1	85·0	1·0	61·4	·8	50·7	1·2	65·1	1·0

CORRELATIONS BETWEEN THE MUSIC TESTS AND THE SEASHORE TESTS.

GROUP A ('s' in certain cells show that r is significant!)

	S_1	S_2	S_3	S_4	S_5	S_6
I	(s) ·40 ± ·12	·27 ± ·13	·06 ± ·14	–·11 ± ·14	(s) ·58 ± ·09	(s) ·49 ± ·11
II	–·08 ± ·14	·18 ± ·14	·31 ± ·13	·32 ± ·13	·28 ± ·13	·17 ± ·14
III	·26 ± ·13	·21 ± ·13	(s) ·44 ± ·12	–·06 ± ·14	·25 ± ·13	·29 ± ·13
IV	–·11 ± ·14	–·15 ± ·14	–·14 ± ·14	–·05 ± ·14	·15 ± ·14	–·16 ± ·14
V	·13 ± ·14	–·01 ± ·14	·04 ± ·14	·18 ± ·14	·09 ± ·14	·06 ± ·14
VI	–·02 ± ·14	·03 ± ·14	–·28 ± ·13	–·08 ± ·14	·20 ± ·14	(s) ·53 ± ·10
VII	–·34 ± ·12	–·25 ± ·13	–·32 ± ·13	–·04 ± ·14	–·31 ± ·13	–·21 ± ·13
VIII	–·23 ± ·13	·13 ± ·14	–·33 ± ·12	(s) ·36 ± ·12	·11 ± ·14	·14 ± ·14

GROUP B

	S_1	S_2	S_3	S_4	S_5	S_6
I	(s) ·19 ± ·07	·04 ± ·08	(s) ·18 ± ·07	(s) ·31 ± ·07	(s) ·22 ± ·07	(s) ·21 ± ·07
II	·09 ± ·08	·02 ± ·08	–·12 ± ·08	–·15 ± ·07	·06 ± ·08	–·04 ± ·08
III	·11 ± ·08	·11 ± ·08	·02 ± ·08	·15 ± ·07	–·07 ± ·08	·14 ± ·08
IV	(s) ·22 ± ·07	(s) ·22 ± ·07	·15 ± ·07	(s) ·23 ± ·07	(s) ·26 ± ·07	·11 ± ·08
V	·12 ± ·08	(s) ·36 ± ·07	·13 ± ·08	·16 ± ·07	·12 ± ·08	(s) ·24 ± ·07
VI	–·01 ± ·08	·12 ± ·08	–·06 ± ·08	–·06 ± ·08	(s) ·23 ± ·07	·02 ± ·08
VII	·08 ± ·08	–·05 ± ·08	·07 ± ·08	·04 ± ·08	·10 ± ·08	·10 ± ·08
VIII	·03 ± ·08	–·07 ± ·08	·01 ± ·08	·06 ± ·08	·05 ± ·08	–·04 ± ·08

GROUP C

	S_1	S_2	S_3	S_4	S_5	S_6
I	(s) ·39 ± ·10	–·07 ± ·12	–·03 ± ·12	(s) ·33 ± ·10	–·02 ± ·12	·14 ± ·12
II	–·17 ± ·11	·01 ± ·12	·13 ± ·12	–·13 ± ·12	–·08 ± ·12	–·07 ± ·12
III	–·00 ± ·12	–·00 ± ·12	·19 ± ·11	·14 ± ·12	–·05 ± ·12	–·17 ± ·11
IV	–·14 ± ·12	–·08 ± ·12	(s) –·41 ± ·10	·01 ± ·12	–·17 ± ·11	–·22 ± ·11
V	·04 ± ·12	–·02 ± ·12	·08 ± ·12	–·20 ± ·11	·00 ± ·12	(s) –·31 ± ·11
VI	·16 ± ·11	–·07 ± ·12	·03 ± ·12	–·09 ± ·12	·08 ± ·12	·09 ± ·12
VII	·22 ± ·11	·11 ± ·12	(s) ·33 ± ·10	(s) –·42 ± ·10	·17 ± ·11	–·08 ± ·12
VIII	·22 ± ·11	–·14 ± ·12	–·04 ± ·12	–·07 ± ·12	·22 ± ·11	(s) ·31 ± ·11

The relations between the test results and the Seashore tests.

The correlation coefficients showing these relations are given on page 58 . The Seashore tests are represented by S with the appropriate suffix.

S_1 means the test for Sense of Pitch.
S_2 " " " " Sense of Intensity.
S_3 " " " " Sense of Time.
S_4 " " " " Sense of Consonance.
S_5 " " " " Tonal Memory.
S_6 " " " " Sense of Rhythm.

Since Groups A and C are small compared with group B, the latter is more likely to be a representative sample and the results for it more likely to be accurate. Adopting this point of view, it can be said that Test IV (Discrimination of Form) has significant correlations with Sense of Pitch, Sense of Intensity, Sense of Consonance and Tonal Memory. It is surprising that no relation has been proved to exist between Test IV and Sense of Time and Sense of Rhythm, yet it is possible to explain this. A composition containing relatively high or low notes is not likely to be a song or hymn, e.g., Item 2, 3, 4, in Test IV. Again a composition with a very strong accented structure is unlikely to be a song or hymn, e.g., 1, 2, 3, 4, 5, 8. A diatonic or relatively smooth composition is probably a song or hymn, e.g., 6, 7, 9. The test for Tonal Memory is testing, to some extent, the ability of the subjects to perceive melodic patterns. This is related to the perception of phrases and hence to 'form appreciation'. As far as the tests which have been used are concerned, the results are quite consistent although admittedly somewhat unexpected.

Test V has significant correlations with Sense of Intensity and Sense of Rhythm, i.e., the ability to name the emotional tone of a composition depends definitely on its general level of intensity, accent and rhythmic structure. This is what could be expected, e.g., Item 1 is 'joyful', but at a slower tempo and on a softer scale of intensity could be called 'cheerful', and even 'peaceful'.

There is no significant relation to the 'Sense of Time'. This may be due to the fact that Seashore's test is using acoustical elements, or, at most, material of very humble pattern, whereas the rhythm test is using material possessing more complexity of structure, in fact more resembling that used in actual compositions. This suggests that the views of the Gestalt psychologists are more important than those of the 'elementarists' (e.g., Wundt, Helmholtz and even Seashore).

Test VI (Names of Pieces) is significantly related to 'Tonal Memory'. The latter test may be performed by using auditory imagery, verbal imagery, or kinaesthetic imagery, any or all of these, whereas Test VI probably depends mainly on verbal imagery. This suggests that the Seashore test depends largely on the verbal process of counting, yet the relation of tonal memory to Test I and Test IV show that auditory imagery is involved.

Test I (Recognition of Pieces) is significantly related to Sense of Pitch, Sense of Time, Sense of Consonance, Tonal Memory, and Sense of Rhythm. All this is what might be expected. The Sense of Consonance is involved probably because experiences of tonality and chord progression are remembered as well as the melody, again an index pointing to Gestalt theory.

It can be said generally that the relations between the eight music tests and the Seashore tests are fairly small. The two significant negative correlations for Group C appear to be meaningless.

It may be noted that the probable errors of the correlations in the three preceding tables are higher than those previously obtained for values of r of the same order. This is due to certain members of the groups being absent on account of illness. This being a random influence, should not appreciably affect the results.

The correlation of the pooled result of the group test in music with the pooled results of the Seashore tests is, for the whole group, $r = \cdot 24$, a significant value showing that the two sets of tests are measuring some things common to both, a result contributing to the validity of the music test already discussed. The value of r is not large, but this is not necessarily an objection to the music test, because the Seashore tests can be objected to on several grounds and because the Seashore tests are measuring less complex and less 'musical' functions than the music test.

<u>The results for the group test when subjects having the same mental age are aggregated.</u>

In the following pages the results are computed for groups of mental age 11-12, 12-13, etc., in distinction to the previous classification for chronological ages 11-12, 12-13, etc. The latter method might be expected to produce groups with an increasing experience of music, while the former would produce groups with increasing intellectual capacity. Further, a given mental age is the same as the average chronological age of a large sample; that is, 1000 unselected individuals of chronological age 11 have an average score performance which is nearer to that denoted by mental age 11 than the average score performance of 100 unselected individuals. If the results are arranged on the basis of mental age, it may be hoped that we obtain some of the benefit to be obtained from larger groups arranged chronologically, provided the 'mental age' groups are adequately large.

A comparison of the results for the two modes of classification may suggest the consequences due either to intellectual capacity or to musical experience. The mean scores and graphs are in the Appendix, page 362.

GRAPHS.

1. The mean score was plotted against the corresponding mental age of the group and the graphs on page 363 of appendix show the results. It can be assumed roughly that learning is proportional to mental age for the subjects used. Where large deviations occur, these are likely to be due to exceptional environmental circumstances like additional out-of-school experience, or due to the ability being largely independent of intellectual factors (e.g., certain aspects of handwork or art).

The graphs which are fairly uniform and approximate to the law of proportionality are those of Tests I, II, V and VI, while III, IV, VII and VIII are variable. These results agree with the values of r for scores and mental age (page 37).

Test VII is no doubt variable because the subjects appear to know very little about names of composers. Ability will depend mainly on random observation of some kind. From page 32 it can be seen that the mean score of a group increases as the chronological age of the group increases, which verifies this conclusion.

Test III is another difficult test. Success in it depends little on mental age.

In Tests IV, VII, VIII the variations from mental age 10 to 13 may be due to the influence of the qualifying examination, when the three R's loom large in the eyes of teacher and pupil, with the result that musical education tends to be superficial, directed to the informative and reproductive rather than to the aesthetic and interpretative.

Tests II, IV and VIII yield graphs whose true orientation may be more or less horizontal; and, since these depend on the formation of judgments important in music, some evidence is provided for the view that musical appreciation (in the musical sense) is largely independent of mental age.

2. The score distributions were plotted for the groups of mental age 11-12, 12 - 13, 13-14 years, and the graphs in

the appendix (page 367) show the result.

These conform to the usual normal frequency type and resemble those already obtained when chronological ages were considered. For age 13-14 the mental age graphs are a little more symmetrical than those based on chronological age.

INTERCORRELATIONS.

These were worked out for the group of mental age 12-13 years (38 subjects). The values are of much the same order as those obtained before. (See appendix, page 383).

The significant values are r_{13} and r_{25} , showing a definite overlap of the functions used in 'Recognition of Pieces' and 'Melody Preference', and also between 'Association with Name' and 'Emotional-tone Discrimination'. The first overlap may be due to the influence of the experience of the subjects in developing concepts of attractiveness in relation to the melodies with which they are familiar and the musical taste so formed subserves the task of judging a pair of given melodies so as to form a preference. This relation may be significant for teaching method. To inculcate melodic taste or to develop the power of apprehending melodic shape, one need not theorise about aesthetic capacity, general musical ability or other obscure entities, but, adopting a realist attitude fortified by this experimental result, teach melodies intensively and extensively (especially the attractive classical melodies), securing memorisation in varied ways. The second relation is no doubt due to verbal, imaginal, or emotional processes which determine an attitude of expectation as to how the music should sound. If the attitude of expectation is concordant with the test item, a successful performance of the test item will generally ensue. If not, the resultant doubt will generally lead to failure.

The intercorrelations are evidently small, as was found already when considering the results based on chronological age. Similar conclusions can therefore be drawn. The average of the above correlations is ·08 while the average for Group B, page 39 , is ·03. This provides a hint that there is a slight increase in the degree of relationship between musical functions when the individuals of a group have approximately the same amount of intellectual development.

RESULTS FOR SECONDARY PUPILS.

1st. test. TABLE I 58 subjects.

	I	II	III	IV	V	VI	VII	VIII	POOL
MEAN	12·83	7·50	5·21	5·34	7·32	33·83	16·20	5·62	27·61
σ	3·21	2·09	2·75	1·35	1·16	8·23	8·41	2·32	3·67

2nd. test TABLE II

	I	II	III	IV	V	VI	VII	VIII	POOL
MEAN	11·52	7·71	5·17	5·18	7·58	34·97	14·65	6·47	28·01
σ	4·03	1·90	2·48	1·34	·97	9·69	7·95	2·12	3·22

TABLE III

RELIABILITY COEFFICIENTS. (RE-TEST)

	I	II	III	IV	V	VI	VII	VIII	POOL
r	(5) ·70 ± ·04	(6) ·55 ± ·06	(6) ·36 ± ·08	(5) ·56 ± ·06	(5) ·44 ± ·07	(5) ·34 ± ·08	(6) ·73 ± ·06	(5) ·46 ± ·07	(5) ·62 ± ·05

TABLE IV

RELIABILITY COEFFICIENTS (HALF-TEST METHOD)

	I	II	III	IV	V	VI	VII	VIII	POOL
r	(6) ·71 ± ·03	(5) ·33 ± ·09	(5) ·46 ± ·06	·11 ± ·14	(5) ·40 ± ·08	(6) ·55 ± ·06	·23 ± ·11	–	–

(TEST VIII is so constructed that the half-test method is not very suitable.)

TABLE V

THE CORRELATION OF EACH TEST WITH THE POOLED RESULT, USING THE DATA OF THE FIRST TEST

	I	II	III	IV	V	VI	VII	VIII
r	·23±·08	(s) ·44±·07	(s) ·33±·08	(s) ·37±·08	(s) ·47±·07	(s) ·49±·07	(s) ·59±·06	(s) ·37±·08

TABLE VI

INTERCORRELATIONS, USING FIRST TEST

	I	II	III	IV	V	VI	VII	VIII
I	–	–·08±·09	·02±·09	–·07±·09	·00±·09	·15±·09	·05±·09	–·08±·09
II		–	(s) ·35±·08	·16±·09	·03±·09	·08±·09	·04±·09	·06±·09
III			–	·09±·09	·02±·09	·07±·09	·23±·08	·19±·09
IV				–	·10±·09	–·16±·09	–·09±·09	·21±·08
V					–	·14±·09	(s) ·34±·08	–·06±·09
VI						–	(s) ·54±·06	–·13±·09
VII							–	·04±·09
VIII								–

SOME EXPERIMENTS DESIGNED TO CHECK THE PRECEDING RESULTS. (SECONDARY PUPILS.)

The group test was applied to a group of secondary school children at the middle of the third year of the course. The teacher's estimate of general musical appreciation for each pupil was obtained together with marks for a practical examination which had been given the day before.

A week later the group test was applied again, the teacher's estimate was invited, and the same practical examination given at a week's interval from the preceding one. This procedure gave two sets of data separated by a week's interval, and the components of each set were almost contemporaneous.

The tables shown on page 64 summarise the results.

Information supplied by teacher.

The correlation between the teacher's first estimate and the pooled result of first test

$r = \cdot 25 \pm \cdot 08$ (Mean of estimate = 68·19, $\sigma = 16\cdot 3$)

The correlation between the teacher's second estimate and the pooled result of first test

$r = \cdot 39 \pm \cdot 07$ (Mean of estimate = 65·52, $\sigma = 13\cdot 9$)

Reliability coefficient of the estimates of the teacher.

$r = \cdot 32 \pm \cdot 08$

The correlation between the pooled result of the first test and the mean of the estimates made by the teacher.

$r = \cdot 44 \pm \cdot 07$

The reliability coefficient of the practical examinations of the teacher

$r = \cdot 32 \pm \cdot 08$

The correlation between the second practical examination and the teacher's first estimate.

$r = \cdot 43 \pm \cdot 07$

The practical examination set by the teacher consisted of the following types of question:-

1. Pitch (a) Writing in sol-fa from memory a phrase played on the piano.

   (b) Writing a longer phrase in sol-fa to dictation, i.e., writing each note as it was played.

2. Rhythm. Writing staff symbols for a rhythm tapped and played.

3. Writing a tune of four bars in staff with key, time signatures and bar lines - first sol-fa, then rhythm, then combining to produce the final result.

4. Recognising composer and work. - examples taken from term's work, i.e., gramophone records, piano excerpts.

5. Writing a tune in sol-fa from memory. These tunes included psalm tunes, folk songs, and airs from the composers being studied, e.g. 'cello theme from 1st movement of Unfinished Symphony.

Discussion of the results.

Tables I and II exhibit no significant difference in the results. It was noticed that in test I, several of those who had done well in the first presentation of the test had reduced scores in the second presentation. The latter test was given without any comment about its having been done before, but these subjects responded positively to the 'dummy' items. This reduced the score, but the phenomenon is obviously an inherent difficulty in the way of re-testing, and suggests that the reliability is under-estimated. Perhaps this is the reason for the standard deviation appearing to increase.

The distribution of scores showed that Tests I, II, and VIII were presenting little difficulty at this stage. The graphs (Appendix, page 384) show that the distributions conform satisfactorily to the normal frequency type, indicating that the test is generally suited to the abilities of the subjects (Test II is least satisfactory. It is evidently rather easy for the subjects used.)

Table V gives the following list, where the values of r between the pooled result and component tests are in descending order:-

VII.	NAMES OF COMPOSERS.	$r = \cdot 59 \pm \cdot 06$
VI	NAMES OF PIECES.	$r = \cdot 49 \pm \cdot 07$
V	EMOTIONAL TONE DISCRIMINATION.	$r = \cdot 49 \pm \cdot 07$
II	ASSOCIATION WITH NAME.	$r = \cdot 44 \pm \cdot 07$
VIII	APPROPRIATENESS OF PERFORMANCE.	$r = \cdot 37 \pm \cdot 08$
IV	FORM DISCRIMINATION.	$r = \cdot 37 \pm \cdot 08$
III	MELODIC PREFERENCE.	$r = \cdot 33 \pm \cdot 08$
I	RECOGNITION OF PIECES.	$r = \cdot 23 \pm \cdot 08$

None of these values of r differs significantly from the one adjacent to it, so the order of value is only approximate. If we assume that the pooled result is a measure of 'all-round' appreciation, then VII, VI, or V is the best single measure of it. The results roughly agree with those on page 36 for elementary school children, except that test VII has become important. This is no doubt due to the systematic instruction of the secondary school.

Table VI shows that r_{23}, r_{57}, r_{67} are significant.

$$r_{23} = \cdot 35 \pm \cdot 08$$

$$r_{57} = \cdot 34 \pm \cdot 08$$

$$r_{67} = \cdot 54 \pm \cdot 06$$

None of these values of r differs significantly from another. The overlap in tests VI and VII is no doubt due to the resemblance between the two tests, and is due, in part at least, to the operation of verbal processes.

Test III can be regarded as the most aesthetic test musically, and its overlap with II suggests that these are suitable musical tests. The low correlations in Table VI resemble generally those on page 39 where low values were also obtained.

Let us consider now the results for the teacher's estimates. It will be seen that the practical examination of the teacher contained tests for which the pupils could prepare; namely tests IV and V, and to a lesser extent the remaining tests. The reliability of this examination was small ($r = \cdot 32 \pm \cdot 08$), although significant. The teacher maintained that it was exceedingly difficult to give a percentage mark of general musical appreciation and interest, and that his estimate was considered by him to be of little value, yet the reliability of the estimate appears to be of the same order as that of the practical examination ($r = \cdot 32 \pm \cdot 08$), in which he had a good deal of confidence. In framing his estimate he was invited to use any knowledge of the pupils which he possessed. Now this teacher was particularly conscientious, was enthusiastic about teaching music, and had opportunities in after-school activities to discriminate the interests of the pupils, so it would be unfair to regard the low reliability as due to scamped estimation.

Taking the pooled results of the first group test as measures of musical appreciation, the correlation between them and the teacher's estimate is low ($r = \cdot 25 \pm \cdot 08$). Now, on the occasion of making his second estimate, the teacher said that he thought that he had been more systematic and thorough in allocating the marks, and that the second estimate appeared to him to be more accurate (statistically the coefficient of variation was a little less).

The correlation was now $\cdot 39 \pm \cdot 07$. This is not significantly greater than the first value, but in the light of the teacher's remarks I am inclined to accept it as a genuine increase.

When the average of the teacher's estimates was taken as a value more likely to be correct, the correlation with the pooled result became $\cdot 44 \pm \cdot 07$, which is of the same order as that found between the Seashore tests and teachers' estimates ($r = \cdot 4$).

The reliability of the pooled result of the group test is $\cdot 62 \pm \cdot 05$; hence it can be said that this test is more reliable than other tests in music, (except two of the Seashore tests) PAGE 48, in spite of the fact that the latter is testing simple functions.) Moreover, the music teachers who have heard the test express their interest in and approval of the test, and agree that it is a good test, in their opinion, of the higher functions used in musical appreciation, especially Test III. All these considerations serve to justify the test, in spite of the weaknesses which have been mentioned in previous pages.

The prognostic value of the test can be evaluated by considering the relation between the best performances in the group test and the best individuals according to the teacher's estimate. It can be assumed that the teacher's estimate is fairly accurate for the high estimates and that the unreliability is caused by the difficulty of assessing the middle or lower middle grades. For vocational work the higher grades are usually more important.

Scores for high grade subjects.

GROUP TEST SCORE (POOL)	RANK	TEACHER'S MEAN ESTIMATE	RANK	REMARKS
39	1	90	2	CHOIR SINGER
36	2	93	1	PIANO. 2 YEARS
34	3	88	4	PIANO 3 YEARS + CHOIR (PARENTS INTERESTED)
33	4	70	14	PIANO 4 YEARS
32	5½	75	9	FATHER PLAYS PIANO (MOTHER GOOD CHOIR SINGER)
32	5½	85	5	PIANO. 4 YEARS. + CHOIR
31	7½	60	<14	CHOIR (MOTHER SINGER)
31	7½	70	12	–
30	11½	65	<14	One sister sings. One sister plays
30	11½	90	3	PIANO 1½ YEARS. + CHOIR.
30	11½	65	<14	PUPIL IN CHOIR. PARENTS SING.
30	11½	50	"	–
30	11½	67	"	–
30	11½	83	7	PIANO. 1½ YEARS.

9 out of the first 14 subjects on the list of the teacher's estimate are in the upper quartile as decided by the group test, and it is probable that the teacher's estimate is measuring functions which are not the same as those measured by the group test. Further, membership of a choir may suggest to a teacher a degree of appreciation of music which does not occur in fact(although this does not affect many of the higher estimates made by the teacher). Piano experience is clearly important in assisting performance. It slightly helps tests VI and VII but has no decisive effect on the other tests. As these young pianists are particularly enthusiastic about learning the instrument, I am inclined to regard the piano playing as an effect of musical appreciation rather than as a prime cause of it.

Tentative norms are shown below in the table of percentile scores.

SCORES

PERCENTILE	I	II	III	IV	V	VI	VII	VIII
90	16	10	9	7½	9	46	27	8½
80	16	10	7	6½	8	39½	22½	7½
70	15	8	7	6	8	37	21	7
60	14	8	7	5½	7½	35	18½	7
50	13	8	5	5½	7½	34	15½	6
40	13	8	5	5	7	32	13	5½
30	12	7	5	4½	7	31	12	4½
20	10½	6	3	4½	6½	28½	8½	3½
10	9	4	1	3½	6	23	7	2½

The above table is suitable for children in the first three years of the secondary course at school. For others (elementary children about the 10-13 years level) the table below, derived from the preceding test, is suitable (page **35**).

SCORES

PERCENTILE	I	II	III	IV	V	VI	VII	VIII
90	14	8	7	6½	8½	38½	9	5½
80	12	8	5	5½	8	33	6½	4
70	11	8	4	5½	7½	30	4½	3½
60	10	6	3	5	7	28	3	3½
50	10	6	3	4½	7	25½	2	2½
40	9	6	2	4½	6½	22	1	2
30	8	5	1	4	6½	20	-½	1
20	7	4	0	3½	6	16	-2½	½
10	6	4	-1	3	5½	12	-4½	-½

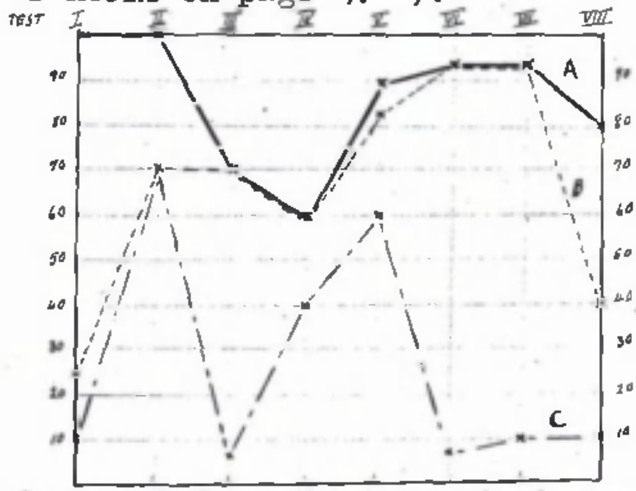
The overlap of percentiles in certain tests shows the need of using longer tests in order to obtain finer discrimination. This has already been noted on page ***50*** , in discussing reliability.

The table in the Appendix, page ***392*** , is based on average scores for the secondary pupils. The average is that of the test and its repetition. (This average is statistically sound since the tests and the repetitions have similar standard deviations.) The resemblance of the means on page ***64*** suggest that practice effects may be slight, yet the test re-test reliability is rather low, which may be due to changes in response in the repeated test which are caused by experiences in the first test. (For example in the case of '*dummy*' items.)

The use of average scores from test re-test results is probably more sound than the use of a single score.

Some individual cases.

Examples of the use of the norms is shown in the diagram below for subjects A, B and C (Secondary Pupils; table of norms on page 71).



A had rank 1 on the group test score (p. 70), with separate scores of 18, 10, 7, $5\frac{1}{2}$, 9, $51\frac{1}{2}$, 36, $7\frac{1}{2}$. The corresponding percentile values are 100, 100, 70, 60, 90, 90+, 90+, 80.

B had rank 3 with percentile scores of 20+, 70, 70, 60, 80+, 90+, 90+, 40.

C with rank 57 (out of 58) had percentile scores of 10, 70, 10-, 40, 60, 10-, 10, 10.

Subject A is enthusiastic about music, sings in a choir with zest, and generally appears to be anxious to learn. Subject B sings in a choir, with less appearance of enthusiasm than does A, and has been studying the piano for four years. Subject C is a brilliant girl, interested especially in languages, but who says that music does not interest her.

Subjects A and B are about equal for test II and IV. The superiority of A over B in I, II, V and VIII is partly due to greater experience in choir work (showing itself in test I) but more probably to difference in musical interest and attention. The equality shown in tests VI and VII is due, I think, to the piano experience of B giving some advantage in becoming acquainted with names. A's comparative weakness in IV is due perhaps to lack of piano experience. C is very weak in all tests except II and V, the tests where verbal imaginal processes are helpful in success. This result may be due to her interest and success in language activities.

Profiles such as those on the preceding page are helpful for grasping the general level of a subject's abilities, and for diagnosing and treating particular weaknesses. If results from the Seashore tests and written tests of the Kwalwasser type are added to extend the profile, one has a serviceable record, which, taken in conjunction with intelligence measures, teacher's estimates and notes about family circumstances, is a useful foundation for considering individual differences and for prognostic purposes.

An abnormal case will now be mentioned. The subject was a mentally defective boy of 12 years of age, so deficient that no measure of his intelligence could be made. He could count from one to ten in a halting manner and the numbers above four were obviously difficult for him to repeat. He was quite unable to count backwards from ten even when the series 10, 9, 8 was suggested. He could not distinguish right from left, name the day of the week, tell the month or the year. The boy was almost entirely uneducable, yet had "one talent". He had an astounding facility for playing a mouth-organ and spent most of his time doing so. It is true that the mouth-organ is a humble musical instrument but the ability of this boy in playing it represented a triumph of patience and enthusiasm when one considered his handicap. He could play in an effective way for hours without appearing to repeat any melody, yet his performance was not a primitive random improvisation but consisted of music hall melodies, folk songs and others which I could not clearly recognise although they were structurally coherent. An attempt was made to test him with the Seashore tests but the speed of running the records was much too fast for his slow reactions. Such attempts as he could make before the records out-paced him suggested that the tasks were impossible. The same conclusion was drawn from slowly performed piano tests made by the writer as paraphrases of the Seashore tests. The music tests devised by the writer were then applied, but none was effective save Test I, Recognition of Melodies. In this test, he had 12 items correct out of 18, yielding a corrected score of 6, or a percentile result of 10 if he is compared with others of his own age, a procedure which is hardly fair to him. Hence about 90% of children of his own age exceed him in recognition, but this is really a very creditable performance for one of his mentality. The profile of this subject is consequently reduced to the measure of a single function, but his scoring in the recognition test, and it only, is quite consistent with his playing of the mouth-organ. It was reported by the boy, and verified by the headmaster, that he heard tunes in 'shops' (i.e. *cafés run* by Italians and shops selling wireless sets and gramophones.) This was one source of new tunes for playing. The boy also maintained that his father showed him how to place the mouth-organ in his mouth in playing, but this explanation was doubtful, for the headmaster stated that the father had no interest in the boy or the home and that he could not be much at home because of his drinking habits and recurring prison detentions. It is more likely that the boy imitated the movements of his father and others in playing the mouth-organ and from the kinaesthetic habits set up in this way his ability in performance and the recognition of tunes was developed. It is interesting to notice that his six errors in the recognition test were all in 'dummy items'. He was correct in all the tests to which an affirmative answer was expected. He appeared to have a poor memory for music heard recently, say after a quarter of an hour, but his 'long-distance' memory appeared quite good. Another interesting point was that if one whistled a few notes of a familiar tune he could play the whole tune on the mouth organ, but he was not so quick at doing this if one played the notes on the piano. Again, if one whistled a melody unfamiliar to him he could imitate a little of it on his mouth organ. I think it likely that muscular tensions and kinaesthetic imagery account for many of the phenomena shown by this subject yet there appears to be no doubt that he had also a genuine interest in music, apart from, *for example, the want to do something* and receive attention.

Function fluctuation.

We may now consider if function fluctuation accounts for the rather low reliability of the tests. When the test scores are split into equivalent halves, A may represent the test formed by the "odd" items and B the test formed by the "even" items. A_1 and B_1 therefore, give measures obtained at the first application of the tests; A_2 and B_2 give measures at the second application. The proof of the existence of fluctuation of the mental function measured by tests A and B is that $r_{(A_1-A_2)(B_1-B_2)}$ differs significantly from zero[67,68].

The values of r which were found are shown below (secondary school subjects.)

TEST	I	II	III	IV	V	VI	VII
r	.30 [illegible]	.07	.20	-.14	.08	.38 (S)	.13

The values of the coefficients for Test I (Recognition of Pieces) and Test VI (Names of Pieces) are significant. The quantity $\dfrac{2r_{(A_1-A_2)(B_1-B_2)}}{r_{A_1B_1} + r_{A_2B_2}}$ is an index of the amount of fluctuation. Assuming that $r_{A_1B_1} = r_{A_2B_2}$, we obtain as estimates of this quantity ·4 for Test I and ·7 for Test VI. Hence function fluctuation occurs in Test I and Test VI, and the latter shows more fluctuation. These results appear strange; the writer anticipated that tests which were probably involving emotional factors (e.g. sentiments, preferences) such as II(Association with Name), III(Melodic Preference), V (Emotional Tone Discrimination) would be more likely to manifest function fluctuation than a memory test like Test I or Test VI. No function fluctuation has been found for Tests II, III, IV, V, and VII. This is encouraging for the development of tests for musical abilities to examine individual differences since it suggests that there is nothing of the 'occult' about these abilities! That is, they do not appear to be inherently variable. There is a reason for the fluctuation in Tests I and VI, namely the use of 'dummy' items. To put the difficulty in an extreme form - suppose in Test I the subject answers the question in the re-test 'Have you heard this tune before' by giving the response 'Yes' to every item. From one point of view he has scored full marks (having heard all the items on the first occasion of the test) but from the scoring instructions his score is zero. Strictly speaking Test I is not in a form suited for repetition. The agreement of the means for the test and the re-test suggests that little harm may accrue from re-testing, yet this in itself is not sufficient justification. Another aspect of the use of 'dummy' items is that the task of recognising a familiar tune is not the same as the task of determining that a 'dummy' tune is not known. (This resembles the philosophical distinction "A thing is either 'A' or 'not A'". 'A' items tend to form closed categories whereas 'notA' items do not. Hence the element of doubt or uncertainty in the determination of the latter.) This objection is probably another source of the fluctuation in Test I and the explanation of the fluctuation in Test VI. (The fact that fluctuation does not for the same reason occur in Test VII, (Names of Composers), may be due to the fact that not many names of composers are known and hence there is a sharper division between the known names and the 'dummy' names). This point was examined by considering the results for Tests VI and VII for the secondary pupils, ignoring the responses to the dummy items, and scoring only the musical items. The test re-test reliability coefficients were:-

Test VI, r = ·69
Test VII, r = ·76

Comparing these with the corresponding coefficients in Table 3, page 64 , it is seen that the coefficients are Test VI, r = ·54, and Test VII, r = ·73, so that the use of dummies reduces the reliability in Test VI but appears to make no difference to the reliability of Test VII, a conclusion verifying the above explanations.

The intercorrelation of the first application of Tests VI and VII was given by r = ·54 ± ·06. When the dummy items are ignored the value becomes r = ·45. That is, it is likely that Tests VI and VII become more independent tests when the dummies are omitted, or, in other words, part of the overlap of the functions concerned is connected with the task of discriminating 'dummy' items from 'musical' items. In practice the recognition of names has a dual aspect. One can, for example recognise a name as being that of a composer or recognise a name as not being that of a composer. Tests VI and VII in their present form cover both aspects - a quite acceptable form, but it seems that, on the whole, advantages occur if the dummy items, although presented in the tests, are not scored. Probably this is also true for Test I. The tentative norms for this mode of scoring are shown below.

	SCORES	
Percentile value	Test VI	Test VII
90	29	21
80	29	18
70	28	17
60	27	16
50	26	15
40	24	14
30	23	13
20	22	13
10	21	10

<u>The correlation of each test with the pooled result.</u>

The values of the correlation coefficients between each test and the pooled results of the tests (with the standard deviations made equal to unity) were given on page 65, (Table V). The order of diminishing correlation value is given by the series Test VII (Names of Composers), VI (Names of Pieces) and V (Emotional Tone Discrimination), II (Association with Name), VIII (Appropriateness of Performance) and IV (Form Discrimination) III (Melodic Preference), I(Recognition of Pieces).

It is more accurate, however, to correlate each test, not with the pool of all the eight tests (which would include the test under consideration) but with the remaining seven tests. This can be done by means of a formula for which I am indebted to Dr. R. H. Thouless.

If a test A has been correlated with a total T (made up of A + B + C + ...) then the correlation of A with T - A (i.e. with B + C + ...) is given by the formula

$$r = (r_{AT} \cdot \sigma_T - \sigma_A) / \sqrt{(\sigma_T^2 + \sigma_A^2 - 2 r_{AT} \cdot \sigma_A \cdot \sigma_T)}$$

This yielded the following values of r:-

Test	I	II	III	IV	V	VI	VII	VIII
r	-·04	·18	·06	·10	·22	·24	·37	·10

The only significant correlation is that for Test VII, so that a knowledge of names of composers appears to be a measure of musical abilities at the age level of the secondary pupils. The low values of the correlations indicate that the functions measured by the tests are largely independent, which is a good thing if a battery of tests is required. This is in agreement with the generally low values of the intercorrelation coefficients and suggests that the profile method of recording the results is sound. The order of diminishing correlation values determined by the table is the same as in the above list. The low value for Test I is doubtless due to the fact that it is a memory test combined with the fact that the tunes used are sufficiently common for most people, musical or unmusical, to have had the opportunity of becoming familiar with them at the age level of the secondary pupils.

The inter-correlations. Are they due to chance factors?

The inter-correlations, it has been seen, are generally small, both for the secondary pupils and for the elementary pupils. In fact, a good many are not significant. This raises the question 'Is it possible that the tests are not measuring anything in particular? That is, can the inter-correlations be the result merely of the operation of chanse factors?'

This was examined by considering the distribution of the inter-correlation coefficients about the zero value and determining if this distribution differed significantly, by the χ^2 method, from a chance distribution of the normal frequency type. It was found that the distribution of coefficients was significantly different from this chance distribution, both for the results for the secondary pupils and for the elementary pupils.

The effect of age on test scores.

The following table (incorporating additional results) shows the mean scores for groups of different age levels. In the case of secondary pupils, results for advanced division pupils of the same age have been incorporated so that more representative samples are being considered than would otherwise be the case.

		MEAN SCORES							
GROUP	NO. OF CASES	I	II	III	IV	V	VI	VII	VIII
ELEMENTARY About 11+	122	9·3	6·8	2·8	5·1	6·6	25·4	1·6	2·4
1st year. About 12+	197	10·2	6·9	2·9	5·0	6·5	27·5	3·8	2·8
2nd year. About 13+	93	12·1	7·4	2·1	4·6	6·8	29·3	6·5	2·5
3rd year. About 14+	71	13·1	7·6	3·6	5·4	7·1	34·5	15·5	5·5

The second year group has a larger fraction of advanced division pupils than the other groups, which probably explains some reductions in the mean scores, but it can be seen that the tests generally show an increase in mean score as age increases.

Additional results for TestsVI and VII.

It has been already indicated that TestsVI and VII appear to be good single tests of musical ability if an estimate is sought in a short time, so additional norms are given in the Appendix (page **393**). These are based on the scores obtained from secondary and advanced division pupils.

The numbers of the individuals in the groups were :-
1st year - 194; 2nd year - 150; 3rd year - 128;
4th and 5th year - 34.

A re-test reliability coefficient for a first year class of 34 pupils, the interval between the tests being one week, was worked out for Test VI and Test VII. The values of the coefficients were - Test VI, r = ·71; Test VII, r = ·85. These are high coefficients. The means for Test VI were $M_1 = 26{\cdot}94$, $M_2 = 28{\cdot}91$, while those for Test VII were $M_1 = 11{\cdot}38$, $M_2 = 12{\cdot}54$. Practice effects appear therefore to be small.

Factorial analysis.

A factorial analysis was made of the inter-correlations on pages 65, 39, 40. A general factor with a small factor loading was found which was evidently 'g', and a second factor entering into several of the tests was noted but this appeared to be of slight importance and might well be due to chance. Such a factorial analysis is of very little value because of the number of inter-correlations which are not significant. In addition, the reliability of several of the tests is low and this would cast doubt on conclusions based on factorial analysis. R.M. Drake[54], using the tetrad difference technique, has analysed the inter-correlations of certain musical tests. (Most of these were Seashore tests. The more 'musical' tests of the set had reliability coefficients lower than those for the Seashore tests - in fact the values resembled the smaller of those found in the tests composing the writer's test battery.) Various group factors were found, and a common factor. Drake suggests that this common factor might be characterised by memory for auditory items or perhaps by 'ear-mindedness', auditory attention or auditory concentration. The writer believes that this work would have been more valuable if more of the tests had been of the aesthetic 'appreciation' type rather than of the Seashore type, and if, further, such tests had higher reliability coefficients.

The opinion of music supervisors about the group tests.

Several supervisors of school music teaching have acted as subjects and also observed school children performing the test. All of these expressed great interest in the test and maintained that it was, in their view, measuring functions of practical importance in school music. In fact, they were ready to accept the test measures as being valuable indices of ability and useful measures of progress in assessing and studying pupils. Such opinions are useful pointers in estimating the validity of the test.

The reliability of tests in music.

Tests of musical knowledge tend to have higher reliability than tests of functions concerned with aesthetic judgments or taste. Of the former type are written tests of the Kwalwasser variety, tests of names of pieces, names of composers, etc. What is true for tests of knowledge appears to be true for tests for memory of auditory experiences. The tendency for tests of aesthetic judgment, taste, discrimination and the like (tests which can be called 'musical') to have rather low reliability is, I think, capable of explanation. (Reference has already been made to the desirability of lengthening tests and also to the time difficulties which will occur when this is done to secure a high degree of reliability, Page 49). Function fluctuation might be a cause of low reliability, but, as has been shown, this was not found in the 'musical' tests of the battery so the evidence is against this possible cause. Explanation may follow five lines (1) Lack of interest in music on the part of pupils, (2) Variation in curriculum from school to school, (3) Differences in teaching standards and methods, (4) Effects of tuition outside school (5) Home and other influences outside school.

(1) Until quite recently, music in school was regarded by teachers, and often by pupils, as a subject of little importance - a 'frill' or recreation subject. This was to be expected in an educational system saturated with idolatry of examinations and the three R's. Teachers in elementary schools had no training worthy of the name in teaching music to children. When the pressure of approaching examinations was heavy, the music period was often omitted. These factors, combined with teaching which was often dull, inefficient and aimless, were inhibitory rather than encouraging to the children, and there was in consequence a reduction of interest on the part of the children as they passed through successive stages of the school. Nowadays, the standards of teaching are improving rapidly.

(2) Variations in curriculum from school to school. In traditional and sophisticated subjects like English, Mathematics, Science, and so on, subjects with systematised curricula and methods, there is not much variation in standard from one part of the country to another. For example, a second year secondary pupil in Glasgow will have been taught much the same topics in arithmetic as one in Galashiels, but the agreement for topics in music would be likely to be much less close. (e.g. in the songs which have been studied). Certainly a good deal more in the way of standardisation is occurring year by year in the case of music, yet it is still true that substantial variations in curriculum occur.

(3) Differences in teaching standards and methods.

Teaching methods in the traditional subjects are fairly constant from school to school. This is not true in the case of music, although certainly the rapid development occurring at present by the expositions of experienced, enlightened and enthusiastic teachers like Professor W. G. Whittaker and Arthur Irvine will do much to facilitate the establishment of efficient method.

(4) Effects of tuition outside school.

In mathematics it is very unusual to find pupils having extra tuition in the subject outside school hours, whereas it is common in music. If the latter phenomenon occurred commonly in other subjects I am inclined to believe that the reliability of the standardised tests for those subjects would be considerably reduced. Using an analogy derived from music, a class studying elementary arithmetic, instead of being fairly homogeneous in attainment, might have, if tuition outside school hours were common, a group capable of doing tasks concerned with analytical geometry, a group capable of using logarithms and the slide rule, a group using contracted methods based on approximations or decimal methods, and so on. If, as in music, a good deal of this extra learning was of short duration, testing in arithmetic would be much more difficult than it is now.

(5) Home and other influences.

Just as in (4), these can influence considerably the standards of a class leading to a greater 'spread' of ability than would occur if they were not present.

In short, the development of the musical abilities of individuals shows more variability than in the case of other scholastic abilities. A person may have a superior sensory equipment capable of great development in the field of music yet, if he adopts an attitude of indifference or resentment towards school music, this development may be retarded and uneven. The other factors mentioned above are likely to operate in increasing the range of variation. Therefore, in studying the musical abilities of an individual one can expect a greater range and a greater unevenness of development than one would expect in scholastic subjects. (This also applies to a group of individuals.) Hence, in order to sample adequately the range of abilities, tests should be both extensive and intensive; that is, a considerable number of different kinds of tests should be used and each kind of test should be of considerable length, consisting of test items which proceed by slight gradations from the very easy to the difficult, with, of course, diversity of the material used for the test items. (On page 50 it was suggested that tests should be longer, a result based on deductions from the reliability coefficients.)

Summary.

A battery of tests for the testing of musical appreciation and knowledge has been devised for the study of individual reactions to music, and the results obtained from its use have been analysed. The tests are designed to measure functions concerned with music which are of a higher order of complexity than those measured by tests of the Seashore type, yet the results compare well with the results of the Seashore tests considered as measuring instruments, suggesting that these complex functions are as susceptible to measurement (or almost so) as the simpler functions measured by the Seashore tests.

The validity of the tests is rather low, as judged by the correlation with teachers' estimates, yet this may not necessarily be the fault of the tests, because the estimates of the teachers may not be accurate and, since a general estimate of the range of musical abilities possessed by an individual is a difficult task,is likely to be biassed in the direction of school performance. That is, the tests and the estimates are likely to be measures of functions which do not overlap much.

The reliability of tests using memorised auditory or memorised verbal material is greater than that of those tests of a more aesthetic or 'musical' nature; yet function fluctuation (a possible cause of low reliability) was not found in the latter tests but was found in the former. It is suggested that the special form of the tests using memorised material may be a cause of function fluctuation.

The inter-correlations of the tests are low, but the distribution of the coefficients as a whole differs significantly from a chance distribution. The general level of the coefficients suggests that the functions measured are largely independent - a desirable thing if a survey of musical abilities is desired. Although it has not been definitely proved that no general factor other than 'g' subserves the functions measured by the tests, that is, a factor which might be called "the general musical factor", the evidence is rather against the existence of such a factor.

The correlations of the test scores with intelligence are low. The profile method of examining individual differences is illustrated by certain examples. While much experimentation is needed to provide a factual background for a scientific study of individual reactions to music, the results obtained are encouraging.

PREFERENCE TESTS.

(varying conditions of tempo, etc.)

COMPOSITION OF TEST FOR PREFERENCES.

NUMBER OF TEST ITEM	NAME OF COMPOSITION	CONDITION OF PERFORMANCE	
		1st. presentation	2nd. presentation
1	'PUER NOBIS', OXFORD CAROL BOOK, NO. 92	SLOW ♩ = 96	QUICK (AS WRITTEN) ♩ = 132
2	'QUEM PASTORES', O.C.B. NO. 79.	SLOW (AS WRITTEN) ♩ = 144	QUICK 𝅗𝅥 = 96
3	SYMPHONY IN C MAJOR, NO. 36, MOZART (PAXTON) ANDANTE 12 BARS	QUICK ♩. = 96	SLOW (AS WRITTEN)
4	FESTIVAL CAROL, O.C.B. NO. 152	LOUD (AS WRITTEN)	SOFT
5	SYMPHONY IN C MAJOR, MINUET, (PAXTON) BEETHOVEN. 25 BARS	DEAD LEVEL TONE	AS WRITTEN
6	SYMPHONY IN C MINOR, ANDANTE, (PAXTON) BEETHOVEN, 22 BARS	'REVERSED' INTENSITIES (e.g. p instead of f, f instead of p)	AS WRITTEN
7	CHORALE OF 'THE KINGS', O.C.B. No. 193	'REVERSED' CRESCENDO (e.g. < instead of >)	AS WRITTEN
8	SAME AS No 7.	AS WRITTEN.	LAST PHRASE LOUD

(over)

NUMBER OF TEST ITEM	NAME OF COMPOSITION	CONDITION OF PERFORMANCE	
		1st presentation	2nd presentation
9	'HOW BRIGHTLY BEAMS' O.C.B. NO.104	EMBELLISHED VERSION	PLAIN VERSION
10	'IN DULCI JUBILO', O.C.B. NO. 86.	PLAIN VERSION	EMBELLISHED VERSION
11	'FANTAISIE', BEETHOVEN, OP. 77, ALLEGRETTO ('STUCKE' AUGENER, p. 48)	PLAIN VERSION (i.e. BARS 1-8)	EMBELLISHED (i.e. BARS 25-33)
12	THEME AND VARIATION II IN A, MOZART (SONATAS, PETERS, p. 116)	THEME	VARIATION
13	SAME AS NO. 2	AS WRITTEN, KEY F	KEY F#
14	THEME WITH VARIATIONS, SCHUMANN. (SONATA I for the YOUNG)	MAJOR VERSION	MINOR VERSION
15.	'REMINISCENCE', SCHUMANN (ALBUM FOR THE YOUNG")	AS WRITTEN	WITH LOUD ACCOMPANYING PARTS
16	NO. 26 of 'ALBUM', SCHUMANN	WITH LOUD ACCOMPANYING PARTS	AS WRITTEN

In the experiments about to be described, the object was to examine the preferences of children for music played under varying conditions of tempo, intensity level, gradation of intensity, and the like. The ability to exhibit such preferences is of great importance in listening to music, for these form the groundwork of the organised aesthetic attitudes which serve to give significance and meaning to music.

The composition and nature of the test can be seen on page 84.

All the tests were played on the piano.

The subjects were each given a strip of paper with the numbers 1 to 32 written on it. Tests 17 to 32 consisted of tests 1 to 16 with the presentations in a reversed form, e.g., Test I consists of Puer Nobis played first Slow, then Fast, while Test 17 consists of the same piece played first Fast then Slow. This procedure was designed to reduce the effects of guessing or the possible tendency to respond frequently or always to the second presentation.

The subjects consisted of 45 children of age 10 to 11 years, 32 children aged 11 to 12 years, 17 children aged 12 to 13 years, 26 children aged 13 to 14 years and 16 children aged 14 to 15 years, selected at random, making a total of 136.

The subjects were instructed to listen carefully to two tunes and then to decide which one they preferred. If the first tune was preferred the figure 1 was to be written down; if the second, 2 was to be written; if they were doubtful, D was to be written. All the subjects were familiar with testing procedures.

Results:

The number of responses for each item at each age level is shown in the table in the appendix, page 394.

From the table it is possible to answer the question - "Are the subjects really exhibiting preferences, or can the results be due to chance?"

If the latter hypothesis were true, then any one of the responses 1, D, or 2 is equally probable. If the sum S of each of the three is calculated, we find that $S_1 = 1717$, $S_D = 808$, $S_2 = 1827$, (the summations being carried out for the total group of subjects) with a total of 4352.

Applying the χ^2 test,[69] to the distribution of responses it is found that $\chi^2 = 432$, yielding $P < \cdot 01$. This shows that significant preferences are being made, but the main point is that the number of D responses is small. The question of significance is considered in more detail below.

The results of the test table with 'doubtfuls' halved and shared will be found in the appendix, page 395.

The percentage shown for each column is the difference in the number of responses, expressed as a percentage of their sum, e.g., for Test 1, Age 10, the difference is $49\frac{1}{2} - 40\frac{1}{2}$, and the percentage is $\frac{9}{90} \times 100$ or 10%.

If the subjects are regarded as forming one group, the following table shows the results:-

TEST	1	2	%
1	$112\frac{1}{2}$	$159\frac{1}{2}$	(s) 17
2	$107\frac{1}{2}$	$164\frac{1}{2}$	(s) 21
3	157	115	(s) 15
4	$136\frac{1}{2}$	$135\frac{1}{2}$	0
5	$129\frac{1}{2}$	$142\frac{1}{2}$	5
6	$125\frac{1}{2}$	$146\frac{1}{2}$	8
7	149	123	10
8	$132\frac{1}{2}$	$139\frac{1}{2}$	3
9	147	125	8
10	115	157	(s) 15
11	$129\frac{1}{2}$	$142\frac{1}{2}$	5
12	$142\frac{1}{2}$	$129\frac{1}{2}$	5
13	120	152	12
14	149	123	10
15	$120\frac{1}{2}$	$151\frac{1}{2}$	11
16	$147\frac{1}{2}$	$124\frac{1}{2}$	8

The χ^2 test for significance was applied to the distributions of the preferences shown in the last two tables. (pp 87/395) The distributions which were significantly different from chance distributions are marked with an 's'. The percentage differences are useful indices for comparing different groups.

Test 1. Age 13, 14 and whole group show definite preference for the written version. Age 10, 11, and 12 are doubtful.

Test 2. Age 10, 13 and whole group significantly prefer the Quick to the written version.

Test 3. Only the total group gave a significant result. This favoured the quick version (not the written version). Generally the quick version seems to be favoured, according to the trend of the several distributions. Summarising the results for what might be called "Appreciation of Suitable Tempo", it appears that this ability develops with age, provided simple judgments are invited, (e.g., Test 1).

In other cases (Tests 2 and 3), there appears to intrude the wish to hear 'lively' music, a wish probably favoured by the popularity of dance music, which appears to have a strong effect. In Test 3 one would expect that there could be no possible doubt about the suitable tempo of the slow version, yet only at the oldest age does the meagre result of equal preference appear. The results for the whole group are not significant.

We may now consider the tests in which functions concerned with intensity are concerned. Let us group these under the heading "Appreciation of Intensity Gradation". The tests are 4, 5, 6, 7, 8, 15 and 16.

Test 4 yields no conclusion.

Test 5. Age 10 prefers the written version. The total group yields no conclusion.

Test 6. There is a suggestion that each group prefers the written version but the total group shows that this is not significant.

Test 7 yields no conclusion.

Test 8. No conclusion. A significant result was obtained only for Age 12.

Test 15. No conclusion. A significant result was obtained only for Age 10.

Test 16. No conclusion.

If for tests 4, 5, 6, 7, 8, 15 and 16 we add up, for the whole group, the percentages shown in the table, we get 13% as a total for correct responses and 32% for wrong. The average percentage is $\frac{19}{7}$ or about 3% on the wrong side. It can be concluded that there is no evidence of an ability to make significant preferences for "Appreciation of Intensity Gradation", and there is a suggestion that 'unmusical' performances are preferred. This is not very surprising. Most pianists tend to play with a mezzo-forte tone, and need a conscious effort from time to time to "get out of the rut" and use dynamic contrasts effectively. So also with singers[70]. It is quite likely that, because intensity effects are seldom heard expressively, the subjects have little opportunity of developing appreciation in this direction. The popular dance music is, as a rule, guilty of using such effects crudely. A dance pianist who is enjoying great popularity just now secures attention by emphasising two-bar rhythm by means of sharply contrasted intensity shading. The preceding results point to a field calling for specific training.

We may now examine the results for what could be called 'Preference for Embellishment'. This is involved in Tests 9, 10, 11, 12. Clearly it is impossible to say if an embellished version of a given musical structure should be preferred. From an intellectual point of view it might be maintained that music showing elaboration of structure is more interesting, more evolved, and therefore should be preferred. But this position is untenable, being merely an opinion which may be rejected or accepted. Yet the procedure of the test is interesting, for it can be used, and I think ought to be used widely, to form standards for various groups of individuals with differing aesthetic capacities.

Test 9. Age 10 prefers the embellished version. The other groups and the whole group do not show significant preference.

Test 10. The total group shows a significant preference in favour of the embellished version. The other results are not significant, but there is a suggestion that the plain version is more and more preferred as age increases.

Test 11. No result is significant. The percentages point to a possibility that the embellished version is preferred.

Test 12. The distributions are not significant, but point to a tendency to prefer the Theme. Probably most people would agree with this judgment in the case of Test 12.

In tests 9, 10 and 12, support for the plain version appears to increase with age. In test 11, support for the plain version appears to be fairly constant. Again we have a set of results without marked tendencies. On the whole we may conclude that mental development during the age range 10 - 14 has not reached the stage of preferring figuration and ornamentation in music. This can also be seen from the difficulty of Test VIII, item 7, of the previous experiments (page 26) where the harmonic structure of the hymn tune was upset by omitting one melodic line without apparently being condemned by the subjects.

Test 13, is somewhat peculiar. It is sometimes maintained that certain individuals have preferences for hearing music performed in special keys, that is to say, these individuals might prefer to hear a composition in G flat rather than in C.

We find that Age 10 significantly prefers Key $F^{\#}$. The total group shows that there is no significant general preference.

No change of key is greater than that of F to $F^{\#}$, so far as hearing is concerned, and we have found no preference for one or the other. The view of 'Key Preference' is therefore doubtful, or the effect is very slight. It may be confined to a few specially talented individuals. The result for Age 10 may be due to the possibility that young children have less experience in hearing key changes, have less 'harmonic sense', so that a key change comes as a pleasurable novelty; also a sharpening effect may give an experience of brightening to the music which is preferred to the dulling of flattening.

Test 14. No result is significant, but there is a suggestion that the major version is always preferred. The explanation for this may be similar to the 'brightness' and 'dullness' of the above speculation.

All the preceding results are consistent with the view that children of the given age range have little or no organisation of the functions used in developed musical appreciation. (The comments on the effect of age have little weight). Their powers are rather crude; speed and loudness are generally the important desiderata.

The results for the whole group are listed below. The statements about preference are of course subject to the qualifications introduced by the question of significance.

1. Puer Nobis. Quick version preferred. (17%)
2. Quem pastores. Quick version preferred. (21%)
3. Mozart Symphony, Andante. Quick version. (15%)
4. Festival Carol. No preference for loud or soft. (0%)
5. Beethoven Symphony, Minuet. Preferred as written, instead of dead level tone. (5%)
6. Beethoven Symphony, Andante. Preferred as written, instead of intensity effects reversed. (8%)
7. "The Kings" Chorale. Reversed crescendo preferred. (10%)
8. " " " 'Last phrase loud' preferred. (3%)
9. 'How brightly beams'. Embellished version preferred. (8%)
10. Carol 'In dulci jubilo', Embellished version preferred. (15%)
11. Beethoven 'Stucke'. Embellished version preferred. (5%)

12./

12. Mozart Theme and Variation. Theme preferred. (5%)
13. Quem pastores. Preferred in F#. (12%)
14. Schumann 'Theme with Variations'. Major key preferred. (10%)
15. Schumann 'Reminiscence'. Heavy accompanying parts preferred. (11%)
16. Schumann 'Album', No. 26. Heavy accompanying parts preferred. (5%)

Summary.

Tests using pieces played under varied conditions of tempo, intensity, intensity gradation, embellishment, key, and mode (major or minor) were applied to subjects of various ages. It was found that the subjects appeared to have, on the whole, little development of aesthetic judgments. Fast and loud qualities in the music appeared to be prepotent in influencing preference.

A TEST WITH CONTRAPUNTAL MUSIC.

This test was devised to examine if children were capable of recognising the use of a given theme in music of a contrapuntal nature. Three compositions were used.
(1) Symphony in C major, Andante cantabile (Beethoven). 19 bars.
(2) Fugue 13 of Bach's, '48 Preludes and Fugues'.
(3) Fugue 16 from the same source.
The tests were played on the piano.

In (1) the theme is used twice in prominent upper parts and twice in lower parts. One would expect the latter to be somewhat difficult to recognise, at least in comparison with the former.

In (2) the subject is used 8 times. In one of these cases the 'shake' is absent, yet its presence on the seven other occasions should aid perception. On three occasions the subject occurs in the top part.

In (3) there are 17 uses of the subject, but some of these occur in stretti and others are difficult to distinguish because of their position in the contrapuntal framework. On 10 occasions the subject should be recognised with a good deal of ease, while on 5 occasions the subject is particularly prominent.

The subjects were instructed to count the number of times that they heard a tune in a piece that would be played to them. They were told that the tune might be heard high up or low down. (This was demonstrated by playing 4 bars of (1) in three octave positions; the two higher positions in Key F and the final, and lowest, position in Key C.)

They were then told to listen to the first theme. This was played three times so that they could become familiar with it, and then they were instructed to count the number of occasions for (1).

The same procedure was used for (2) and (3). Guessing was reduced by telling the subjects to write D if they were doubtful. Scarcely anyone did so.

In playing the pieces, the theme was always made prominent. (More so than in a standard performance of the compositions).

Results:

AGE	TEST	MEAN	σ	$P.E._M$	NO. OF SUBJECTS
10	1	3·5	2·1	·21	45
	2	7·1	3·1	·31	
	3	8·9	3·9	·39	
11	1	3·4	2·4	·29	32
	2	7·0	3·3	·39	
	3	7·8	3·9	·47	
12	1	4·1	3·2	·52	17
	2	8·7	5·3	·87	
	3	10·1	6·0	·98	
13	1	3·7	4·1	·55	26
	2	7·2	3·9	·52	
	3	9·2	2·7	·36	
14	1	2·8	1·2	·20	16
	2	6·8	3·3	·56	
	3	9·7	4·9	·83	
WHOLE GROUP	1	3·6	-	-	136
	2	7·3	-	-	
	3	8·9	-	-	

The distributions of the responses will be found in the appendix, page 396.

Discussion of the results.

On page above it will be seen that none of the series of corresponding means differ significantly among themselves. There is therefore no evidence that the functions concerned increase with age.

Besides individual differences in ability, there is another cause of variance in the test scores; one peculiar to musical testing. That is the fact that if a subject 'loses the place' in listening, by some lapse of attention, he cannot compensate for this by getting another opportunity. The nature of the test makes the use of imaginal operations very difficult. This, no doubt, accounts for the wide range in the distribution of the responses, especially in test 3.

However, for practical purposes in music, this does not matter in the slightest.

It can be seen that the results group themselves about the value 3·4 for test 1, 7·3 for test 2, and 8·9 for test 3.

This tendency is sufficient to show that the tests are fulfilling their purpose. Indeed it is remarkable to note how well the subjects have done, in spite of the variations in the results, especially if we bear in mind the opinion that listening to a Bach Fugue is difficult. The results closely resemble those obtained from adults of average ability in listening to music.

In test 1, two of the four entries of the theme could be expected to be easy. The second entry is harder and the third harder still. (Harmonic considerations would account for this. The themes become absorbed in the harmonic structure, instead of being salient.)

These anticipations are consistent with the results, on page 398. The results for the responses 2, 3, and 4 cover 79% of the group. There is therefore no doubt that the test is suitable for the age range used.

In test 2, a small response (about 3) would indicate somewhat primitive powers, 7 would show good ability, while 8 would be distinctly better. 38% of the total group decided for responses of 6, 7, and 8. The responses higher than 8 may be explained by the possibility that the subjects reacted to material developed from fragments of the theme. On page 396 the response 5 appears to die out steadily as age increases.

Test 3 calls for the greatest effort in listening, because of the stretti and the occurrence of the theme in low registers. The modal response is 8 in the total group, and also for ages 12,13 and 14. A response of 10 is to be regarded as very satisfactory, so that these modal responses, together with the mean of 8·9 for the whole group are really surprisingly good.

We may now ask if this group of three tests forms a good test of musical ability. Musicians would place the ability to follow a theme treated imitatively pretty high in a scale of musical judgment. In addition, the results accord well with the anticipations already made about the responses likely to be obtained, assuming that the task was within the powers of the subjects. It was also found, by getting written replies from the pupils, that the majority of the group considered the tests to be easy. While we can discount part of the strength of this majority, the result is of interest, for the subjects were quite free to state that they found the task difficult. All these considerations suggest that the test is a good test.

It is possible to go further, however. The papers showing close approximation to the results 4, 7, and 10 or 12 were selected. There were 36 of these, and they were divided into two groups 'Musical' and 'Unmusical', in the light of the results of the group test previously described. It was found that there was a significant preponderance of 'Musical' subjects in this group of 36 cases, and as more and more successful samples were considered in this group, (i.e., successful in the contrapuntal test) the average 'group test score' increased.

This appears to justify the 'Contrapuntal' test and also the group test.

It may be wondered why performance in this contrapuntal test should be good while performance in previous tests should be poor (e.g., page 84 , Tests 2, 3, 15 and 16). One reason is probably due to the melodic interests of children being stronger than other musical interests. Racially the development of harmonic structure is quite a new thing, being roughly only six centuries old. Among primitive races, the occasional stroking of a chord on a stringed instrument, usually at the final note of a melody, satisfies their interests in the direction of harmony. Even Bach shows a peculiarity relative to this topic. When he was about the age of eighteen he wrote certain chorale preludes which were based on a chorale which is written at the beginning. The harmony of the latter is crude, but the contrapuntal treatment of the variations is very effective. Harvey Grace[71] is of the opinion that Bach's psychological development at this time was strong contrapuntally, but weak harmonically. Again, if we suppose that a melody produces in perception the organised form which has been the basis of the Gestalt theory, then the task of responding to the 'Contrapuntal' test should be easier than one would expect from 'a priori' considerations. Since the results of the test were very satisfactory, we obtain another pointer to the view that Gestalt theory may be important in music.

A peculiar point is the occurrence of responses which are greater than the number of appearances of the theme. This does not occur much in the first test, but is commoner in the two fugue tests. Almost all the subjects who gave such responses were of poor intelligence so that a failure to understand the task, or guessing after 'losing count' of the themes, may explain the matter. In some cases note counting instead of theme counting seemed likely, or perhaps little phrases which appeared to resemble the theme were counted.

The consideration of sex differences.

The tables showing the responses divided into two sets ('boys' and 'girls') are in the appendix, page 401.

From the table of results for boys it can be seen that the means for test 1 do not differ significantly from each other; so also for test 2 and test 3. There is therefore no evidence of an increase of the functions tested with age.

From the table of results for girls it can be seen that there is no evidence of any increase as age increases. In test 1 there is no significant difference between the means for boys and girls at any age level. The same result is found for tests 2 and 3.

The values of V are nearly always greater for the boys than for the girls. This general result for the values of V suggests that boys are more variable in their responses than girls are.

Summary.

Some tests using contrapuntal music were given to school children to examine their reactions. It was found that their ability to count the number of occasions on which a theme treated imitatively occurred was more highly developed than had been anticipated (especially in the light of the weaknesses which many of the subjects had displayed in responding to tests concerned with harmonic material). The results verified the view that the musical interests and abilities of children are primarily melodic, a point which has obvious applications to the school music curriculum. A consideration of the results for these tests in conjunction with those obtained by the same subjects in the group test which has already been described, suggested that the melodic ability concerned with the contrapuntal tests is an index of the general level of a subject's musical abilities.

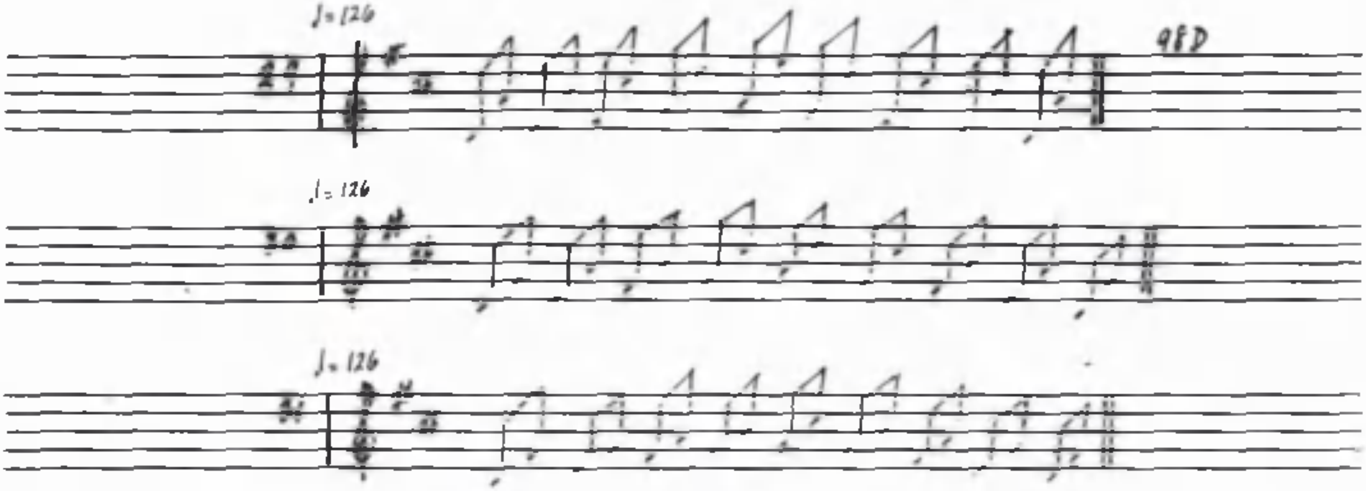
PREFERENCE TESTS.

MELODIC PROGRESSIONS AND HARMONIC FORMS.

PREFERENCE TESTS. MELODIC PROGRESSIONS AND HARMONIC FORMS.


♩= 126
11
♩= 126
12
♩= 126
13
♩= 126
14
♩= 126
15
♩= 126
16
♩= 96
17
18 is 17 with A♮.


98C
♩= 126
19.
20 is 19 with E♮
♩= 126
21
22 is 21 with E♮
♩= 126
23
♩= 126
24
♩= 63
25
♩= 126
26
♩= 126
27
♩= 126
28


♩= 126
98D
♩= 126
♩= 126

The tests are shown in the test manuscript. The group consisted of 151 subjects whose ages ranged from 10 to 14 years. The subjects were told that they were going to hear two tunes and they were to decide whether they liked the first one better or the second one better. If the first, they were to write down 1, if the second they were to write down 2, and if they were doubtful and could not decide they were to write a cross (+). Suitable strips of paper were given to the subjects.

Test I. 7 melodies were used to give paired comparisons. The arrangement is shown.

(1)	1 - 2	(22)	4 - 1
(2)	1 - 3	(23)	4 - 2
(3)	1 - 4	(24)	4 - 3
(4)	1 - 5	(25)	5 - 6
(5)	1 - 6	(26)	5 - 7
(6)	1 - 7	(27)	5 - 1
(7)	2 - 3	(28)	5 - 2
(8)	2 - 4	(29)	5 - 3
(9)	2 - 5	(30)	5 - 4
(10)	2 - 6	(31)	6 - 7
(11)	2 - 7	(32)	6 - 1
(12)	2 - 1	(33)	6 - 2
(13)	3 - 4	(34)	6 - 3
(14)	3 - 5	(35)	6 - 4
(15)	3 - 6	(36)	6 - 5
(16)	3 - 7	(37)	7 - 1
(17)	3 - 1	(38)	7 - 2
(18)	3 - 2	(39)	7 - 3
(19)	4 - 5	(40)	7 - 4
(20)	4 - 6	(41)	7 - 5
(21)	4 - 7	(42)	7 - 6

It will be seen that each melody is treated equally with every other as regards number of presentations and order of presentation. Also the key is kept the same to avoid the effect of key contrasts, and the lengths of the melodies are approximately the same.

RESULTS ('DOUBTFULS' HALVED AND SHARED)

THE TABLES SHOW THE TOTAL NUMBER OF PREFERENCES (T) AND THE AVERAGE NUMBER (A) GIVEN TO EACH ITEM.

BOYS

AGE	NUMBER OF SUBJECTS		ITEM 1	2	3	4	5	6	7
10	20	T	91½	111½	129	169	100½	81½	157
		A	4·58	5·58	6·45	8·45	5·08	4·08	7·85
11	13	T	54	81	90½	102½	76½	59	82½
		A	4·15	6·23	6·96	7·88	5·88	4·54	6·35
12	15	T	61	96½	100	124½	87½	69	91½
		A	4·06	6·43	6·67	8·30	5·83	4·60	6·10
13	27	T	88½	148½	201½	225½	158	116½	195½
		A	3·27	5·50	7·46	8·35	5·85	4·32	7·24
WHOLE GROUP	75	T	295	437½	521	621½	422½	326	526½
		A	3·93	5·83	6·95	8·29	5·63	4·35	7·02

(over)

GIRLS

AGE	NUMBER OF SUBJECTS		1	2	3	4	5	6	7
10	25	T	91	168½	153	235	132½	97½	172½
		A	3·64	6·74	6·12	9·40	5·30	3·90	6·90
11	14	T	47	89	99½	120	81½	56½	94½
		A	3·36	6·36	7·11	8·57	5·82	4·04	6·75
12	6	T	27	40	47½	44½	31½	24½	37
		A	4·50	6·67	7·92	7·42	5·25	4·08	6·17
13	31	T	98½	216	238½	238½	191	130½	189
		A	3·18	6·97	7·69	7·69	6·16	4·21	6·10
WHOLE GROUP	76	T	263½	513½	538½	638	436½	309	493
		A	3·47	6·76	7·09	8·39	5·74	4·07	6·49

WHOLE GROUP

NUMBER IN GP		1	2	3	4	5	6	7
151	T	558½	951	1059½	1259½	859	635	1019½
	A	3·70	6·30	7·02	8·34	5·69	4·21	6·75

There is a possibility that these results may be due to chance instead of being due to significant preferences. By applying the χ test to the whole group, we find that $P < \cdot 01$. The same result is found for the total boys' group and the total girls' group.

The results, then, are definitely not due to chance. The means for various ages in a given test appear to be consistent and there seems to be no tendency for the preferences to alter with increase in age.

The order of decreasing preference for the total group is test 4, 3, 7, 2, 5, 6, 1. For the girls, the order is 4, 3, 2, 7, 5, 6, 1 and for the boys, 4, 7, 3, 2, 5, 6, 1. The increase in the preference for test 7 which is exhibited by the boys may be due to the resemblance of test 7 to a 'bugle-call', i.e. to its martial qualities.

It is noteworthy that if the melodies had all been equally appealing, a distribution of 'preferences' resembling a chance distribution would have been obtained, so that if the χ test had given a 'chance' result, we could have drawn no helpful conclusion. As it is, however, we have proved that definite preferences were made by the subjects, these preferences being given by the series of tests, 4, 3, 7, 2, 5, 6, 1. This gives a norm of aesthetic appeal for these melodies for the given age-range, and it is one which is reasonable when judged a priori from the musician's standpoint. Test 1 is clearly unattractive and test 6 is a little more attractive. Test 4 could be judged as worthy of a place inferior to none. It is a little surprising that children should prefer test 4 to tests 2, 3, 5 or 7, since the latter are less suave and more 'virile'. On page 88 it appeared that children were lacking in aesthetic judgments affecting artistic performance, but it was realised that tempo and intensity effects were commonly heard with obtuseness and were imperfectly appreciated, even by individuals having musical training of some sort. Evidently melodic shape and beauty is of a lower order of complexity. That is to say, subjects are more capable of appreciating this. While children's wider experience of melodies compared with harmony, etc., may explain this, I doubt if the explanation is complete. The order of preference shown above indicates that complex structure in melody tends to be preferred, whereas the experience of children is largely confined to 'singable' melodies. Furthermore, scale singing of the type shown in tests 1 and 6 is familiar to children. Familiarity therefore appears weak as an explanation. I am inclined to think that the explanation is to be found in Gestalt theory, i.e. 'shape' is an immediate experience.

The experimental procedure described in the preceding pages is most interesting for the setting up of aesthetic standards. Much disputation about artistic merit would be prevented if standards of judgment were available, and the use of an experimental method such as this would be capable of wide extension. From the teacher's point of view a scale of preference for musical compositions is clearly of the greatest value, for it aids not merely the assessment of individual aesthetic taste, but also serves to guide his choice of music for teaching purposes. It is a great gain to a teacher to use material which will interest his pupils. If it were urged against this that such selection on the part of a pupil would be crude and 'vulgar', it is worth noting that the above order of preference does not bear out this hypothesis.

The formation of such scales of preference could also be used to indicate improvement in the taste of an individual.

<u>Test II</u>. As a continuation of Test I, 5 melodies were given for paired comparison. (Melodies 8 to 12 in manuscript.)

The arrangement was:-

(43) 8 - 9	(53) 10 - 8
(44) 8 - 10	(54) 10 - 9
(45) 8 - 11	(55) 11 - 12
(46) 8 - 12	(56) 11 - 8
(47) 9 - 10	(57) 11 - 9
(48) 9 - 11	(58) 11 - 10
(49) 9 - 12	(59) 12 - 8
(50) 9 - 8	(60) 12 - 9
(51) 10 - 11	(61) 12 - 10
(52) 10 - 12	(62) 12 - 11

<u>Results:-</u>

WHOLE GROUP

NUMBER OF SUBJECTS		8	9	10	11	12
151	T	512	660½	725½	506	616
	A	3·39	4·37	4·80	3·35	4·08

When the χ^2 test is applied to the distribution of preferences, it is found that $P < \cdot 01$, i.e. the distribution differs significantly from a chance distribution. We can conclude that the subjects are showing definite preferences within the melodic presentations, and that the order of preference is test 10, 9, 12, 8, 11.

Again we have a list satisfying an a priori estimate of the tests. In test 10 we have sequential treatment aiding the shaping of the melody, with more rhythmic variety in the second half to sustain interest. Note that scale movement is not regarded by the subjects as lacking in interest on this occasion; possibly the scale movement is regarded as an organic part of a structural whole. It may be that test 11 loses interest because of lack of harmonic support.

We have already found an order of preference for 7 melodies. If we had used the whole 12 melodies for paired comparison the time taken would have been about two-thirds longer, with increased likelihood of inducing effects of boredom and fatigue.

If we interlock the two lists after studying the means we get test 4, 10, 3, 7, 9, 2, 12, 5, 8, 11, 6, 1. The first two are 'flowing' melodies; the second two are more rhythmical. This casts doubt on the widely held opinion that children appreciate rhythm first and foremost.

Test III. An examination of harmonic preference. As a continuation of the previous test, tests 13 to 22. were given with the following arrangement.

(63) 13 - 14	(68) 14 - 13
(64) 15 - 16	(69) 16 - 15
(65) 18 - 17	(70) 17 - 18
(66) 20 - 19	(71) 19 - 20
(67) 22 - 21	(72) 21 - 22

The arrangement tends to neutralise any effect due to order of presentation, especially since a chance method was used to decide which one of a test pair should be presented first in numbers 63 to 67.

TEST	13	14	15	16	17	18	19	20	21	22
NO. OF PREFERENCES	147½	154½	154½	147½	147	155	163	139	137½	164½

When the χ^2 test is used for tests 13 and 14, 15 and 16, 17 and 18, 19 and 20, 21 and 22 to test the agreement with a chance distribution of preferences, the values of P are between ·50 and·70 for the first three pairs and between ·10 and ·20 for the last two. There is therefore no significant difference, i.e. the subjects are not showing evidence of making significant preferences.

If the results for tests 15 to 22 are pooled, we get:-

Preferences for chromatic presentations, total 595.
Preferences for diatonic presentations, total 613.

The χ^2 test gives an agreement with a chance distribution with P between ·50 and ·70. That is, there is no significant difference between the preferences for chromatic and diatonic presentations.

We conclude that no evidence has been found for a preference between major and minor tonality, a chromatic alteration of a melody note, or chromatic alterations in harmony. These results are consistent with those found on pages 88 to 91 , where it appeared that the abilities to judge tonality, tempo, intensity and the like were undeveloped. This agreement suggests lack of development rather than an approximate equality in the appeal of the test items.

<u>Test IV.</u> To test the appeal of various scale forms. Tests 23 to 27 were used to give the following arrangement.

(73) 23 - 24
(74) 23 - 25
(75) 24 - 25
(76) 23 - 26
(77) 23 - 27
(78) 26 - 27

(79) 24 - 23
(80) 25 - 23
(81) 25 - 24
(82) 26 - 23
(83) 27 - 23
(84) 27 - 26

<u>Results.</u>

TEST	23	24	25	26	27
MEAN PREFERENCE	1·44	2·24	1·56	2·09	2·06
TOTAL NO. OF PREFS.	435	489	261	315	311
CHANCE DISTRIBUTION	604	302	302	302	302

The χ^2 test gives $P < \cdot 01$. The distribution actually obtained therefore differs from a chance distribution, i.e. significant preferences are being made.

Taking the descending order of preference determined by the mean number of preferences awarded to each, we get Tests 24, 26, 27, 25, 23, i.e. Scale with rhythmic skip, Harmonic minor scale, Melodic Minor scale, Scale in triplet figuration, Major scale.

The choice of the rhythmic form might well be expected. The low place of the triplet 'flowing' form is rather unexpected, especially after the preference given to Bach's triplet theme, discussed on page 102 . This suggests that rhythmic pattern is less important for causing preference than melodic pattern.

Experiences of novelty probably account adequately for the second and third items in the preference list, and familiarity and lack of interest would account for the fifth.

Test V. Tests 28 to 31 give 4 examples of passage work based on the octave, fifth, fourth and third.

The arrangement was:-

(85) 28 - 29	(91) 30 - 31
(86) 28 - 30	(92) 30 - 28
(87) 28 - 31	(93) 30 - 29
(88) 29 - 30	(94) 31 - 28
(89) 29 - 31	(95) 31 - 29
(90) 29 - 28	(96) 31 - 30

Results.

TEST	28	29	30	31
MEAN PREFERENCE	3·6	2·7	2·8	2·8
TOTAL NO. OF PREFS.	563	414	427	428
CHANCE DISTRIBUTION	453	453	453	453

The value of P becomes less than ·01. Once again significant preferences have been found. The order is test 28, 31, 30, 29, i.e. the arrangement based on the octave, third, fourth, and fifth respectively. This arrangement suggests strongly that children of the ages considered have a development of tonality or consonance, so far as these tests are concerned, similar to that of the adult mind.

Passage work based on the octave and third is common in classical music, showing that this has long been observed to be suitable for pleasurable listening. The low position of the test based on the fifth reminds us of the unpleasant sound, to modern ears, of the medieval 'organum'. If the tolerance of the medieval listener for the latter was due to lack of tonality development, as is usually supposed, then the above result is not so trite as it may appear, since it has shown that children of 10 to 14 years have a tonality sense comparable with that of the adult mind (even the trained musical mind) and are very much more sensitive to the 'rough' progressions which were used in the tests than medieval musicians would have been. If we reject, or at least minimise, the tendency to explain this as the result of the inheritance of acquired characteristics (an attitude justified by the difficulty of finding convincing evidence), it seems likely that the development of this tonality sense is rapidly acquired from environmental influences.

CONCLUSIONS AND SUMMARY.

It has been shown that children of from 10 to 14 years of age are generally capable of making significant preferences, even with material which one might expect to present difficulties, or result in random variations of response. Their ability to appreciate melodic pattern and rhythmic pattern appears generally to be well developed, while their sense of tonality for dynamic progressions (Test V) resembles the adult development. No preference between chromatic and diatonic presentations was found.

The mean of the number of preferences given to each test gives a series of results which will provide rough norms for individual testing.

It appears that this experimental procedure could be profitably employed over a wide field of musical questions since it provides fairly easily and quickly a method of discovering relations. Questions concerning consonance and dissonance, harmony, melody, structural form, rhythmic pattern, and aesthetic appeal can be examined by using paired-comparison tests.

Much that is speculative in music, the result of individual opinion or of the generalising of a small number of personal experiences, could be clarified by adopting this method.

PREFERENCE TESTS

for

CERTAIN MUSICAL COMPOSITIONS.

In these experiments the following compositions were used:-

Bn_1 No. 4 of 'Seven Bagatelles', bars 1 - 16. (Beethoven)

Bn_2 Andante in F, bars 1 - 8.-Beethoven. (Stücke, published Breitkopf).

M_1 Fantasia Sonata C minor. -Mozart. Last statement of theme near end of fantasia (7 bars + tonic chord).

M_2 Rondo of 'Sonata Facile' in C. - Mozart. 16 bars.

S_1 Kinderscenen, no.5. - Schumann. (Shortened forms, using bars 9 - 24. Anacrusis and bar 9 made to resemble bar 1).

S_2 Kinderscenen, no.1.

S_3 Kinderscenen, no.6. 8 bars.

S_4 'Kanon' from '2nd Sonata for the Young', Op. 118 - Schumann. 12 bars.

B_1 Minuet from Orchestral Suite, B minor. - Bach. Bars 9 - 24.

B_2 Badinerie from Orchestral Suite, B minor. - Bach. 16 bars.

B_3 Gavotte from Orchestral Suite in D - Bach. 10 bars.

B_4 Bourrée " " " " D - Bach. 8 bars.

123 subjects were used, with ages ranging from 11 - 14 years of age. The above material was presented for paired-comparison as in the preceding test. The arrangement is shown in the Appendix, page 403 . The order of presentation of a given pair was settled by a chance method. It will be seen that complete combinations for Bn_1, Bn_2, M_1, and M_2 were used, but the others were only partially completed because of the restriction of time.

<u>Results</u>. (Tables I to IX in Appendix, page 404).

If the χ^2 test is applied to any row of the first two tables and the corresponding chance distribution, it is found that $P < \cdot 01$. At every age level, therefore, significant preferences are made.

From the second two tables it can be seen that the preference for Bn_1 and Bn_2 increases with age. There is a suggestion that this also occurs for M_2. The preference for S_4 decreases with age and there is a suggestion that this also occurs for B_2 and B_3. Tables V and VI (Appendix, page 405), help to determine the order of preference for the compositions. Each mean has been expressed as a percentage of the value which would be obtained if no tendency to prefer one composition to another had been found (i.e. the value which is half the number of times the composition was used.)

The χ^2 test applied to table VII shows that significant preferences are made at every age level, and also for the whole group.

Table IX shows that the order of decreasing preference is S_1, B_2, M_2, B_4, B_3, S_4, S_2, Bn_2, S_3, Bn_1, B_1, M_1.

It is interesting to compare this list with the qualities of tempo, style and tonality exhibited by the compositions.

It is rather difficult to attempt verbal description of a musical work, but the following list is probably acceptable:-

Bn_1 - Andante. Rather serious. Major.

Bn_2 - Andante grazioso. Rather serious. Major.

M_1 - Adagio. Declamatory. ("Epic"). Minor.

M_2 - Allegretto. Staccato. Light and cheerful. Major.

S_1 - Allegretto. 'Quite happy'. Imitative counter theme. Major.

S_2 - Allegretto. Triplet figuration in accompaniment. Major.

S_3 - Fairly quick. Loud and pompous. Major.

S_4 - Vivace. Rhythmic, imitative. Suggestion of syncopation. Minor.

B_1 - Andante expressivo. Flowing. Minor.

B_2 - Vivace. Minor.

B_3 - Allegro. Major.

B_4 - Allegro. Major.

Dance style.

If the list of twelve compositions on the above page is divided into two halves ('most preferred' and 'least preferred') it is possible to examine the list for those qualities which are meeting with greatest approval.

(1) Tempo.

The six most preferred compositions are all quick (above the andante level). In the remaining six there are two quick and four slow. If quickness or slowness had in itself no effect on the preference of the subjects one would expect a chance distribution. The existence of a relation can be considered from the following tables. ('Above' means 'occurring in the first six of the list'. 'Below' means 'occurring in the second six of the list'.)

OBSERVED

QUICK, ABOVE	QUICK, BELOW
6	2
SLOW, ABOVE	SLOW, BELOW
0	4

EXPECTED BY CHANCE

4	4
2	2

The value of $\chi^2 = 6$. With 1 degree of freedom P is between $\cdot 02$ and $\cdot 01$. There is consequently a significant divergence from chance, so that a quick tempo is preferred. (Yates' correction gives a value of P between $\cdot 1$ and $\cdot 05$, thus casting doubt on the preceding result). The smallness of the distribution number makes conclusions rather doubtful.

(2) Tonality: Major or Minor.

There are 4 major compositions 'above', 4 'below'. 2 minor 'above' and 2 minor 'below'. There is no significant conclusion.

(3) Style.

The Bach dances, characterised by rhythmic vigour, are popular, while the expressivo soft minuet (B_1) is low on the list. The most appealing work (S_1) has an attractive melody, but one sustained in interest by the rhythmic action of the semi-quaver accompaniment and of the imitative counter theme in a lower part. The light Rondo of Mozart (M_2) is third on the list. The canon (S_4) is perhaps surprising in its position of being sixth. One might expect it to have a lower place.

These results suggest that smooth 'singable' melodies are not necessarily appealing to children (cf. positions of S_2, Bn_2, and perhaps Bn_1). It seems more likely that the results are explicable by considering that children like a good 'singable' tune, but that the vitalising effects of intensity, melodic leaps, accents and rhythmic effects generally, have a strong effect in modifying preferences.

Serious, meditative or dramatic compositions are less favoured. (cf. S_2, Bn_1, Bn_2, B_1 and particularly M_1). The case of S_3 is interesting. It consists of four two bar phrases, descending in rhythmic and harmonic sequence. It is fairly loud throughout. Here is a composition which one would expect to be particularly attractive to children. It is loud, rhythmical, tuneful and easily grasped. Yet the results indicate a low appeal; to the adult mind S_3 appears flamboyant and rather superficial. It is somewhat strange that the children should have perceived its weaknesses, in at least some measure.

It is quite true that some of these results could have been anticipated, yet not, I think, all of them; besides, one could argue indefinitely with an individual who chose to speculate in a way different from one's own. These objective results indicate a method of obtaining concrete data in musical theory.

The popularity of the rhythmic compositions, particularly the Bach ones, is significant for the teacher. Certainly the old days are rapidly passing away when it was considered fit and proper for a music teacher to introduce his pupils to Bach as the composer who wrote wonderful fugues and then instruct the luckless pupils in the 'Inventions' or even in one of the '48'. Nowadays it is widely understood that the young pianist should start with simple dances from Bach and the young organist with the chorale preludes. Nevertheless one cannot resist the conclusion that widespread investigations into children's preferences would not only accelerate the destruction of preconceived ideas, but would firmly establish a body of positive facts.

The percentage table on page 406 shows that the Beethoven pieces gain more favour as age increases. This is interesting, since Beethoven is regarded generally as a composer whose music is thoughtful and serious, so that we could reasonably expect the mature mind to appreciate his music more than the immature mind. M_1 appears to be too lofty in conception to appeal to the young. S_3, which has been discussed on the above page, falls off sharply in interest above the youngest age level. The Schumann and Bach pieces seem to decline in popularity as age increases.

These occurrences are explicable by the hypothesis that loudness and rhythmic interest give way to melodic and harmonic influences (of the type which make music appear 'thoughtful' and 'serious') as age increases. This hypothesis is not surprising, but its manifestation within the age range 11 - 14 is of interest. It suggests that the beginnings of mature attitudes to music occur within this range.

The results for the various composers were then pooled. (All the Beethoven results, all the Mozart results, etc. These are shown under the headings, Bn, M, S, B.)

AGE	Bn	M	S	B
11-12	489½	586	550½	540
12-13	255½	292	232½	246
13-14	433	402½	322½	324
TOTAL	1178	1280½	1105½	1110

In this table the χ^2 test yields a value of P less than ·01 for the first group, about equal to ·01 for the second, between ·5 and ·3 for the third, and less than ·01 for the total group.

The third value of χ^2 means that the observed distribution does not differ significantly from a chance distribution. But the latter might give the same values as one where equal (and definite) support was given to Bn, M, S, and B, for the compositions used. It is more consistent with previous evidence of definite preference to consider that the value of χ^2 shows that preferences for Bn, M, S and B tend to become equal as age increases, at least for the group considered. (Since M, for example, contains a popular and unpopular composition, the rough results which may occur from the type of pooling here adopted should lead to caution in estimating the results.)

The following tables show the mean preference given to each, together with these means expressed as a percentage of the number of occasions on which the corresponding compositions occurred.

	Bn		M		S		B	
AGE	MEAN PREF.	%	MEAN PREF.	%	MEAN PREF	%	MEAN PREF	%
11-12	8·6	78·1	10·3	93·5	9·7	120·7	9·5	118·4
12-13	9·5	86·0	10·6	78·3	8·6	107·6	9·1	113·9
13-14	11·1	100·9	10·3	93·8	8·3	75·2	8·3	75·5
TOTAL	9·6	87·1	10·4	94·6	9·0	112·4	9·0	112·8

The percentages for the total group show that the order of preference is B and S (about equal), M, Bn, i.e. Bach's music of the type of the dances from the Orchestral Suites has the greatest appeal compared with the music of the other composers which were studied. The music used for the Schumann group is reasonably typical of Schumann's style, and so also for Mozart and Beethoven. The results are therefore capable of a certain amount of generalisation, extended to the composer's work as a whole, although it is difficult to know how far this could be extended. In view of the Bach diversity of style (song, cantata, fugue, variation, etc.) it would be an ill-advised process to attempt to generalise from the dance movements. Nevertheless the order of preference shows the appeal which particular styles of composition have for children.

The pooled results show that the Beethoven pieces increase in favour as age increases whilst the Schumann and Bach pieces decrease.

The examination of sex-differences. (M_B = mean for boys; M_G = mean for girls)

MEANS AND PROBABLE ERRORS OF MEANS FOR PREFERENCES.

	Bn_1		Bn_2		M_1		M_2		S_1		S_2		S_3		S_4		B_1		B_2		B_3		B_4	
	M_B	M_G	M_B	M_G	M_B	M_G	M_B	M_G	M_B	M_G	M_B	M_G	M_B	M_G	M_B	M_G	M_B	M_G	M_B	M_G	M_B	M_G	M_B	M_G
	4·88	4·59	5·25	4·74	4·24	2·55	6·26	7·05	2·71	3·14	1·67	2·05	1·41	1·63	2·13	2·79	1·39	1·63	2·30	2·61	2·36	2·54	2·49	2·60
$P.E._M$	·14	·13	·16	·21	·16	·16	·16	·16	·07	·07	·06	·07	·09	·09	·08	·09	·07	·07	·08	·08	·09	·09	·08	·07
$P.E._{diff.}$	·19		·26		·22		·23		·10		·09		·12		·12		·11		·11		·11		·10	

With the criterion "3 x P.E." we find that M_1, S_1, S_2, and S_4 show significant differences between the means for boys and girls.

i.e. M_1 (dramatic, declamatory) is preferred by the boys
S_1 ('Quite happy') " " " " girls

S_2 ('Of strange lands and people') is preferred by the girls.

S_4 (Canon) is preferred by the girls.

Here we have found differences which are consistent with the differences in attitude in boys and girls. The boys' preference for M_1 is comprehensible. The smooth peacefulness of S_1 and the imaginative flow of S_2 can readily be conceived to be attractive to girls. S_4

has a neat restrained crispness which could be imagined to appeal to girls rather than to boys.

Again we have found results which might or might not have been anticipated. The usefulness of the experimental procedure is clear. It produces definite results and these can be used to frame curricula for boys and girls separately, if such are required, and to study the psychological reasons for any preferences which have been exhibited.

Summary.

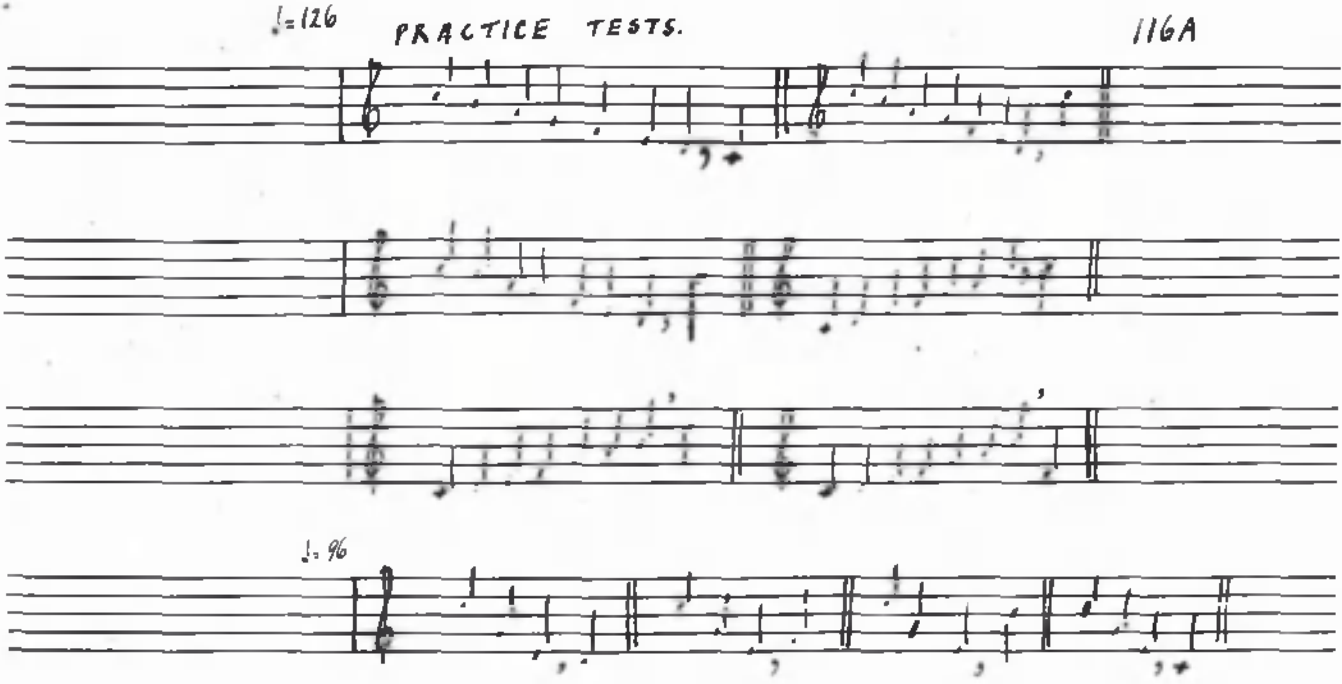
Tests using the 'paired-comparison' method were devised to examine the preferences shown by children for certain compositions by Beethoven, Mozart, Schumann and Bach. At every age level considered it was found that significant preferences were made. The appeal of the Beethoven pieces increased as age increased and there was a suggestion that this occurred also for a tuneful rondo by Mozart. Somewhat similar conclusions were drawn for certain of the other compositions. It appeared that quick compositions were more popular than slow, and it was suggested that while children like a smooth 'singable' tune the vitalising effects of intensity, melodic leaps, accents and rhythmic effects generally have important influences in modifying preferences. Serious, meditative or dramatic compositions receive rather less favour than others. It appeared that loudness and rhythmic interest give way to melodic and harmonic influences (of the type which make music appear 'thoughtful' and 'serious') as age increases, and that the beginnings of mature attitude to music occur within the age range of 11 to 14 years. Sex differences in the preference shown for certain styles of composition were noted and these appeared quite comprehensible.

The conclusions are naturally qualified by the number of compositions which were used and by their structure and style. Nevertheless, the method of paired-comparison has interesting applications in the field of music for the teacher, and extensive testing of this nature applied to numerous compositions of various types by different composers would provide objective data on which to base curricula and views on musical appreciation.

TESTS FOR

PREFERENCES FOR VARIOUS MELODIC ENDINGS.

PRACTICE TESTS.



THE TESTS.

♩= 96
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♩=126
41
42
43
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46
MIDDLE NOTE
TO BE
JUDGED
♩=96
47
48
49
50
51
52
53
♩=96
54
55
56
57
58

These consisted of 58 tests designed to examine the preference shown for various endings to a given musical structure. For example, the notes C, D, E, F, G, A, B (or doh, ray, me, fah, soh, lah, te) might be played as part of an ascending scale on the piano. As a result of expectation and association, the succeeding note would probably be anticipated to be high C or high doh. Suppose E, F or A were used instead of high C; would the subjects regard any one of these as a satisfactory ending?

The test was designed as follows. The notes C, D, E, etc. to B were played and the subjects were told to listen carefully to a note which was going to be added. Then the scale C to C' was played, with a very slight detachment or rest before the C'. The subjects were asked to describe this last note as a good ending, a bad ending, or "middling" (neither good nor bad). If good, G was to be written; if bad, B; if middling, M. Extra practice (without writing) was given with D' and F as terminal notes, and with the descending scale and descending common chord. (See practice tests in test manuscript.)

The subjects appeared to understand the task readily. Tests 1 - 46 were of the above type. Tests 47 to 53 had similar instructions, but this time G, B, or M was to be applied to the second note of the three. This was explained just before Test 47 was played, and a little practice given. In tests 54 to 58, G, M or B was to be the response given to the last sound, which is, of course, a chord.

It will be seen that the 58 tests consist of 9 groups, each based on a given musical pattern (e.g. C, D, E, F, G, A, B). The pattern was played 3 times before the corresponding set of tests so that the subjects could become familiar with it.

Key C was used throughout, but the precaution was taken of playing the perfect cadence of this key just before each test item was played - in case any subject had developed images suggesting another key.

143 subjects were used. Group I consisted of 56 children of age 11 - 12 years, Group II contained 54 children of age 12 - 13 years and group III contained 33 children of age 13 - 14 years.

Results.

The distributions of the responses will be found in the Appendix, page 407 .

When the χ^2 test was applied to the responses for the whole group it was found that there was a significant difference from a chance distribution ($P < \cdot 01$) in all tests except test 50 where P is between ·20 and ·10

Comments on the various preferences are given below:-

Tests 1 to 4

1. Scale rising to tonic preferred.
2 and 3. Leading note rising or falling by a leap, considered bad.
4. Dislike shown for leading note falling by a step is not significant.

Tests 5 to 11.

5 and 6. The arpeggio C, E, G, C' is preferred to C, E, G, C, but both are significantly pleasing.

7. C, E, G, A is considered relatively displeasing.
8. C, E, G, G is least displeasing. (Possibly because of its resemblance to the opening of the 'Blue Danube' Waltzes.)
9 - 11. Displeasing.

The order of descending preference for this set based on the tonic chord is C, E, G, C'; C, E, G, C; C, E, G, G; C, E, G, E; C, E, G, D; C, E, G, A; C, E, G, F.

Tests 12 to 19.

15. The only one of the set which is liked or considered good, viz., C, D, E, F, G.

The order of increasing dislike for the others is C, D, E, F, A; C, D, E, F, E; C, D, E, F, D; C, D, E, F, C'; C, D, E, F, C; C, D, E, F, B. (Note the tritone in the last item.)

Tests 20 to 24.

20 and 21 have a slight but not significant preponderance of G responses.
23 and 24 are significantly disliked. The order of increasing dislike is therefore G, B, D, F, E; G, B, D,

F, A'; G, B, D, F, D; G, B, D, F, G'; G, B, D, F, C.

The position of the first is comprehensible, suggesting as it does the Dominant-Tonic resolution. The last three items of the series may have their low position attributable to their less satisfying resolution of the "seventh". This explanation has an harmonic basis, but another factor to be considered is melodic progression. None of the above progressions is a good 'singable' melody, but the case of the second (G, B, D, F, A') is of interest. This is the arpeggio chord of the dominant 9th, a chord which one would expect to require resolution even more than the dominant 7th. If harmonic considerations formed the sole explanation, one might expect this test item to be last in the above list. Perhaps melodic progression provides the reason for its higher position. G, B, D, F, A' is a series of thirds and when the movement has been established, a form of momentum makes F, A' more acceptable than F, D or F, G' or F, C, i.e., this momentum or inertia effect compensates for the harmonic effect. One finds these inertia or momentum effects commonly in the class teaching of songs.

Tests 25 to 31.

Significant indication of dislike is shown in tests 27, 29 and 31, viz., E', C', G, G; E', C', G, A; E', C', G, B;

Tests 26 and 30, while not yielding significant results, appear to be the tests which are most liked in this set. They have each a descending movement and bear a close relation to the tonic chord.

Tests 32 to 40.

The order of decreasing appeal is 33, 38, 40, 34, 36, 39, 32, 35, 37, i.e., C, E, G; C, E, F; C, E, B; C, E, C'; C, E, A; C, E, E; C, E, D; C, E, C; C, E, B_1.

Tests 41 to 46.

All the conclusions for this set are significant. All the terminal notes are disliked except in test 45, which is C, D, E, F, G, F, E, D, C - the standard five finger exercise.

The order of the tests for increasing dislike is:-

C, D, E, F, G, F, E, D, G.
C, D, E, F, G, F, E, D, G,
C, D, E, F, G, F, E, D, F
C, D, E, F, G, F, E, D, E
C, D, E, F, G, F, E, D, C'.

Tests 47 to 53.

The order of decreasing preference is C, F, E; C, D, E; C, G, E; C, A, E; C, B, E; C, $B_{,}$, E; C, $G_{,}$, E.

Tests 54 to 58.

These tests consisted of various cadences which harmonised C', C', B, C'. These four notes were played three times so that they could be memorised and so that 'mental sets' about suitable harmonisation could be formed.

The order of decreasing preference is:-

Test 54. Interrupted cadence. Major mode.
56. Perfect cadence. Minor mode (relative minor.)
58. Perfect cadence. Minor mode (Tonic minor and Tierce de Picardie).
55. Perfect cadence. Major mode.
57. Perfect cadence. Tonic minor mode.

The first two were liked and the others were disliked, yet only the first and last yield significant results. Contrast and novelty are probably factors of importance in these results. A long investigation using paired comparison methods is needed to decide such cadence preferences. Further, more musical contexts are needed in presenting the cadences.

Summary.

The preferences of children for certain melodic and harmonic terminations were examined. A complex investigation would be needed to get precise results, so the experiments are more interesting from the point of view of method than for the value of the results. It was found that the children showed preferences of a "developed nature". That is, their responses were substantially in agreement with the laws of melodic and harmonic progression. "Inertia effects" were suggested in some of the results but these were comprehensible.

TESTS IN MUSIC FOR YOUNG CHILDREN.

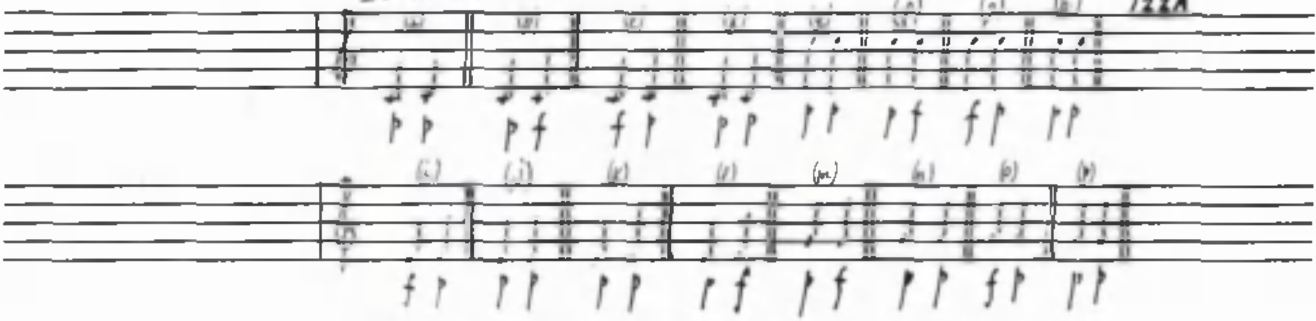
It is clear that none of the tests in current use are suitable for young children. Tests of verbal knowledge are debarred because written responses are impossible, and, of course, these tests are weak as tests of musical capacities as such, e.g. 'knowledge' tests like those of the Kwalwasser type. On the other hand, tests of sensory capacities, like the Seashore tests, cannot be carried out by using gramophone records, for the following reasons - (1) The writing of responses to the Seashore tests involves a fair amount of strain in adult listeners. Young children lack the concentration necessary for filling up the response sheets besides lacking the writing skill which is required. (2) The children cannot be relied on to answer at once, for young children, especially if they are in doubt, try often to get some help or indication by looking at the experimenter. Since the tests are administered quite rapidly, this is a serious drawback. (3) Listening to a gramophone and watching its being manipulated are not conducive to attentive listening.

On the grounds of length, difficulty, speed of administration with the accompanying need for rapid written or verbal response, the Seashore tests are quite unsuitable. Nevertheless, the testing of young children could be expected to be an important side of musical investigation, for genetic studies of musical development may be of great value in systematising the speculation of theorists in aesthetics.

It is hardly necessary to demonstrate that some manifestations of musical aptitude in young children are highly deceptive. For example, a child may appear to be interested in listening to gramophone music, but the basis of interest is sometimes that of displaying its ability to manipulate the machine. Again, the ability to select records has been shown in certain children of the writer's acquaintance to be merely that of identifying the colour of certain labels. Another appearance of musical interest is that of singing a song. One may suspect that in certain cases the achievement is dictated by a desire for display on the part of the child (or perhaps on the part of the parent). Weakness of pitch reproduction is so noticeable in many of these efforts that one may hold suspect such evidence of aesthetic sensibility. However it is unwise to generalise in criticism just as it is unwise to generalise in approbation. Instead we should attempt to obtain standards for these young children before trying to estimate the worth of manifestations of abilities, and the following tests were devised with this object.

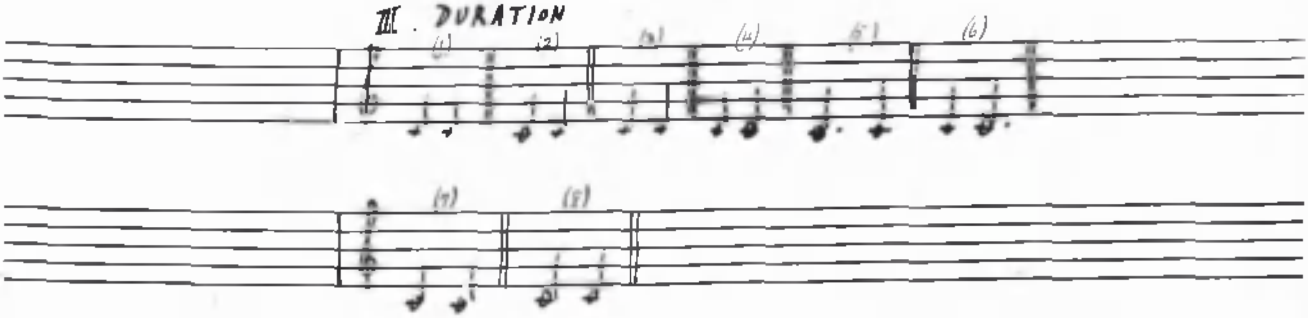
TESTS FOR YOUNG CHILDREN.

I. INTENSITY.



II PITCH.

III. DURATION



IV. RHYTHM

V. MELODIES

The tests.

These are shown in the test manuscript.

Test I is a test of intensity discrimination between two notes of the same pitch.

Test II is a test of pitch discrimination.
Test III is a test of time discrimination (duration).
Test IV is a test of rhythmic discrimination for simple time combinations.

Test V is a test of melodic discrimination for simple melodies.

The subjects.

These were (1) children who had just entered the elementary school. The age level ,therefore,was 5+ . The children had been in school one month before the tests were administered. This gave the children time to settle down in their new surroundings but did not allow the influence of school teaching to be appreciable; (2) children who had received a little school education. Age level 6+ . The tests were given individually, the writer playing the piano (out of sight of the child), while the teacher of the child gave the instructions and recorded the responses.
(Notation:- The notes of the C major scale from middle C upwards are represented by plain letters, viz. C, D, E, etc. The octave above middle C is C' and the second octave above is C". C_1 is the first octave note below middle C and C_2 is the second.)

Instructions.

Test I - Intensity.

"I want you to listen hard to two sounds on the piano. Here are two sounds which are different." (Middle C played twice, one note piano, the second forte). "We say that these are different. Here are two which are the same". (Middle C played twice, each note piano). "Let me see if you can do this." (Practice given with E, p f; G, pp; C' fp)

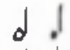
(Then test should begin).

Test II - Pitch

Similar instructions, with E, C" and G, G as demonstrations then practice given with G, E'; F#, F#; A', E.

(Then the test should begin.)

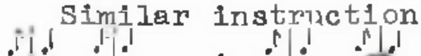
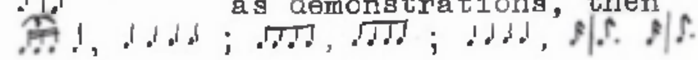
Test III - Duration.

Similar instructions, with , and  as demonstrations, then practice given with  (Middle C used throughout)

(Then the test should begin.)

Test IV. - Rhythm.

Here two rhythmic groups of four notes have to be judged to be the same or different. (Middle C used throughout.)

Similar instructions with , and  as demonstrations, then practice given with 

Test V. - Melodic discrimination.

Here two short melodies have to be judged to be the same or different.

Similar instructions, with C, D, E and C, D, E^{b}; and E, F, A and E, F, A as demonstrations. Practice given with E, F, G, and E, F, B; D, F, A and D, F, A; E^{b}, G, B, and E^{b}, G, C.

Notes on administering tests:-

(1) The tests require careful practice by the pianist.

(2) These tests may appear to be pedantic in origin and to be conceived in an attitude of 'elementarism', to which exception has already been taken (pages 15, 60). Yet this is scarcely a fair comment. (a) The subject is asked to respond 'Same' or 'Different' so that a comparison is being made, i.e. he is judging a relation so that there is some organisation in all the test situations (b) While the writer agrees that more 'musical' material should be used, it is difficult to see what material could be used at this early age. As an example of the

difficulty in attempting to find suitable tests the writer gave the test described on page 20 to the children individually and found that only one child gave 'Yes' responses to Test I. ('Yes' given for test items 8, 10, 12 giving a score of 1). A rough survey was made of the other tests (II to VIII) but it was obvious that these were quite beyond the powers of the children. If, then, common tunes cannot be recognised, we must look for simpler material.

(3) The test items were played at a rate of ♩ = 60 MM.

(4) Some repetition of the instructions and some slight paraphrasing of them was considered permissible. Also, practice examples were repeated where necessary. The principle here was to see that the child appeared to understand the task, and the fact that the teacher gave the instructions was most helpful in securing rapport with the child.

RESULTS.

The distributions of 'same' and 'different' responses (S and D) are shown in the Appendix, page 415 . (28 children were of age 5 ; 23 of age 6).

In the table $P = \frac{S \sim D}{S + D} \times 100$

($S \sim D$ = difference between S and D, the correct answer being written first. If there are fewer correct answers than there are wrong answers, the difference will be negative.)

Order of difficulty.

The values of P can be used to arrange the items of a given test in order of increasing difficulty.

The order is listed on page 419 of the Appendix.

DISCUSSION OF THE RESULTS.

TEST I - INTENSITY.

The responses for the three types of intensity tests may be compared. The 5-year old group will be called group A, the 6-year old group B, and the whole group C.

pp. 8 tests.

	A		B		C	
	S	D	S	D	S	D
Sum of responses.	116	108	91	93	207	201
P	3·4		−·9		1·5	

There is no evidence that the subjects can clearly recognise that one note is equal in loudness to a preceding note of the same pitch and duration. While it may be admitted that judgments of equality are often much more difficult than judgments of inequality,* it might be argued that the child had many opportunities of hearing repeated sounds of equal intensity, e.g. in speech, 'Johnny, come here', or tunes with repeated notes. Actually it is very doubtful if such occurrences are common. In the first example, 'Johnny' is made up of two vowel sounds which are different in quality and are probably pronounced by most people with different intensities. So also for 'come here'. Further, tunes containing repeated notes are not usually within the experience of young children, and in any case such notes are generally subject to intensity variations. Even when systematic teaching of music occurs at later ages, tunes with repeated notes appear to be in disfavour with the compilers of music readers because less effort in reading music ensues in these tunes. This attitude is unfortunate for many reasons, but for this particular section of the work it is sufficient to note that more experience in listening to repeated notes might strengthen considerably the ability to recognise equal intensities, which, as has been shown above, is weak in young children; so weak in fact, that children are as likely

*Some experiments of Branford and Ballard are related to this matter of equalities. These were of the form "If A=B, and B=C, then A=C." (Quoted by Spearman, 'Nature of Intelligence' p. 293-294. Spearman's conclusion that such intuitions are in need of preparatory growth seems applicable to the experiments in music.)

to say 'same' as 'different' to a pair of such notes.

The teaching of nursery rhymes and folk songs containing repeated notes could be useful for this purpose apart from other justifications, e.g. musical interest, ease in singing and remembering, the foundation of expressive effects like crescendo and diminuendo, etc.

It should be noted that weakness in the perception of intensity effects has been observed in older children (p. 91).

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pf , 4 tests.

	A		B		C	
	S	D	S	D	S	D
Sum of responses	34	78	17	75	51	153
P	39·3		63·0		50·0	

fp. 4 tests.

	A		B		C	
	S	D	S	D	S	D
Sum of responses.	28	84	17	75	45	159
P	50·0		63·0		55·9	

It appears that pf and fp tests are equally easy. The results differ significantly from chance and show that the children have, on the whole, little difficulty in recognising the intensity effect. This is in strong contrast to the results of pp tests.

We should conclude from this, since the pf and fp relations form the dynamic basis of accent, that children of these ages could readily recognise the accents of music. This is in agreement with the view that young children should learn to appreciate rhythm by marching and dancing, and that marches and dances are very suitable types of composition for the child to hear. Nevertheless it is worthy of note that one-quarter of the responses at each age level were wrong, so that individual differences are sufficiently obvious to prevent us regarding this view of musical aptitude and training as being capable of rigid and general application. The question of individual differences will be discussed later.

TEST II - PITCH

(a) A comparison of the responses for tests using (1) an upward leap, (2) a downward leap, (3) repeated notes.

Upward leap

	A		B		C	
	S	D	S	D	S	D
SUM OF RESPONSES	80	116	40	121	120	237
P	18·4		50·3		32·8	

(Test 29 omitted in this analysis because of the special pitches used in the test.)

Downward leap.

	A		B		C	
	S	D	S	D	S	D
SUM OF RESPONSES	64	132	36	125	100	267
P	34·7		55·3		43·9	

Repeated notes.

	A		B		C	
	S	D	S	D	S	D
SUM OF RESPONSES	202	78	123	107	325	185
P	44·3		7·0		27·3	

It seems clear from these figures that a downward leap is more readily perceived than an upward leap, an effect which is marked in the case of the younger children. (However, the smallness of the groups casts doubt on general conclusions.) This effect may be explained by supposing that the upward leap, which in the tests proceeds from a familiar and often experienced sound (Middle C) to a sound calling usually for greater effort in reproduction and producing as a rule greater difficulty in imaginal recall, can be regarded as a leap from an easily perceived to a less easily perceived, or less familiar pitch. In this case the final state of awareness in the subject has more components of doubt than in the case of the downward leap. The comparison may be illustrated by the analogy of a person jumping from the ground on to a fairly large box as compared with the person jumping from the box to the ground. There is greater satisfaction in returning to muscular equilibrium in a familiar state than in an unfamiliar state. These observations on the difficulty of the upward leap are likely to be related to the following phenomena:- It is common to find that, in class singing, bad intonation is more noticeable in scales moving upwards than in scales moving downwards. If a stepwise progression is followed by a leap (e.g., d, r, m, f, s, r', d') the second note of the leap is apt to be inaccurate, which is doubtless due to an inertia effect in the neuromuscular system (although, of course, this is related to kinaesthetic and auditory imagery.) This pitch difficulty is more noticeable in a passage moving upwards than in one moving downwards. Melodic sequences are more easily and accurately sung when they move downwards rather than upwards. Most of the natural cadences of the voice in speaking tend downwards. (Indeed the derivation of 'cadence' means 'a falling'.) Pure vocal art follows the rule of the inflections in speaking. Only rarely can a point of repose be imagined on a high note, for the sustaining of a high note implies tension of vocal chords and effort. In modern music the cadence is a harmonic process and not a melodic one. The view that melodic scales developed downwards rather than upwards is held by Parry ('The Evolution of the Art of Music'). Similar views are expounded by Fox-Strangways ('The Oxford History of Music').

Repeated notes.

The younger group recognise these more easily than they do either upward or downward leaps, yet the value of P (44.3) is not impressive. (If repeated notes were clearly recognised P would be 100). The average performance of the group of 5 year olds shows that about

24 correct responses are given to every 11 wrong ones.

On the other hand, the results for the six year olds are altogether surprising. Here we find that the task of determining if two notes are the same is far more difficult than the task of determining if they are different. The difference in performance in the two age groups is not due to effects of sampling, for the group of six year old children is markedly superior to the group of five year old children in 'Difference' judgments. It is probably true to say that the younger children make spontaneous judgments (involving the direct operation of pitch imagery) whereas the older children have attitudes of expectation whereby the 'Different' response is considered more likely (since it more closely resembles taught melodies and is associated with teaching of one kind or another about pitch.) The six year old child with more experience of school than the five year old, is more likely to think what the answer should be, perhaps attempting to get some clue from the face of the adult, so that central processes affect his judgment. (At the same time the small numbers in the groups make conclusions dubious.)

The pitch sense of both five and six year old children is clearly not acutely developed, but the six year old children possess more of the sophisticated response tendencies of the adult.

(b) The effect of interval on responses to tests involving leaps.

The table below was constructed by pooling the responses for two intervals which were the same and then working out the value of P, e.g. tests 1 and 4 use the same interval, the fifteenth, and the results for 1 and 4 were added together.

INTERVAL	TESTS USED	AGE 5			AGE 6			WHOLE GROUP		
		S	D	P	S	D	P	S	D	P
FIFTEENTH	1, 4	18	38	35·7	5	41	78·3	23	79	54·9
ELEVENTH	6, 7	17	39	39·3	7	39	69·6	24	78	52·9
TENTH	9, 11	14	42	50·0	6	40	73·9	20	82	60·8
OCTAVE	16, 14	20	36	28·6	10	36	56·5	30	72	41·2
FIFTH	19, 17	22	34	21·4	12	34	47·8	34	68	33·3
THIRD	23, 22	23	33	17·9	19	27	17·4	42	60	17·6
SECOND	26, 28	30	26	−7·1	17	29	26·1	47	55	7·8

The values of P can be taken as a measure of difficulty of the test items. The order of increasing difficulty for age 5 is :- Tenth, Eleventh, Fifteenth, Octave, Fifth, Third, Second. For age 6 the order is:- Fifteenth, Tenth, Eleventh, Octave, Fifth, *Second, Third*, and for the whole group the order is:- Tenth, Fifteenth, Eleventh, Octave, Fifth, Third, Second.*

If the interval of the fifteenth had been omitted, the order would have been almost identical for the two groups. It is possible to explain the discrepancy of the fifteenth in the two sets of results. A note and its octave when sounded together appear to 'fuse', giving the effect of a note of brighter quality, as when an organist adds a four foot register to an eight foot register; or when orchestral instruments of the same quality play in octaves. There is also fusion when a two foot register is added to an eight foot register on the organ, showing the fusion between a note and double octave above. Another arrangement producing a peculiarly sounding fusion is obtained by using a sixteen foot register with a four foot. It is possible that the younger children experience a fusion effect which makes the difference in interval of the fifteenth less striking than that of the tenth and the eleventh, and this fusion effect is less, or absent, in the case of the six year old children, due no doubt to greater experience in listening to different pitches. (The confusing effect of hearing the octave relation may be illustrated further. The writer has observed beginners among organ pupils playing a composition on a four foot stop without the normal eight foot tone being used, yet without appearing to notice anything abnormal. The fact that intelligent adults can make such errors after many years of experience in which to develop pitch imagery makes the foregoing results not only acceptable but also what one might expect.)

Surveying the order of difficulty, the general result appears to be that the greater the difference in pitch between two notes the more easily are these notes judged to be different. This may appear to be a trite result, yet its obviousness is largely due to random and ill-controlled observations of adult judgments. One cannot assume that such a result is true for young children, but should test the result experimentally. The fact that it is substantially true for young children shows that the level of pitch perception has some resemblance to that of the adult.. More important still, the rule for pitch perception is by no means exact. The difficulty provided by the fifteenth has

* Valentine's work[11] on preferences (with older children) has some points of agreement with this list.

already been discussed. Why should the tenth appear easier than the eleventh? Further, the interval of a second is made up of notes just as 'different' as the notes of the eleventh. Indeed the 'closeness' of the notes C, D on a pitch scale might make one consider that it would be very easy for children to recognise that these notes are 'different'. (Statistically, the distribution of responses for the third and second do not differ significantly from those obtainable from a chance distribution.)

It appears that children of 5 and 6 years of age cannot definitely recognize that the third is made up of two different notes, and that children of 5 years of age cannot recognise the notes of the second as being different. This indicates a humble degree of pitch ability. It may be the case that the notes of the third produce disturbances of the basilar membrane of the ear which are so close to each other on the membrane that an analysis of the resulting sensations cannot be clearly educed at the age 5 to 6. This may also be the reason why adults may hear a succession of thirds in a melody without realising the duplex structure of the melody, regarding it rather as an interesting 'single-line' melody, e.g. the Viennese waltz and allied types.

Whatever the perceptual reason may be, it is clear that effects of 'absorption', 'fusion' or 'tonality' enter into judgments of pitch difference, and a simple rule invoking pitch 'distance' is not sufficient to explain the results.

(c) The difficulty of the tests using repeated notes.

The table of results is in Appendix, page 421. In the table, 'interval' means the interval between middle C and the note which was repeated. This table is derived from page 415.

The superiority of the younger children in responding correctly to equal pitches has already been discussed (page 130). The fact that certain of the results in the table may have occurred by chance calls for caution. The χ^2 test applied to the distributions of responses in the total group (page 421) gave significant values to the results marked by 'S' in the Appendix table, page 421. It will be seen that the results for age 6 generally show less success in dealing with these tests than age 5. It does not necessarily follow that the results are due to random guessing or to a sensory disability on the part of the 6 year olds in recognising repeated notes. In fact, the results for the group of age 5, which is just as much a random sample as is the group of age 6, would make such conclusions rather unlikely.

The results could be explained either as due to attitudes of expectation or as due to other perceptual processes. (e.g. confusion of a note with its octave or first overtone).

It may now be asked if the pitch of the repeated note has any effect on the response. (In the table below the responses for the tests using middle C, repeated, have been pooled and the value of P worked out for the pool.) The 'interval' written in the table is the interval between middle C and the note which was repeated.

P

Interval	Age 5	Age 6	Whole group.
10th	85·7	13·0	52·9
Octave	85·7	13·0	52·9
2nd	57·1	39·1	49·0
11th	64·3	21·7	45·1
15th	57·1	4·3	33·3
-15th (2nd octave below	57·1	4·3	33·3
Unison	44·9	3·1	26·1
5th	42·9	-13·0	17·6
3rd	7·1	4·3	5·9

It is clear that the task of deciding if two notes (of the same pitch) are the 'same' or 'different' depends on the pitch of the notes. There is a wide variation in the values in any column of the above table. It will be noted that the values of P for age 6 indicate a general tendency for members of this group to incline to a 'different' response instead of 'same'. (In regarding tables using P, one may overlook the precise meaning of a result. For example P = 85·0 means

that 37 correct responses were given out of a total of 40, which is indicative of almost perfect accuracy.)
The intervals on the previous page, as used in the tests, have the following order of increasing difficulty:-

Age 5 - 10th and Octave (equal); 11th; 2nd, 15th and -15th (equal); Unison; 5th; 3rd.
Age 6 - 2nd; 11th; 10th and Octave (equal); 3rd; 15th and -15th (equal); Unison; 5th.
Whole group - 10th and Octave (equal); 2nd; 11th; 15th and -15th; Unison; 5th; 3rd.

The order of difficulty agrees roughly with that found for notes of two different pitches (page 131), the positions of the octave and the second being noticeably different. This suggests that there is some relation between the ability to detect notes as being different in pitch and the ability to detect notes as being equal in pitch. It might be considered that the latter task is easier than the former, since a given note could produce a primary memory image which would form the basis of comparison with the given note and a succeeding note. It may be concluded that the primary memory image is weak in young children or that it is not used in such a way. The influence of the primary memory image is probably not a profitable consideration, since its effective use in perception would equalise the values of P on the preceding page; one would expect it to be equally effective for the notes C - C as for E - E or D - D. Yet the results show that there are some pitches in the pitch scale at which equality of pitch is more easily detected than at others, e.g. at the 10th or octave above middle C.

It is certain that these experiments are giving results which are not explicable by "Stimulus → Response " psychology. (The varied results for the Unison on page 421 show this, where the values of P range from 71·4 to 21·4 for age 5, as well as the results mentioned above.) Even such an apparently simple task as the response to the test situation ('Same' or 'Different') is complicated, doubtless because the child is responding not merely to a pair of notes, but to a pair of notes in a certain configuration, the configuration being determined by the preceding test structure. Again we appear to have the type of result considered in Gestalt psychology.

It might be maintained, however, that a sufficient explanation would be found in the relative practice which a child had obtained with notes at different pitch levels. The argument would take this form:- A young child, by humming or singing, develops familiarity with notes in its voice range, say from G to C", and consequently develops skill in detecting deviations in pitch from a given note in this range.

If this were true, one might expect a falling off in accuracy of discrimination at each end of this range. The experimental results do not show such a gradation clearly. More striking is the result for test 30. The repeated notes at an interval of a fifteenth below middle C seem to be no more difficult than the notes at a fifteenth above middle C. The former pair are definitely outside the voice range of the child. (Admittedly a few of the overtones of the low note are within the voice range, excluding the first and second overtone, but when the fundamental and these two overtones are omitted, whatever is left for perceptual processes is certainly not an experience directly derived from a singing acquaintance of the note.

Although the preceding tests have used only the notes in key C, it is highly probable that the 'configuration' set up by the test structure is related to key and tonality.

The results for test 30 also throw some doubt on the theory that a child's development of pitch sense depends largely in the early years of life on practice in listening to different voices - voices differing in pitch range (e.g. those of father and mother), quality and the nuances of quality produced by emotion.

(d) If the results for the leap of a 5th downward (test 17) and the leap of a 5th upward (test 19) are compared on page 415, it will be seen that the leap upward is harder to perceive as a difference than the leap downward.

Test 17 - P is 28·6, 65·2 for groups A and B respectively.
Test 19 - P is 14·3, 30·4 " " A " B "

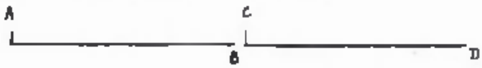
A rapid development of the power to perceive that these pairs consist of 'different' notes occurs as age increases, as one might expect. The reason for the difference in response depending on the direction of the leap is no doubt due to a tonality confusion set up by the tests 16, 17, 18 and 19. The same effect can be noticed in adult choirs, where the reading of intervals is usually fairly good, but very far from perfect, i.e. the singers can read competently notes in one key but find a certain difficulty when the key of the music is changed in a transposition passage. Confusions of the sol-fa intervals d - f, f - d, d - s, s - d are very common, especially when the modulation is from the tonic to the dominant key or vice versa. Singers will report that confusions in reproducing the above intervals are due to a mal-adjustment of key awareness. Putting it roughly, the singer loses his 'key-sense'. This observation shows that the discrimination of interval occurs against a 'back-ground' or 'mental set' determined by an awareness of intervals in the prevailing key. When the key is changed, this mental set has to be altered to perceive the relations given by the intervals occurring in the new key. This explanation accounts for many errors which occur over a wide range of ages, so that it is a plausible explanation for the results of this section. Further, since the relation of the tonic note to the dominant note has an important function in establishing the key relationships these results serve to explain in part the difficulty of the interval of the fifth shown in the series on page 131 .

TEST III - DURATION.

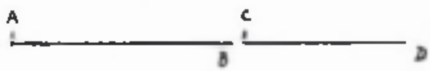
The table summarises the results when the test results are pooled.

	Age 5			Age 6			Whole group		
	S	D	P	S	D	P	S	D	P
Equal durations. (Tests 1, 3,7,8)	86	26	53·6	52	40	13·1	138	66	35·3
Different durations. (2,4,5,6)	62	50	-10·7	50	42	-8·7	112	92	-9·8

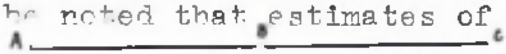
It is clear that the task of judging that the durations of two notes are equal is easier than the task of judging that the durations are unequal. It might be expected that the contrary would be true, but three considerations should be observed. (1) Such an opinion is a reflection of adult experience with all its maturity and multiplicity. There is no reason why it should, or should not, be true for young children. Experimental results are the determining factor. (2) Piano tone, with its rapidly fading intensity, makes judgments of duration harder than would be the case with notes of fixed intensity. Nevertheless the tempo of performance was sufficiently rapid (♩ = 60 MM) not to make this, in the writer's opinion, a matter of any importance worth considering. (3) Judgments of duration are influenced by the attitude and mental activity of the subject during observation [19, 22]; indeed the perception of duration might be claimed by the Gestalt psychologists in illustration of their views. Consider the diagram below, which represents two equal notes sounded in succession.



A represents the sounding of the first note and B represents the cessation of it immediately before the second note is sounded at C. If, for any reason, the subject develops the mental set that leads him to regard A → B as a duration longer than it really is, we can regard this mental set as initiating an activity of perception which will be directed to a point past B as its terminal point. The entry of C will act as a stimulus upsetting this organisation of perception. If D is accurately perceived as the terminal point of perception of the second note then it is quite possible for the subject to regard CD as phenomenally of longer duration than AB. In the next diagram is represented a note followed by a shorter note.



If AB represents a note longer than that which the subject expects, as a result of a pre-determined mental set, the delay in hearing the start of the second note which starts "late" at C may cause mental activation which leads the subject to judge AB as a shorter duration than it really was, in which case AB may be judged to be equal in duration to CD. Putting the matter in a slightly different way, if the diagram below represents two notes of equal duration sounded at A and B, then A and B, the points of sounding, are 'salient' (to use a term from Gestalt psychology) while the duration lines AB and BC are less salient. In fact, as the note A is sustained, the experience takes on more of 'ground' quality as time goes on. C has less 'figure' quality than A or B. AB is more a 'filled' interval than BC, so that AB may be considered by the subject to be of shorter duration than BC. If the subjects had matured and trained ability in estimating duration, these possibilities in producing perceptual difficulties would have little or no influence. (It should be noted that estimates of duration appear



weak in certain adult situations, e.g. the sustaining of terminal notes in a hymn sung by a church congregation, sometimes the same sort of difficulty in a choir performance, the shortening of a dotted note, and so on. Such weaknesses are also shown frequently in aural tests, even by music students who might be expected to have good ability in the perception of duration.) With very young children these possibilities may have important influences, since their ability in estimating duration may be very weak. The increase in difficulty shown from test 3 to test 4 and from test 4 to test 5 may be reasonably explained as due to such influences. In fact, test 5, which might be expected to be the easiest test, is one of the hardest.

Furthermore, the older children (group B) appear to be generally less capable in Test III than the younger ones. It was noticed during the experiments that the younger children were more inclined to answer spontaneously than were the older children. The latter appeared to be more cautious about giving answers, as if they were looking for some guidance from the adult. This does not necessarily mean that they found the tests more difficult actually than the younger children did. It is an understandable attitude at this age, when the children have lost some of the naïve attitudes of the pre-school stage and developed some awe of the teacher as the 'fons et origo' of wisdom. Judicious encouragement was given to overcome such manifestations but it appears to be a plausible reason for some of the weakness of the older children as compared with the younger. From the point of view of the test constructor it appears that tests using duration are unsuitable for this age-level on the whole; or, at least, that types of a nature similar to those used in these experiments are unsuitable.

We may conclude that although ability in judging duration is measurable at this stage of child development, say in the case of superior subjects, such ability appears to be too rudimentary to give general conclusions of a decisive nature.

TEST IV - RHYTHM.

The responses of the subjects to tests 1, 5, 6 and 8, where the response should be 'Same' are of interest. The results for the tests show remarkable uniformity in distribution (page 418) with the exception of test 1 for Group A. This shows a constant tendency to react to such tests in a special way and the exception in test 1 is doubtless due to suggestibility or inexperience on the part of the younger children. The pooled results of these four tests for Group A give a value of P= 46·4 % ; for group B the value is 13·0 % and for group C (the pool of group A and B) the value is 31·3 %. It is evident therefore that the older children tend to respond wrongly to 'Same' tests, a tendency which has been noted already in the preceding pages. If test 1 is omitted and values of P are calculated for each group by pooling the results for tests 5, 6 and 8, the values will be found to be 28·5, 13·0, and 21·6 for groups A, B and C respectively, so that the conclusion is still warranted.

When the responses for each group to the 'Different' tests, viz., 2,3,4,7,9 are treated similarly the values of P for the groups are -7·1, 44·3 and 16·1 respectively. This shows a marked superiority of the older children over the younger children in discriminating rhythmic patterns.

<u>The difficulty of the test items.</u>

Neglecting the first test among the 'Same' items, each of the others appears to be of much the same degree of difficulty. The results for group B show that there is a suggestion that items 5, 6 and 8 are of increasing difficulty, i.e. that greater complexity in rhythmic structure increases the difficulty of giving a 'Same' response. So slight is this indication that one is led to wonder whether these test items are not being perceived without analysis, that is as 'Wholes.'

When the values of P for the 'Different' items are considered, the order of increasing difficulty is:-
Group A, items 9; 3; 2 and 4 (equal); 7.
Group B, " 2 and 4 (equal); 3; 7; 9.
Group C, " 9; 3; 2 and 4 (equal); 7.

No conclusions as to the reason for these orders of difficulty can be obtained. If the order for the whole group (C) is considered, the ratio of the duration of the first to the second rhythmic pattern in each test item would give a corresponding series $\frac{1}{2}$, $\frac{1}{2}$, $\frac{1}{2}$ and $\frac{2}{3}$, $\frac{2}{4}$ from which it might be concluded that the greater the disparity of the duration between the pairs of rhythms in a test-item, the easier is that test-item. But item 9 in group C would be a stumbling block in the acceptance of this hypothesis. Again, it might be thought that 'asymmetry' in a rhythmic pattern would make for ease in discrimination. If this were the case, a pattern consisting of equal notes could be regarded as symmetrical while one consisting of unequal notes would be asymmetrical, so that test 9 would show a high degree of contrast between the two constituent patterns. Nevertheless test 9 is most difficult for group B while most easy for group A. It would appear therefore that the ability to discriminate rhythmic patterns is complex at the age levels considered, depending, no doubt, on several factors such as duration comparison, symmetry comparison, Gestalt perception and attitudes. There is apparent in the results both resemblance and difference with regard to adult ability.

TEST V - MELODIES.

Item 1. Group A and B appear to be unable to perceive a difference in mode as expressed by a broken chord, major and minor.

Item 2. Both groups can definitely recognise the resemblance of a scale repeated.

Item 3. Group A is definitely unable to recognise the difference between the major and minor scale, while no conclusion about group B is possible.

In item 2 the tendency of group B to answer 'Different' to a 'Same' situation is noticeable, as was observed in preceding tests.

While it is true that Test V is too short to be satisfactory, it is sufficiently clear that children of ages 5 and 6 have, on the whole, very weak melodic ability. This, of course, is true only for the groups as a whole. A few children are capable of such tasks of discrimination. These results indicate that the pre-school environment of children has, at least at present, only a slight contribution to make to the development of melodic ability. They show, too, that the school, with a wisely chosen scheme of musical progression, has the responsibility for this development. (It is true that this state of things may be due either to lack of opportunity for development or to the fact that maturation of mental equipment is necessary, the latter occurring after the age of 5 to 6 years. Neither of these considerations alters the conclusion that the school has a major responsibility.) Percussion band work, nursery rhymes, marches, simple dances, are all helpful towards this end provided that the teacher adopts the view that time can be well lost in order to gain it.

The wise teacher of music will recognise that repeated notes are desirable in simple melodies, that simple rhythms are natural to this age, and that questions of notation and the reading of music develop from happy musical enjoyment and singing. At the present time, progress along such lines seems assured, although it is true that the pedagogy of elementary music has not yet shaken off the shackles of 'teacher-centred' principles and outworn methods.

Scoring the tests.

Various methods of scoring were tried and reliability coefficients were worked out for the results, using the half-test method. Graphs were also drawn to examine the resulting distributions. From these trials, methods of scoring were devised which gave distributions approximating to the normal distribution and which gave the highest reliability coefficients.

The scoring was then as follows:-

Test I. Intensity.
Score each item. 1 mark for correct answer, and -1 for a wrong answer. Maximum possible score = 16.

Test II. Pitch.
Same method. Maximum possible score = 30.

Test IV. Rhythm.
Score the D items only. 1 mark for each correct answer, and -1 for a wrong answer. Maximum possible score = 5.

(Tests III and V appear to be unsuitable in their present forms. Test V, of course, is ridiculously short, but it is reasonable to conclude that if the children cannot show enough melodic ability to score well in the short easy test, it is extremely unlikely that a lengthened test will be worth devising. (Other ways of testing melodic ability may be developed but the results of Test V are far from encouraging such a project for children of ages 5 and 6 years.) Similarly, Test III suggests strongly that the estimation of duration is weak at these ages. Nevertheless these tests are not entirely valueless, since they can be used as auxiliary tests to give qualitative results or to pick out the specially talented.)

The scores obtained by the subjects and the graphs of the distributions will be found in the Appendix, pages 422 and 425.

The tables below show the means, standard deviations, probable errors of the means, coefficients of variation, and reliability coefficients for the groups.

Age 5.

Test	I	II	IV
Mean	3·9	11·6	-0·4
σ	6·9	8·9	3·1
P.E.$_M$.	·88	1·13	·39
V	177	77	775

Age 6

Test	I	II	IV
Mean	5·0	9·3	2·2
σ	7·2	9·4	3·1
$P.E._{M.}$	1·01	1·32	·43
V	144	101	141

Whole group.

Test	I	II	IV
Mean	4·2	10·6	0·8
σ	7·1	9·2	3·3
$P.E._{M.}$	·67	·86	·31
V	169	87	413

Probable errors of the difference of the means for ages 5 and 6.

Test	I	II	IV
P.E. of difference	1·3	1·7	0·6

Reliability coefficients (half-test method).

Test	I	II	IV
Whole group	·78 ± ·04	·80 ± ·04	·77 ± ·04

The effect of age on the test scores.

Test I.

The mean score of six year old children is greater than that of five year old children, but the difference is not significant.

The effect of musical experience in school has not been proved to be sufficient to give the former a marked advantage over the latter. At the same time, this test may be measuring a sensory capacity which increases only slightly as age increases; results of this nature were found by Seashore[6].

Test II.

There is apparently a decrease in mean score as age increases, but the difference is not significant. This apparent decrease is due to the tendency of the older children to be relatively inferior in responding to the 'same' tests (page 128) while being superior in the 'different' tests.

Test IV.

There is a significant increase of mean score with age. As the younger children have, on the whole, little ability with the rhythm tests, it is quite reasonable to believe that the songs, marching, singing-games and other musical activities of the infant room have produced this effect. Further, it appears that rhythmic ability is different in kind, to some extent at least, from the abilities used in intensity and pitch estimations, and consists more of functions influenced by training.

The inter-correlation of the tests.

r_{12} means the correlation coefficient between Test I and Test II, the coefficient being worked out treating the children as being in one group. The results are shown below.

$r_{12} = \cdot 66$ P.E. $= \cdot 05$
$r_{24} = -\cdot 02$ P.E. $= \cdot 09$
$r_{14} = \cdot 03$ P.E. $= \cdot 09$

r_{24} and r_{14} are not significant but it is clear that Test IV has little in common with Test I or Test II. r_{12} is significant and shows that there is a certain overlap between the functions measured by Test I and Test II. It might be maintained that this overlap could be due to partial correlation with intelligence, so this question was examined. The children had been examined individually by the Stanford-Binet intelligence scale and the correlation of each test with mental age was worked out. If r_{1g} represents the correlation between Test I and mental age, then the results are:

$r_{1g} = \cdot 53$ P.E. $= \cdot 07$
$r_{2g} = \cdot 56$ P.E. $= \cdot 06$
$r_{4g} = \cdot 11$ P.E. $= \cdot 09$

It will be noted that Test I and Test II resemble each other in the degree to which each is correlated with mental age, suggesting a fair degree of resemblance in the functions measured by the two tests. Also, success in these tests depends to a fair extent on intelligence, but it may be that a good deal of this relation is connected with the influence exerted by intelligence in understanding the instructions and in reasoning about the judgments involved in the test situations, as well as in aiding the formation of other central processes. The relations with intelligence are higher than those found already (page 38), and while it may be the case that the more intelligent child has greater insight into a test situation than has the less intelligent child, with a resulting tendency to more successful performance, we may also regard the mental age of the child, not only as an index of reasoning power, but also of cultural level or experience of life, so that the child of high mental age may be reacting in a test like an older person of average ability (at that new age). Test IV appears to depend little on mental age, a result which is consistent with the observations of page 144, namely that rhythmic ability appeared to be strongly influenced by training as compared with intensity and pitch ability.

The correlation between Tests I and II was then worked out by the method of partial correlation. If r_{12} is the computed (raw) correlation between the two tests, and $r_{12,g}$ represents the correlation when mental age is held constant, then

$$r_{12,g} = \frac{r_{12} - r_{1g} \times r_{2g}}{\sqrt{(1 - r_{1g}^2)(1 - r_{2g}^2)}}$$

$$= \cdot 52$$

There is, therefore, still a considerable degree of correlation between the two tests, i.e., there is a tendency for ability in pitch discrimination to accompany ability to recognise intensity differences; or, to put it another way, there is a group factor overlapping these abilities. While the existence of this factor is clear, the explanation of its existence is difficult. It may be due to some broad psychological factor which might be called 'the music factor'; if this were so, it would justify the use of general, unqualified terms like 'musical talent', 'musical capacity', 'musicality', and so on. It would be a little strange, however, if such a broad factor existed and had so little influence on rhythmic ability, or, indeed, on the results of any other of the tests which have been used.

Another explanation , not essentially different from the preceding one, is possible. It has been seen that ability in pitch discrimination tends to be accompanied by ability in intensity discrimination. This may be due to the fact that when a child hears pitch variation in speech this is accompanied by variation in intensity. For example, in "Johnny, come here", there is both pitch and intensity variation. Vocal communication between human beings, and of course animals, is facilitated by a recognition not only of pitch changes but also of intensity changes. There is no need to elaborate this point. It is clear that meanings of different emotional content, of different urgencies to the individual and the gregarious unit, can be conveyed by inflections both of pitch and intensity. So sensitive are birds and animals to rallying or directional cues that this is quite a plausible explanation of the relation observed experimentally; that is, the relation between the pitch and intensity tests may be due to a genetic development which is biologically serviceable. From infancy the child is aware of inflections of pitch and intensity because such observance aids the satisfaction of his wants. At the same time musical experience fortifies and develops this concomitant perception but is probably an adjunct rather than an essential part of the training process during the pre-school years.

It might be pointed out, however, that speech is delivered in a speech rhythm, so that the rhythm test should also show a fairly high relation with the two other tests. Now speech, on the whole, does not employ regular rhythms (as distinguished from poetry) nor does it employ a few standard rhythms. On the contrary it employs a diversity of rhythmic figures, while on the other hand Occidental music is characterised by the use of relatively few rhythmic figures. Consequently, although speech is rhythmic, it probably does not give much practice in perceiving the rhythms commonly used in music. If it did, one would expect more regularity in the order of difficulty of the items used in the rhythm test (page 139). Further, the increase of ability in the rhythm test with increasing age suggests that specific training in music, which will of course embody the characteristic rhythms of music, plays a large part in this development; a part large in comparison with the influence of the extraneous pre-school rhythmic experience. It will be noted that this is a somewhat surprising result. Rhythmic perception is not on a high level of attainment without specific direction and training. It is no doubt a development of kinaesthetic experience, but not so 'natural' and direct as the development of pitch and intensity abilities from non-specific sources.

Without systematically analysing the tests of pitch, intensity and rhythm to determine the degree of difficulty of each test item one can observe that the ability shown by the subjects in the pitch and intensity tests appears to be distinctly greater than in the rhythm tests, particularly if one maintains that rhythmic figures show Gestalt organisation, that is, that they can be regarded as units. As a result of the rhythm experiments one could conclude that this organisation of rhythms into units does not take place up to and including the five year old stage. Such children doubtless hear the elements of a rhythmic figure as single notes or as a very vaguely perceived pattern. On the other hand, the abilities shown in pitch and intensity show that these two foundations of melody perception and training are in a healthy condition, but, as will be noted from previous tests, that other foundations - ability in duration, rhythm and tonality - are weak.

This leads to some conclusions as to the form the music course for young children should take. The singing of simple songs, listening to songs, marching, action songs, percussion band work are all obvious activities in such a course and are in use in schools. But the ability to observe intensity changes shows that guidance as to intensity accent is not so important as guidance in developing ability in perceiving duration, rhythm and tonality. Consequently percussion band work should hold an important position (as an enjoyable activity, not as a pedantic task in which the reading of music is attempted). Music making as a joy in itself is the object of the infant room, but the wise teacher can look ahead and design the music which is used so as to remedy most effectively those weaknesses mentioned above.

Norms.

Tables for converting scores into percentile values are given in the appendix, page 434 . Since the age-groups of 5 and 6 years are small and since it is not definitely the case that the mean scores for the two groups show an increase with age for the given age range, these norms can certainly not be regarded as being accurate. Nevertheless the reliability coefficients are fairly high and the testing of the individuals was carried out carefully, so that the tables should be capable of giving useful results. Norms obtained from the table for the whole group can be considered in relation to norms read from either of the other tables.

A consideration of individual cases.

The results of the three tests were aggregated by changing each score into the corresponding sigma score (z), adding the results and taking the average for each person.

If X is the score in a given test, M is the mean score for that test and σ the standard deviation, then $z = \frac{X - M}{\sigma}$.

In this work the two groups of age 5 and age 6 were treated as one group. The older children have had the benefit of some music teaching, so that the grouping is hardly justified, but the statistical method is more suitable to the larger group. Actually the number of younger children who came out well in the test is quite comparable with the number of older children; so, although this does not remove the objection, it suggests that no great harm is being done by this procedure.

The grading obtained by the use of average z score, together with age, mental age and intelligence quotient, is shown in the Appendix, page 435.

An important question now is, "Does this test measure musical ability in an important or useful form?" Clearly not much information can be obtained about the children at this age, but the teacher was asked to report any manifestations of musical interest or ability (e.g., the ability to sing any songs with a reasonable degree of accuracy in pitch, ability to whistle, the exhibition of well-defined interest in school music activities). It was found that most of those in the top quartile of the z scores (table referred to above) had shown some indications of this nature to mark them off from the others. This was an encouraging result, but a clearer indication is desirable. The teachers were asked to assess the pupils in the group tested so that the children could be graded for musical ability. Three years later an estimate derived from teachers (obtained from a discussion amongst them) was taken, so that the efficiency of the estimate could be as high as possible. This estimate was a three grade classification. A - those distinctly above average, B - those who appeared to be quite average, and C - those who were distinctly below average. (In all discussion with teachers the writer was careful not to refer to the test results, or at least to be non-committal in any reference to them.) The proportion A:B:C was to be of the 1:2:1 type as nearly as possible, children were to be estimated in relation to others of the same age and school experience, and where there were border line cases the tendency should be to place these in class B. A similar classification of the 1:2:1 type was worked out on the basis of the z scores and the mean square contingency coefficient

(C) was worked out between the two classifications. The table for this is shown below.

		School estimate		
		A	B	C
Test	A	9	4	0
	B	2	18	5
	C	0	6	7

C = ·61.

G. U. Yule[72] has shown that in a 3 × 3 classification C cannot exceed ·816. An approximate correction for C can be obtained by dividing ·61 by ·816, and C then becomes ·75. If C = 0, $P.E._C = \frac{\cdot 6745}{\sqrt{N}} = \cdot 094$, so that either of the above values of C is significant. While Yule recommends a 5 × 5 classification it is doubtful if this is worth attempting in teachers' estimates of musical ability (at least in so far as the latter is considered apart from written examinations, which are, in any case, not likely to be reliable). The agreement between the two estimates is high, in fact higher than that usually found. Some circumstances explain why this is more likely with young children than with older ones. (1) Musical ability at this stage is simple. Appreciation as a factor apart from performance is negligible. (2) The musical activity and interest of the young child in school is usually obvious to the observer. He sings, marches, plays or listens with overt pleasure or overt dissatisfaction. (3) The estimation was carefully done by teachers whose classes were smaller than usual, in which more individual attention was given, and the teachers were interested in music. (4) Intelligence influences the tests in the direction of high scoring and probably also influences the teachers' judgments similarly. (The contingency coefficient between the teachers' estimates and intelligence is C = ·42 and this becomes C = ·51 when corrected. That is, the music tests appear to be measures of something more than intelligence, and this something is involved in teachers' estimates of musical abilities. To put it another way, the teachers' estimates are not merely estimates of intelligence.)

The value of C suggests that the test has significant prognostic value, so that the use of this test at an early age would serve to mark out those for whom special training in music seems suitable.

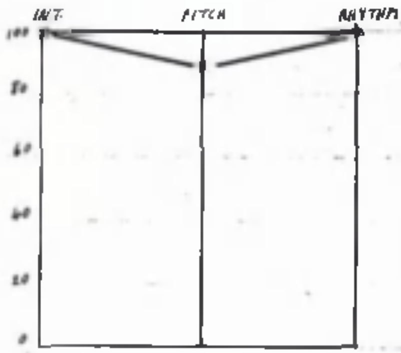
Certain individual cases of interest are discussed overleaf. Profiles have been drawn for these and discussed in the light of information obtained from school.

H. McM. AGE = $6\frac{10}{12}$ MA. = $9\frac{2}{12}$. I.Q. = 134

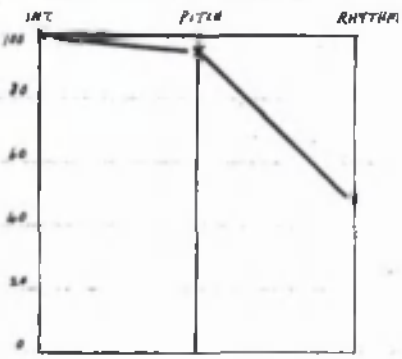
(All correct in Test V. Poor at Test III)

L. McM. AGE = $5\frac{8}{12}$. MA = 7 I.Q. = 123

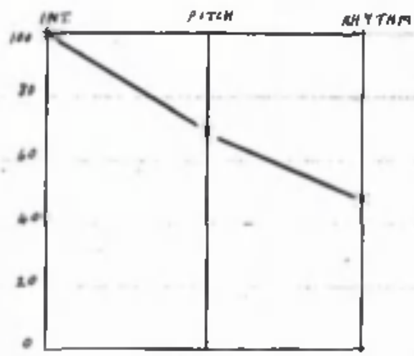
(All correct Test V. Quite good Test III)



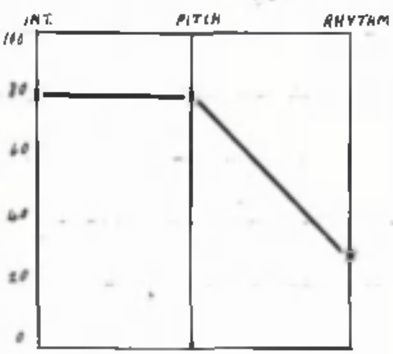
J. McD. AGE = $5\frac{8}{12}$. MA = $6\frac{4}{12}$. I.Q. = 113.
(GOOD TEST III. Fairly good Test V)



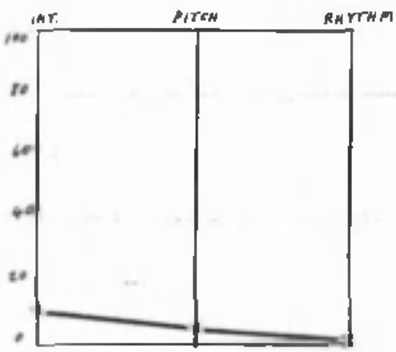
V. S. AGE = $6\frac{10}{12}$ M.A. = $6\frac{4}{12}$. I.Q. = 93
(Poor in Tests III and V)



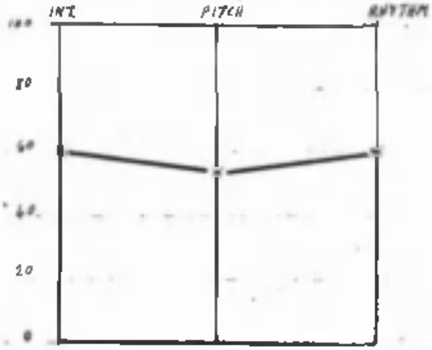
M. McA. AGE = $6\frac{10}{12}$. M.A. = 9. I.Q. = 132
(All correct Test V. Fairly good Test III)



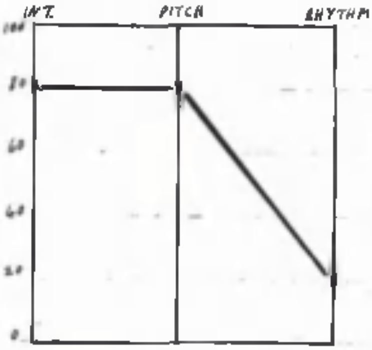
J. M. AGE = $5\frac{4}{12}$. M.A. = $5\frac{8}{12}$. I.Q. = 105
(POOR IN TESTS III AND V)



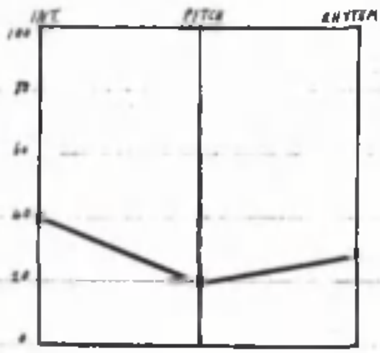
M.D. AGE = 6 $\frac{[illegible]}{12}$. M.A. = 6 $\frac{[illegible]}{12}$. I.Q. = 100
(All correct Test V; poor in Test III)



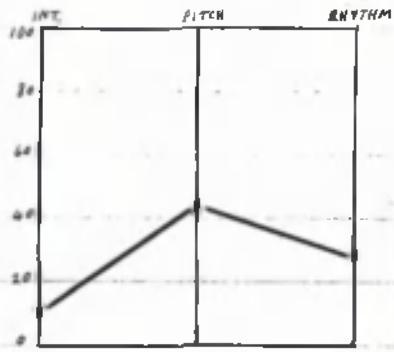
A.D. AGE = 6 $\frac{6}{12}$. M.A. = 8 $\frac{10}{12}$. I.Q. = 136
(Poor in Tests III and V)



B.T. AGE = 6 $\frac{6}{12}$. M.A. = 6. I.Q. = 92



J.T. AGE = 5 $\frac{[illegible]}{12}$. M.A. = 5 $\frac{[illegible]}{12}$. I.Q. = 95



(Both equally weak in Tests III and V)

<u>Discussion of individual results. (profiles shown in preceding pages).</u>

Subject:- H. McM.

Best boy in test. Best profile. First report from teacher (after test):- "Smart, intelligent boy. Pleasant manner. Could sing six songs when he started school". Second report (three years later):- "Very interested in music. Good home conditions. Mother plays piano. Excellent at all subjects." (Teacher's estimate:- A).

Subject:- L. McM.

Best girl in test. Pitch ability not quite so good as intensity and rhythm abilities. First report:- "Could sing a few songs when she started school". Second report:- "Good all-round pupil. Parents both sing. Good home conditions. Very interested in music". (A).

Subject:- J. McD. (Fourth place in test).

Rhythm relatively weak. First report:- "Shy boy. Bad 'mixer' with other children." Second report:- "Sings well, but does not appear to be interested in any school subject. Moody." (A)

His I.Q. is 113 so that his school report indicates a discrepancy between ability and capacity. It seems very likely that emotional factors disturb his play contacts with others, and may explain why rhythmic ability is rather weak.

Subject:- V. S. (Eighth place in test).

Pitch and rhythm relatively weak. First report:- "Italian parents. Active personality. Quite good singer." Second report:- "Poor at school subjects, but interested in music. Good singer. Time weak." (A).

It is not very informative to hear that a child is 'weak in time', since this could be said of many different types of people with musical accomplishments of one kind or another. On further enquiry it appeared that the boy could sing songs learned outside school but the 'flow' or rhythm of his singing was erratic and rather poor compared with his voice quality and enthusiasm.

It could not be said that he was worse in time ability than most pupils. This is an interesting case, for it is verified by the profile, and may show the influence of nationality in the way of custom exhibited by the parents (or possibly by much listening to Italian broadcasting stations).

Subject:- M. McA. (Twelfth place in test).

Good in intensity and pitch discrimination. Distinctly weak in rhythm. I.Q. 132. First report:- "Good singer. Active personality." Second report:- "Good singer. All-round ability, but inattentive. Tends to lose interest quickly." (A)

This is an interesting type. With intellectual ability well above the rank and file of her class mates, she doubtless becomes bored with a pedestrian rate of learning and shows this by inattention. There probably develops in her the attitude that she is different from her class mates and this attitude may affect the development of rhythmic ability, either through non-co-operation in play or by antagonistic emotional factors. This case resembles that of J. McD. on preceding page. Promotion to a higher class would be a sensible remedy to make her a better scholar and perhaps even a better musician.

Subject:- J. M. (Worst subject in test).

Poor at all three tests. Average intelligence. No first report. Second report:- "Not interested in music. Appears tone deaf. Quite good pupil." (C)

His I.Q. is 105 so that he should be quite average in school attainment. The 'tone deafness' is consistent with the poor abilities exhibited in the tests of pitch and intensity discrimination.

Subject:- M.D. (Sixteenth place in test).

First report:- "Cousin of A.D." Second report:- "Average at music. Cousin of A.D." (B)

Subject:- A.D. (Seventeenth place in test).

First report:- "Cousin of M.D. Clever boy." Second report:- "Average at music. Excellent at other subjects. Cousin of M.D." (B)

These latter two cases are of some interest. M.D. is a girl of average intelligence and her profile for the music tests is average with no marked difference in the three tests. A.D., her cousin, is a boy of very high intelligence (I.Q. 136), has pitch and intensity well developed to an equal extent, but is very weak at rhythmic ability. His superiority to his cousin in pitch and intensity is probably due to the correlation of these abilities with intelligence. On further enquiry it appeared that although he was quite cheerful and active, he did not make friends readily with other pupils, so that it is possible that his very poor ability in the rhythm test may be due to lack of development of the functions subserving rhythmic ability, this being due to restraint in gregarious play or to emotional factors. It will be seen that his profile resembles those of M. McA., and J. McD., two other intelligent pupils. The average z score for M.D. is ·43 while that for A.D., is ·42. (consecutive values).

Subject:- B. T.

First report:- "Dull pupil." Second report:- "Dull pupil but average at music. Sister of J. T." (B)

Subject:- J. T.

No first report. Second report:- "Dull pupil. Average at music. Brother of B. T." (B)

The I.Q's of these two pupils are low and of the same order of size. The profiles are much the same, of low abilities, with J. T. slightly superior in pitch ability. As in the case of the cousins mentioned above, the average z scores of the brother and sister are remarkably close. (-·79 and -·76 repectively; consecutive values).

While one cannot deduce much from such relationships because of the small number of cases, these resemblances suggest that hereditary as well as environmental influences play a part in determining musical ability.

Variability in the tests.

Differences in the values of V, the coefficient of variation, page 142 are not significant, so it is impossible to conclude if children are greater or less variable as age increases. One can only adopt the tentative conclusion that abilities in the pitch and intensity tests are much the same at both ages, but children in the older group may be less variable in the rhythm test as age increases, possibly due to the effect of school activities in producing uniformity of ability.

Sex difference.

No significant difference due to sex was found in any of the three tests.

THE TEST APPLIED TO HIGHER AGES.

The preceding results provide a survey of the psychological equipment of young children for the perception of musical experience. It will be noted that considerable individual differences have been found. Some of the children who have just entered school have a markedly superior ability relative to those who show ability which is very small. Nevertheless the 'zero' of musical ability from the teacher's point of view can, as a result of these experiments, be justifiably placed at the crude ability level of the child entering school. It was thought next that it would be of interest to try to locate an age level at which abilities of a more complex and more musically useful nature could be observed, while at the same time noting the effect of age on the tests hitherto used.

An important ability in pitch perception is that of deciding if a note is 'high' or 'low'. This is a judgment which in many musicians appears to be absolute, although actually there is often a comparison between two pitch levels, sometimes with middle C of the pianoforte or more usually with the 'tessitura' or middle level of the voice of the person making the judgment. In dealing with young children it was considered that a definite basis of comparison should be made; that is, a note is played and a second note has to be judged to be higher or lower than the first. This ability of naming a note on a high-low spatial basis is not an artificial luxury in the musician's attainments. It is an ability which serves to co-ordinate visual, auditory and kinaesthetic modes of perception so that an individual may be more efficient than he would otherwise be in recognising the progression of a melody, or of one melody in relation to others, including accompaniment structures.

The ability of children to perform this type of naming was examined, together with naming of the 'soft-loud' (intensity) and 'long-short' (duration) forms. The subjects consisted of 14 children of age 7 years and 16 children of age 8 years. Each child was tested individually so that the work was somewhat laborious and restricted the number of children in the samples. These numbers were not as large as one would wish, but certain results emerged which were of interest in a first approach to such testing.

The tests.

(1) The first part of the test was identical with that used for younger children. (The five tests described on page 123 with the same instructions.) It was observed that the older children understood the nature of each task much more quickly than did the younger children - an interesting insight which suggested an increase with age of the musical functions which were involved. This part

of the test was called the 'Spontaneous' part.

(2) The 'Named' tests.

Test I. (of the earlier test). Intensity.

Instructions:- "Listen to this sound. (Middle C, piano). This is called a soft sound. Listen to this sound. (Middle C, forte). This is called a loud sound. Now listen to these two sounds. (Middle C, piano, followed by Middle C, forte). The last sound was loud. Listen to these two sounds. (Middle C twice, piano). The second sound was soft. Let me see if you can do this one." (E, p and f; G, p and p; C', f and p.)

(Then test should begin).

Test II. Pitch.

Instructions:- "Listen to this sound. (Middle C), and then this sound (C"). This last one is called high. Now listen again. (C" followed by Middle C). This last one is called low. Here is another answer. Listen to this (Middle C and Middle C). This last is called the same, because it sounds just the very same. (Instructions repeated in their entirety here). Let me see if you can do this." (G, E'; F#, F#; A', E.)

Test III. Duration.

Similar instructions for long and short. Demonstrate with 𝅗𝅥 ♩, ♩ 𝅗𝅥 and ♩ ♩ , then practice given with ♩ 𝅗𝅥 ; 𝅗𝅥 𝅗𝅥 ; 𝅗𝅥. ♩ . (Middle C used throughout).

(Then test should begin).

Notes:-

(a) The instructions should be repeated and the practice examples continued until the child appears to understand the test. The judgment of 'same' in Tests II and III appeared to cause difficulty. These 'same' practice examples required most practice and it will be seen that the 'same' judgments gave peculiar results and called for special attention in scoring.

(b) It might be objected that by using the same material the results would be affected by practice effects. An attempt to compensate for this was made by carrying out the 'Naming' test at an interval of about a month from the 'Spontaneous' test. The interval would probably cause a very great deal of loss in any memorised material (due to "oblivescence"). Yet although this is very likely, it is not a complete answer to the question. The surprising result in the naming of Test I appeared to be reasonably explicable as a practice effect (page 159). This was noticed after a few subjects had been tested, so an important modification in procedure was introduced. The second half of each group of subjects performed the named test first and then the spontaneous test at an interval of about one month. No appreciable difference in the results was observed so the effect of oblivescence is probably adequate. (The results of this section are intended to give results of a rough nature. No large scale investigation was contemplated.)

Results.

Scoring each item, with 1 mark for a correct response and -1 for a wrong response.

Spontaneous test.

Test	I	II	III	IV	V
Means Age 7 Age 8	6·0 10·6	14·0 25·4	3·4 3·5	5·0 7·4	0·7 1·0
Maximum possible score	16	30	8	9	3

These may be compared with the corresponding results for the younger children (page 142) in the table below.

Test	I	II	III	IV	V
Means Age 5 Age 6 {Age 5+ Age 6	3·9 5·0 4·4	11·6 9·3 10·6	1·7 ·2 1·0	1·5 2·7 2·1	·6 ·3 ·5

These means have been plotted on the graphs (Appendix, page 437). Test I shows a steady increase in the ability to perceive differences in intensities as age increases. In Test II (pitch) there occurs the drop due to the weakness of the 6 year olds in responding to the 'same' items. Again there is the appearance of an increase due to age, at least in the upper ages. In Test III (duration) the upper age groups perform better than the lower, but no steady increase is demonstrated. In Test IV (rhythm) there is a steady increase with age. In Test V there is a humble level of achievement with an indication of a slight increase with age. To a musician this must appear extraordinary. Briefly, children from ages 5 to 8 years have no strongly developed ability to discriminate (1) the major from the minor chord (2) the major scale from itself when repeated (3) the major and minor scale. This appears exceedingly easy to the musical person, yet, on the whole, these children are weak at such discriminations, although of course some individuals among them are quite satisfactory. It may be thought that three tests are quite insufficient to demonstrate this. As against this, one may maintain that if children cannot discriminate such fundamental and apparently simple material it appears useless to elaborate on such test items.

Clearly the results of Test V show the great weakness of teacher-centred pedagogy as illustrated, say, by the Curwen system. These children can sing with zest and accuracy of pitch, yet this facility co-exists with the uncertainties shown in Test V. To teach them the Curwen steps would be likely to stultify their interest in singing, and it is doubtful if any fruitful result would accrue: for, if singing does not give enough opportunity to develop a melodic sense sufficient to make Test V an easy task, then it appears futile to try pedantic steps of the Curwen type.

It is very likely that maturation of function is involved here, of a type requiring several years. From this point of view the child gradually acquires, by listening to music and performing it, the power of realising those sets of pitch relations known as the major scale, the minor scale, the major chord, and so on. The formation of these conceptual relations is slow (graph of Test V) but is doubtless aided by a suitable choice of school music (e.g., melodies using a good deal of scale movement). The development of facility in sol-fa verbalisation from singing such music hastens the development of conceptual relations of pitch and leads to efficiency in reading. It should be noted that the 'transfer' of pitch discrimination from the singing of the children to the performance of Test V is not marked, but the recommendations above seem a reasonable mode of facilitating such a transfer.

It may be objected that the 'Rights minus Wrongs' method of scoring is unsound for Test V - a reasonable objection. The table below shows the means when 1 mark is given for a correct answer and 0 for a wrong answer.

Test	V
Age 5	1·8
Age 6	1·7
Age 7	1·9
Age 8	2·3

This set of results places the matter in a more encouraging light, yet the conclusion still holds, namely that abilities to discriminate fundamentals of scale and chord are quite weak at these ages. (To a teacher of music this will be less surprising if he reflects that these tests are probably at least as hard to these young children as tests using diminished and augmented triads, etc., would be to older children.)

Naming tests.

Test		I	II	III
Mean	Age 7	9·0	0·6	1·9
	Age 8	15·9	8·3	3·3
Maximum possible score		16	15	4

In scoring tests II and III, it was decided to ignore the 'same' items because the response 'same' so rarely occurred. The children by an overwhelming majority responded to these as if one note were different from the other.

When the table above is compared with the corresponding table at the top of page 157 it will be seen that the process of naming produces differences, as compared with the results for the 'spontaneous' tests. For both ages, the naming of 'high' and 'low' notes is more difficult than the perception that the notes of a test pair are the same or different in pitch. This is what one would expect. The naming of intensity differences is quite different; the mean scores for the naming tests are higher than those in the spontaneous tests. It might be the case that this result had occurred by chance, but this possibility was examined by considering the significance of the difference between the means for age 7 in the two forms of Test I, and also the significance of the corresponding difference for age 8, using Fisher's "t" test for small samples[69]. The values of t are respectively 4·1 and 12·2 which give clearly significant differences. This may appear extraordinary. One might think that it would be easier for these children to recognise that a pair of sounds were different in intensity than to say that the second of the pair is 'soft' or 'loud'. This would express an adult opinion, and there is consequently the possibility that the child mind would react in a way different to the adult mind.

There are some reasons why the experimental result may be less surprising than it would appear to be. (1) In listening to two notes the child has to deduce a relation ('same' or 'different') involving the comparison of the intensities of the two notes. The deduction of relations is difficult for children and needs a certain maturation of mental ability (page 126).

(2) In presenting the naming test one is presenting two notes from which a relation may be deduced (e.g., "The second note is softer than the first",) and this would be difficult if notes of a wide range of differing intensities were played to the child. It is questionable if the children did solve the problems by deducing relations. They may have reacted to the second note primarily, regarding it as a single stimulus which could be described as 'loud' or 'soft'. If this were the case, reacting to the single stimulus could be a simpler task, psychologically, than reacting to two stimuli in order to deduce a relation. The form of the instructions and practice for the test make this alternative mode of reaction possible, but the instructions were couched in such a form as to make the purpose of the test more evident. It had been found that the younger children (age 5 and 6) had more or less zero ability in this naming test, so that it seemed reasonable not to complicate the instructions when testing the older children.

(3) Even if the latter explanation were regarded as reasonable, it might be maintained that a similar occurrence should appear in Test II. It is highly questionable if the naming of pitch, and the naming of intensity are comparable tasks. 'Loud' and 'soft' are names made familiar to the child at an early age. Punishment, exhortation, rewards, and other forms of social approval and disapproval are factors presented to the growing child which have a strong effect in making him realise the difference between loud and soft. Such realisation is both biologically and socially serviceable. The case for pitch naming is not so strong. In discussing the results of pitch tests with younger children (page 146) it was suggested that biological and social factors had doubtless influence on the development of pitch ability, but the relating of pitch to spatial and kinaesthetic discriminations is not a matter of utility to the child. (In fact, the child might regard other 'pitch-names' as more obvious than 'high' or 'low'. For example, 'whistley' and 'boomy', or 'angry' and 'pleasant'; the latter ('pleasant') referring to 'high-medium', derived from the mother's voice, or 'low-medium', derived from the father's. And so on. The distinction 'high-low' is a convention in music, derived primarily from the kinaesthetic sensations of the singer, and extended to include other forms of note production. It would be logical, but not convenient, for the pianist to describe pitch progression as 'right-left', or the violinist or trombone player as 'out-in'. Less sensible terminology can be found in music, as the naming of organ stops, to mention one example, would show.) The naming 'high-low' for pitch is

a clear, general-purpose form of terminology. It has, however, less of the utility shown by 'soft-loud'.

(4) The interest of children (and adults, including musicians) in loud music is obvious. No doubt this interest is related to (3) above (particularly in play aspects) and to the test results.

In Test III (duration) there is little difference between the named response and the spontaneous response, but the results suggest the organisation of a time-sense, for discriminating differences in short durations, at approximately the age level of 8 years.

The order of difficulty of the pitch test.

The items of the test were arranged in order of difficulty by observing the number of persons in the group who were correct in a given item. This was done for age 7 and age 8 separately, both for the spontaneous form of the test and for the named form. The results are in the Appendix, page 442.

The reactions of the subjects to 'same' items (Tests II and III).

On page 159 it was mentioned that the answers to 'same' items were ignored because so very few of these were correct. The total numbers of answers of each kind are shown below.

RESPONSES TO 'SAME' ITEMS.

TEST	NO. OF TESTS	AGE 7 (14 subjects)	AGE 8 (16 subjects)
II	15	85 HIGH, 118 LOW, 7 SAME	88 HIGH, 135 LOW, 17 SAME
III	4	38 SHORT, 18 LONG, 0 SAME	39 SHORT, 25 LONG, 0 SAME

When the χ^2 test is applied to each of these four distributions (halving and sharing the 'same' responses) it is found that P is less than ·05 except in the case of Test III, Age 8. Hence in the three other cases, the distributions differ significantly from chance distributions. Thus, in Test II, the subjects are extremely weak in responding 'same' and definitely tend to answer 'low' instead. This may be due to the formation of a belief that 'low' is a zero level with which other notes are compared (or perhaps a manifestation of that 'mental set' postulated in the view that melodies tend downwards, page 129).

The children of age 7 tend definitely to respond 'short' instead of 'same'. This is much more comprehensible. Just as performers (singers, choirs, congregations, and the like) tend to shorten terminal sustained notes, it is probable that a similar and premature relaxation of effort leads the child to regard the second note as being shorter than the first, a process encouraged by the characteristic and rapid decrement of a piano sound. (This is unfortunate for testing purposes, yet to a musically trained person the decrement is small at the tempo of the tests. Of course, the judgment of duration combined with a fading tone is important in music; nevertheless the effect of piano tone is a possible qualification of the significance of the results, particularly if the child does not listen carefully, but not, I think, an important one.)

As for Test III, age 8, the lack of significance, statistically, is explicable by the growth of ability in duration estimates from age 7 to age 8.

While no great weight need be attached to these results since the samples are small and verification is desirable, the results are sufficiently marked to suggest some teaching methods:- (a) Pitch: Songs with repeated notes, little monotones with interesting words, and listening to melodies with repeated notes would be helpful in building up the concept of 'sameness in pitch' besides being valuable for inculcating scale sense. (b) Duration: Marching, clapping, and other physical exercises in time to music should be helpful, but it is important that the child should learn that equality of movement is related to equality of duration or tempo, so direct instruction is essential. (The theories and practice of Jaques Dalcroze, are interesting in relation to such matters, e.g.,[87].)

Norms.

These are given in the Appendix, page 443, though they naturally call for wider investigation. They may be serviceable, however, in their present form. These norms are given in three forms:-

Table A.

These results are a continuation of those already tabulated for younger children, (page 147), and may be used for comparing the abilities of children of different ages.

Table B.

The results of all five tests in the 'spontaneous' form. In Test IV, it was decided to score all the items ('same' as well as 'different' items) so that the maximum score is 9, while in Test V the 'rights minus wrongs' method is abandoned in favour of 'rights' only. (1 mark for a correct answer and 0 for a wrong one). This was done because it seemed fairer to the subjects and because it yielded mean scores showing a greater tendency to increase with age (page 158) than the former method.

Table C.

The results of the 'named' tests. It will be seen that Test I, age 8, is too easy and does not 'spread out' the scores of the subjects.

SUMMARY.

Certain tests, of intensity, pitch, time, rhythmic and simple melodic discrimination, were applied to young school children. The results showed that this was quite practicable and the agreement of the results with the estimates of ability at later ages was marked. The age level of the subjects (5 to 6 years of age) is about the lowest at which attempts at systematic testing may be made, so that the results (and the structure of the tests) are of interest psychologically in providing, at this level, a picture of some components of mental functions concerned with music - i.e., they provide a practical datum-line for the consideration of development.

Intensity tests.

Equal intensities caused more difficulty than unequal.

Pitch tests.

Downward leaps were rather more easily perceived than upward leaps. Equal pitches caused more difficulty to the older children than to the younger. (This may be due to 'mental sets' or to a reduction in spontaneity of response in the older pupils as compared with the younger.) Test items using leaps became easier to the subjects as the size of the leap decreased; but this rule is not always true. Tests using repeated notes presented an order of difficulty depending on the pitch of the notes, an order resembling that for the difficulty of leaps. A leap of a fifth upwards presents more difficulty than the leap of a fifth downwards.

Time tests (tests of duration perception).

Test items using equal durations appeared to be easier than tests using unequal durations. The ability to estimate duration seemed generally to be rudimentary at the age levels considered.

Rhythm tests.

The older children showed a marked superiority over the younger children in tests using different patterns but the reverse was true for tests using identical patterns. The ability to discriminate rhythmic patterns is probably complex at the age levels of the subjects, depending no doubt on several factors such as duration comparison, symmetry comparison, Gestalt perception, attitudes.

Testsusing simple melodic structures.

These tests showed that very poor ability in melodic discrimination is manifested by the subjects.

On the whole the abilities shown by the subjects are humble. Some interesting results on pitch movement agree with the hypothesis of certain musicians about the historical development of melodic sensitivity or discrimination.

The tests of intensity, pitch and rhythm were scored and the tests so formed had high reliability. The rhythm test showed a significant increase of mean score with age. It was found that the intensity and pitch tests showed a marked inter-correlation. This was not entirely accounted for by partial correlation with mental age. When the latter was partialled out, the resulting value of the inter-correlation coefficient was substantial showing the presence of a group factor other than 'g'. The inter-correlations of the rhythm test with each of the other two tests were small.

Individual cases were considered by examining pooled sigma scores, profiles, and teachers' reports.

A high relation was found to exist between the test results and the teachers' estimates compiled three years later. The tests appear therefore to have prognostic value.

When the tests were extended to include children of ages 7 and 8, increases in mean score as age increased were found for the tests of intensity and rhythm discrimination. Less uniform increases were found for the other tests.

A 'naming' form of the test was also applied to these older children, (i.e., the names 'loud' or 'soft' were sought for the terminal notes of the intensity tests, 'high' or 'low' for the pitch tests, and 'long' or 'short' for the duration tests). Naming in the pitch test was a more difficult task than the discrimination of 'same' or 'different' in the earlier form of the test. Naming in the intensity test, on the other hand, was easier than the performance of the earlier form of the test, and this result was clearly significant. Naming in the duration test appeared to make little difference, but the results suggest that the organisation of a time-sense for discriminating differences in short durations becomes noticeably efficient at approximately the age level of 8 years - that is, noticeably compared with younger children.

The application of musical tests to the study of individual reactions to music.

by

JOHN MEIKLEJOHN.

1940.

VOLUME II

VOLUME II.

A TEST OF

"SPONTANEOUS GROUP PERCEPTION."

The object of this test was to present various musical structures, mainly melodic in character, and to examine the ability of the subjects to perceive the existence of various groupings within each of these. For example, if a melody were played, one could ask how many 'motives' (or sections, or groups) were contained in it. Some practice was given to explain the nature of the task, yet it was considered to be important that no principle should be explained for determining grouping. In this way it was hoped that information might be obtained about the tendencies in subjects of different ages to perceive grouping spontaneously within a given percept. The practice was given in two forms - one visual and one auditory.

(1) Visual explanation on blackboard:- "Here is a drawing of a string of beads. There are twelve beads on the string. We would call this one set of beads or one group. But we can take the beads and make two groups out of the one group." (Second drawing) "Six beads make one group and the other six make another group." (This explanation was also extended to show two groups of two and ten beads, four and eight beads, and the reversed positions of these, namely ten and two beads, eight and four beads.)

. . . .

(A further extension was used to show three groups, four groups, five groups and six groups, groups of various sizes being used - that is, both equal and unequal groups). "Look, now, at the first drawing. We said that it showed one group of beads. Without making a space between two beads we could see that there are two groups. Can you see them?" (Experimenter placed finger between 6th and 7th dots to indicate the point of demarcation, then between 2nd and 3rd, 4th and 5th, 5th and 6th, etc., using various positions so that adequate demonstration could be given. This was also done for three and four groups.) "The beads are like the notes in a tune. Sometimes the notes seem to make one group or one set, but sometimes they make two groups or three groups or more."
(Note:- It might be said that these instructions convey suggestion affecting the mode of response of the subjects, e.g. a suggestion that 'spacing' should be expected as a condition of group formation. Although this may be the case, it is difficult to avoid such a result with didactic instructions when an attempt is made to guide the subjects to a clear awareness of the

task which is to be performed. Besides, the concept of grouping inevitably involves segregation of some sort and this is most readily realised in the spatial field. It may therefore be maintained that in spite of the drawbacks of the preceding instructions an attempt has been made to set the subjects on the same level of realising clearly the nature of the task.)

(2) Auditory practice.

Four low notes were played on the piano (G_2, A_2, B_2, C) followed by four high notes (G', A', B', C".) All the notes were of equal duration, with no break between the first set and the second. On a show of hands it was found that the majority recognised two groups.

Next the notes C, D, E, F were played, followed by F, E, D, C with a very short break between the groups. Then C, D; E, F; F, G with a break between each pair equal in duration to that of each pair of notes. Finally, C, E, G; C', E', G'; C", E", G" were played with no break between each group. Almost all the subjects responded to the correct answers, but no indication of success or failure was given by the experimenter.

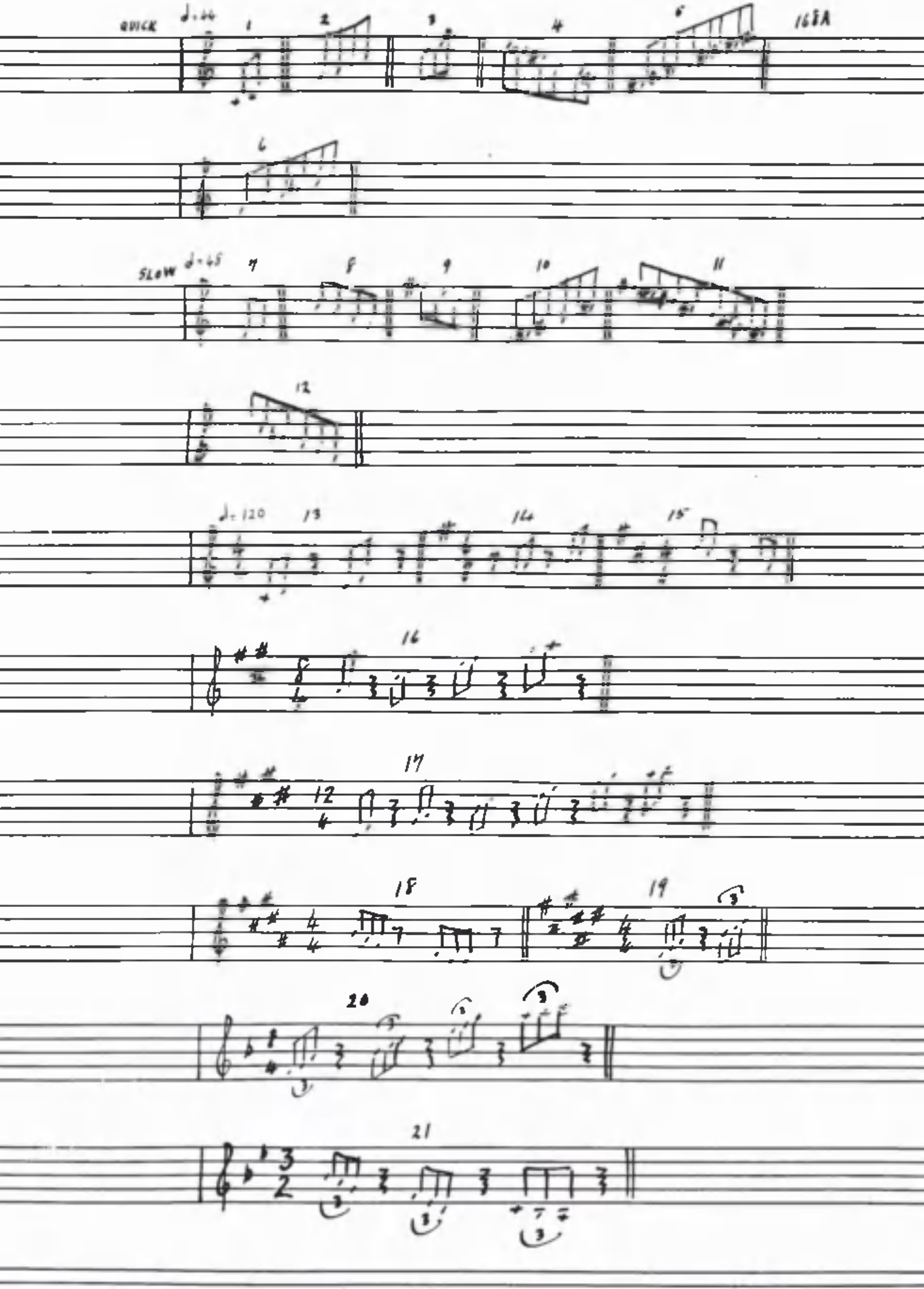
The children were then told to listen carefully to each tune and to write down the number of groups of notes which they heard in each tune. ("How many groups do you hear?"). If however, the tune had notes that seemed to form only one 'bunch' or group, they were to write down 1. Certain of the tests were played more than once in order to note any change in the responses which might accompany repetition. (This will be clear from the tables of results, where N_1, N_2, N_3 refer to such repeated tests.)

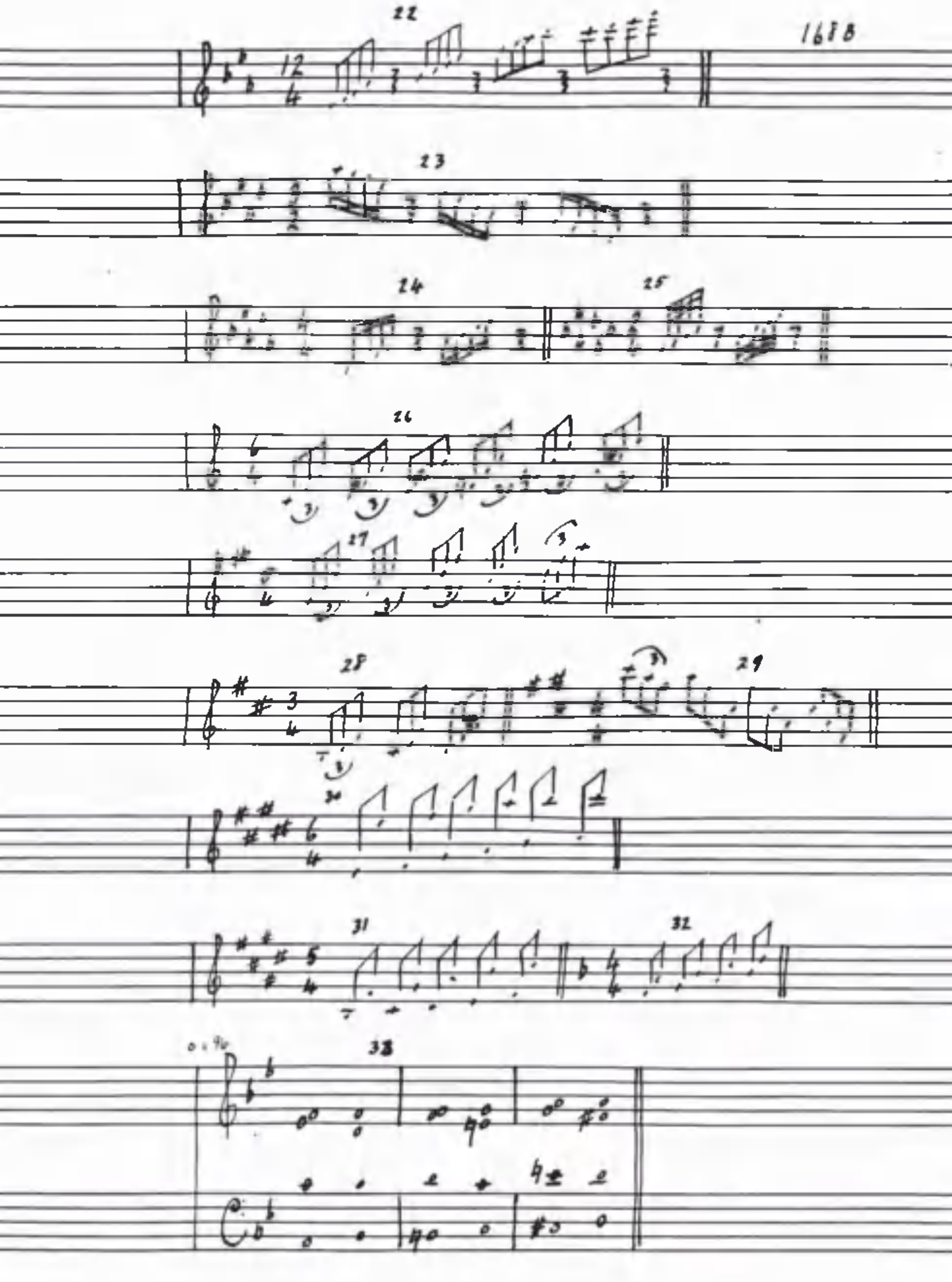
The performance of the tests on the piano calls for a great deal of careful practice so that the tempo of the tests may be correct and so that the notes may be played with even tone without accent or detachment (unless otherwise indicated by the test manuscript.) The experimenter used a tape-metronome to recall exactly the speeds which he had practised.

The tests will be found on the test manuscript. The subjects consisted of 21 school children of age 12, 54 of age 13, and 28 of age 14.

Tests 1 to 25 were administered on one day, 26 to 42 on the following day, and 43 to 67 on the third day. On each successive day the subjects were reminded of the instructions- that the number of 'bunches' or groups in each piece was wanted. Precautions to prevent the transmission or alteration of answers were taken.

GROUP PERCEPTION.

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The results are shown in the appendix, page 445. It will be seen that these are not the raw results for the distribution of the responses but that percentages have been calculated from the raw results.

DISCUSSION OF THE RESULTS.

The tendency to variability of response.

Certain of the tests allow the subjects three trials, viz. tests 26 to 39 and 43 to 67; 39 tests in all. If the three answers of one subject to a given test be called a 'triad', then the variability of response of the group can be estimated by counting all triads showing any change in response number (e.g., 1,2,1, or 3,3,4). The variability of one group compared with another can be considered by expressing this number of triads as a fraction of the total number written by the group (which is, of course, 39 × the number of persons).

The values of this fraction for ages 12, 13 and 14 are ·43, ·47, and ·40 respectively, which suggest a tendency to uniformity of response independent of age. This would lead us to form the hypothesis that intelligence (measured by mental age) had possibly no effect in determining constancy of response, or obversely, variability of response. This hypothesis would arise in connection with questions like "Does the clever child tend to detect the grouping in a musical structure more readily than a dull child?", "Does it detect the grouping not only successfully, but immediately?"

To test this hypothesis, 48 out of the 54 subjects in the group of age 13 were considered. These had been tested with the group test previously described (page 20) and an intelligence test had been performed. The number of triads in which variability of response had been shown by each subject was counted and this number served as a measure of 'variability'. The same number subtracted from 39 gave a measure of 'constancy' for each subject. The Spearman rank coefficient of correlation (ρ) was calculated. The relation between intelligence and 'constancy' of response is given by $\rho = \cdot 01$. (This recalls results by R.D. Walton[73], who found that the measure of oscillation amplitude was almost independent of intelligence level.) This is not significant, so the only conclusion to be drawn is that any relation between these variables is small, if not a chance relation.

The relation between the pooled result of the group test in music (assumed to be a satisfactory index of musical talent in listening to music) and 'variability' of response was given by $\rho = \cdot 26$. By using the formula $P.E_{\rho} = \frac{\cdot 7063(1-\rho^2)}{\sqrt{N}}$ the value of $P.E_{\rho} = \cdot 09$. From the formula $r = 2\sin(\frac{\pi}{6}\rho)$, it is found that $r = \cdot 27$ with $P.E_{r} = \cdot 09$. These values are just a little below the criterion of significance (with $P = \cdot 05$), so that we cannot conclude that there is a significant relation between musical talent (as measured by the group test) and variability of response, although the 'border-line' character of r or ρ suggests that a significant relation might be found after wider experimentation.

Next the teacher's estimate of musical talent was considered. This was a threefold classification, since the teacher was of the opinion that any attempt to obtain a finer estimate would not be justified by her ability to assess the talent of the pupils. The scores of the subjects for 'variability' were used to form three classes, assuming normality of distribution, so that a mean square contingency coefficient (C) could be calculated. It was found that $C = \cdot 47$. By applying Pearson's correction for 'broad categories', the corrected value of C is ·58 which gives a fairly high and significant relation between the teacher's estimate and 'variability'.* It is easy to obtain an explanation of this. The teacher admitted that her estimate of the talent of the pupils was certainly influenced by their singing ability, more particularly by their reading ability (as one would naturally expect), and that this was a major factor in determining her estimate. Now, reading ability in school music is mainly ability in sol-fa reading (and rightly so!), and an important aspect of this ability is the realisation of pitch as something analogous to a vertical spatial distribution ('high-low', 'up-down'), so that good sol-fa readers should show superiority in the development of 'musical imagery' as a compound of auditory, kinaesthetic and visual imagery. This development may explain the relation between the teacher's estimate and 'variability'. It will be noted that the above results lack importance until success of response, in addition to constancy or variability, is examined.

Scoring the test.

Tests 26-39 and 43-67 were considered, since these could be examined for variability of response (as above) and also for successful achievement. In certain of the tests more than one answer seemed reasonably acceptable, so one mark was awarded for either of these. In others, one answer

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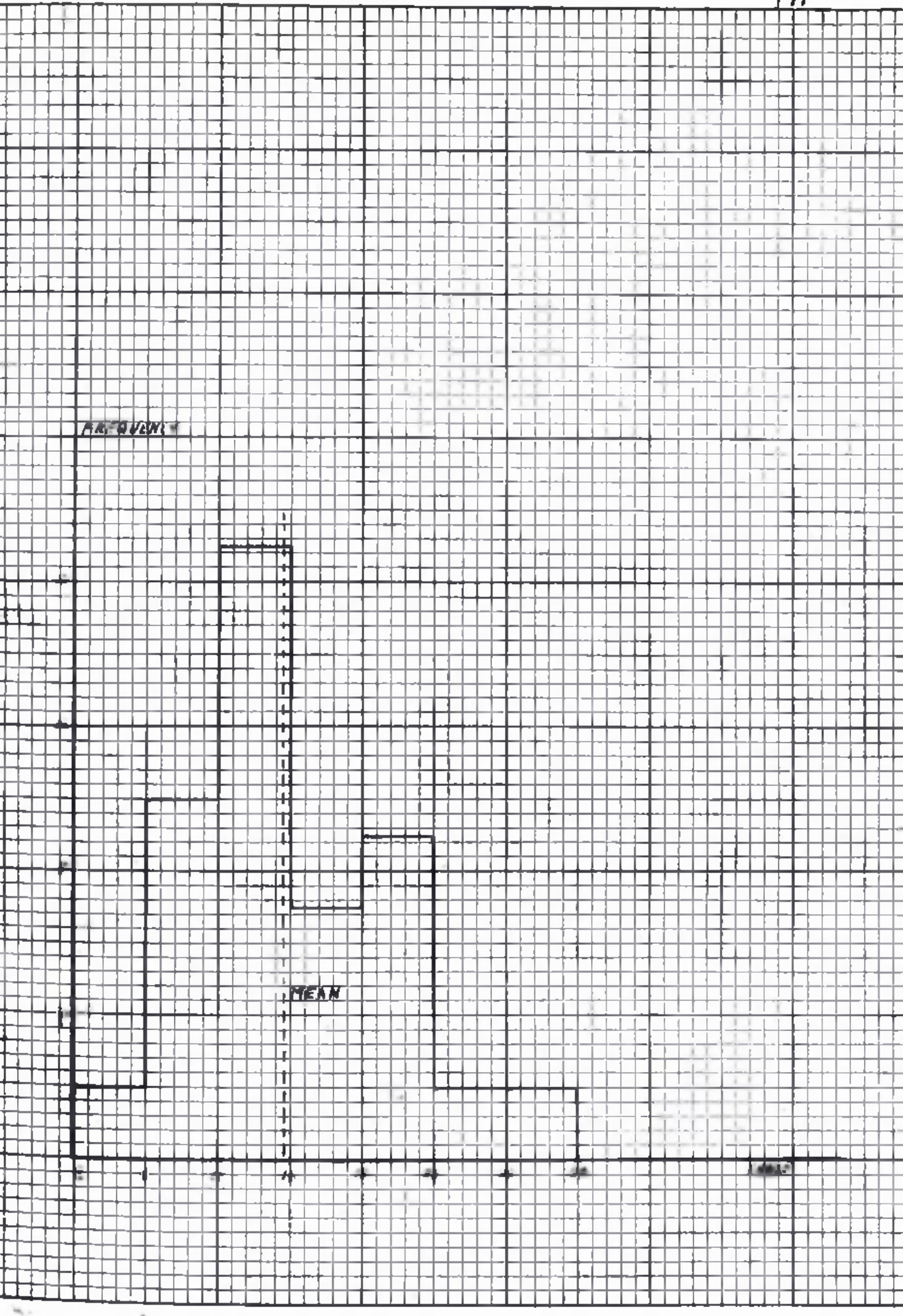
* (Walton (op. cit.) found $r = -0{\cdot}32$ between oscillation measures and teachers' estimates of 'steadiness'.)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could be accepted yet this appeared distinctly less satisfactory than another; in this case the less satisfactory answer was awarded half a mark. The scoring key is shown in the appendix, page 467. Answers in brackets are those awarded ½, whilst the others received 1 mark.

Distribution of scores.

These have been shown on the accompanying graph. The distribution is of the normal frequency type. There is a slight skewness toward the lower scoring range, so that, although the test appears to be within the powers of the group of subjects, it is on the difficult side. Nevertheless the graph compares favourably with many published graphs based on experimental results derived from fairly small groups.

Correlations.

The relation between intelligence and success in the perception test is given by $\rho = \cdot 12$ ($P.E._\rho = \cdot 10$). The derived value of r gives r = ·13. The value of ρ is not significant, so no relation has been established. It is evident, however, that any relation which might be established would be rather small. This suggests that the recognition of groups within a musical structure (at least of the types used in the tests) bears little relation to intelligence, a result already tentatively drawn (page 169). The recognition of such groups is a task which may be associated with Gestalt psychology, so the above conclusion can be paraphrased - shape perception of auditory configurations is a process which is little influenced by intelligence.

It was noted that tests 33-36 were badly done. These consist of sequences of cadences (various forms of perfect cadences). One would expect that the subjects would detect the grouping of the chords into pairs, but, instead, many of them recorded the number of chords. There is, of course, some justification for this, but it is a primitive answer compared with that which involves the recognition of harmonic grouping. 37 out of 48 subjects scored nothing as a total for the four tests. No one scored 4. It is clear, therefore, that the tests were too difficult for the subjects. The results of the eleven subjects, with some additional comments will be found in the appendix, pages 468, 469.

Individual cases were examined, and it was found that most of those who had scored in the test had specific experience, either as a result of specific interest or specific training. On the other hand, the majority of those who had failed to score had no such specific experience. We may conclude, therefore, that specific training leads to increased ability to perform such a test. This suggests that harmonic relations form a type of Gestalt calling for greater powers of perception than melodic Gestalten.

Hence the perception of harmonies, qualified, of course, by the limited experimental data, does not appear to depend noticeably on intelligence, teacher's estimate (which is considerably influenced by melodic ability), or the ranking of the group test (which is a pool of various musical abilities.) It probably depends on specific experience, in which imaginal activation and development are doubtless very important.

In the many-sided musical activities and presentations of to-day, an individual has the opportunity of developing powers of discrimination and shape perception at a rapid rate. The fact that so few of the 'good' subjects, as measured by tests, are successful with the four harmonic tests makes it seem possible that some other consideration, not dealt with above, may be operative. It may, for example, be a mode of shape perception that matures without being greatly influenced by experience, although this would be difficult to examine.

The relation between the pooled result of the group test of musical abilities (page **20**) and scores in the perception test was given by $\rho = \cdot 37$, with $P.E._\rho = \cdot 09$. (The derived value of $r = \cdot 39$ with P.E. = $\cdot 08$). This proves that a significant relation exists, although it is rather small. The relationship is probably due to the fact that perception of 'shape' (particularly melodic shape) is important in performing certain tests in the group test, e.g., Test I (Recognition), Test II (Association with Name), Test III (Melodic Discrimination), Test IV (Form Discrimination), Test V (Emotional Tone Discrimination) and Test VIII (Appropriateness of Performance). Of course, one is assuming a priori that shape perception is important for these tasks. The above result is a verification of this, so that Gestalt psychologists could regard the tasks of the group test as involving their principles of configuration and perception.

The relation between the teacher's estimate and scores in the perception test was worked out by a mean square contingency coefficient. This gives C = $\cdot 38$. Pearson's correction gives the modified value C = $\cdot 46$. This is significant and shows a moderate degree of relationship. (It can be assumed to be greater than the one above). This is likely to be due to the teacher's estimate being influenced by singing and reading ability so that it is an index, of a kind, of ability in shape perception; rather more so, no doubt, than the group test - hence the slightly increased correlation value.

The above results show that shape perception plays a part in certain musical activities, including singing and reading on the imaginal side and that, of course, the more musical person tends to be more successful in shape perception (at least of the type used in this kind of test) - the question raised on page 170. The latter result was also considered by calculating the mean scores of the groups formed on the basis of the teacher's estimate (A, B and C).

Group A:- Mean score in perception test = 16·39
Group B:- Mean = 14·06
Group C:- Mean = 10·77

Fisher's 't' test for the significance of the differences between these means was worked out. For the difference of the first two means, P = ·2. For the second two, P is between ·1 and ·2. For the first and third, P is less than ·01. The first two differences are not significant but the last is, and this, in conjunction with the gradation shown by the means, indicates that there is a significant relationship between the teacher's estimate and success in shape perception.

Relations with the Seashore tests.

(1) Success in the harmonic tests (33-36).

The Seashore results for the group which made a score in these harmonic tests were considered and the mean percentile rank for each Seashore test was worked out. This was also done for the remaining individuals - those who were quite unsuccessful in the harmonic tests. The means are shown below.

	S_1	S_2	S_3	S_4	S_5	S_6
Successful group	69·8	84·3	87·0	63·8	44·0	70·1
Unsuccessful group	58·1	81·9	82·8	61·1	48·3	64·9

It may be recalled that Seashore's tests have the following composition:-

S_1 is the test for Sense of Pitch./

S_1 is the test for Sense of Pitch.
S_2 " " " " " " Intensity.
S_3 " " " " " " Time.
S_4 " " " " " " Consonance.
S_5 " " " " Tonal Memory.
S_6 " " " " Rhythm.

Apart from S_5, the successful group appears to be a little superior to the unsuccessful group in the Seashore measures. Since the successful group consists of 11 individuals and the differences may not be significant (although the almost complete superiority shown in the table of means would make this unlikely), no great weight can be attributed to the results. Yet it seems reasonably evident (although not certain) that the successful group shows superiority in those sensory capacities measured by the Seashore tests. Hence, harmonic sense depends to some extent (probably small) on superiority in the Senses of Pitch, Intensity, Time, Consonance and Rhythm. This is a reasonable conclusion for the cases of Pitch and Consonance, but it is not obvious that Intensity, Time and Rhythm should influence the type of test used in the harmonic tests. It may be that these three senses are involved as the result of the mutual inter-correlations of the Seashore tests, inter-correlations which should be increased (even if only slightly) by musical experience and training such as had occurred in the case of the members of the successful group. Nevertheless, the table of results makes it possible that the perception of harmonic relations depends on the factor of efficiency of sensory capacities, of which the Seashore tests are partial measures. That is, such perception may be influenced by innate factors.

It might be thought that, in view of the superiority of one group over the other in respect of the five Seashore measures, a marked superiority in S_5 should be found; in fact, the greatest superiority. Yet the Tonal Memory Test does not call for the same kind of response as do these perception tests. In the Tonal Memory Test the subject has to perform the complex and difficult task of stating the number of an altered note when a melody is repeated in a modified form. This calls for considerable imaginal and analytic powers. In the perception tests there is a certain amount of analysis possible, but the attention of the subjects is directed towards the perception of groups and resemblances, so that the attitude of the subject is synthetic rather than analytic, the reverse of the Seashore task.

Rank coefficients of correlation were worked out between the scores in the perception test (tests 26-39, 43-67) and each of the Seashore tests. From the values of ρ

obtained in this way, the corresponding values of r were calculated, as shown in the table.

	S_1	S_2	S_3	S_4	S_5	S_6
ρ	·44	·25	·27	·05	·02	·31
$P.E._\rho$	·09	·10	·10	·11	·11	·10
r	·46	·26	·28	·05	·02	·32
$P.E._r$	·08	·10	·10	·10	·10	·09

The correlations between the perception test and S_1 and S_6 are clearly significant, while the correlation with S_3 is just a little above the border line of significance (namely P = ·05). The ability to detect groups in musical structures (at least of the type used in the tests) thus depends on Sense of Pitch, Sense of Rhythm and Sense of Time. The Sense of Intensity would come next in importance, but the table above does not give a significant value. Next come the Sense of Consonance and Tonal Memory. The values of the correlations are not significant but we can conclude that they are definitely small. (The order in which these functions have been mentioned above is the order of decreasing correlation, as given by the table). The results may not appear to be illuminating, since it may be maintained that one would expect such results, but the experimental method puts such conjectures beyond the field of opinion or anecdotal reference.

The influence of the Sense of Pitch on shape perception is clear, since that sense would enable the individual to locate the relative pitches of the constituent notes and hence the direction of the movement in the melody and still further the resemblances of the constituent movements within the whole melodic progression. One can analyse these processes by Spearman's Principles of Cognition[2]. (see appendix, page 470)

We may now enquire if experimental evidence points to one or other of the modes of perception determined by (1) Spearman's analysis or (2) Gestalt theory. The following results may be examined:-

(1) The correlation between the perception test and intelligence is r = ·13 (not significant).
(2) The correlation between the perception test and Sense of Pitch is r = ·46 (P.E. = ·08).
(3) The correlation between 'constancy' of response and intelligence is r = ·01 (not significant).
(4) The relation between the teacher's estimate and 'variability' of response is given by C = ·58.

(5) The relation between the teacher's estimate and success in the group test is $C = \cdot 46$.

(6) The relation between the group test in music **and** success in the perception test is $r = \cdot 39$ (P.E. = $\cdot 08$).

(7) The character of the responses, obtained from the tables in appendix on page 445. The number of groups perceived may vary in the three attempts of the subjects, by decreasing steadily, increasing steadily, remaining constant, or fluctuating (e.g., 8,7,8; 8,6,9; 8,9,6. These fluctuations are to an equal value, to a greater value, or to a smaller value, respectively.)

The number of values of R (i.e., the number of groups perceived) for N_1, N_2 and N_3 were examined for tests 26-39 and 43-67.

By using probability tests derived from the binomial expansion (distributing the constant value answers and the fluctuation values in different ways) it was found that the probability of the number of decreasing values being due to chance was at least of the order $\frac{1}{64}$, so there is clearly a causal factor tending to produce a diminution in the number of response categories on successive attempts. Suppose we attempt to weigh the above evidence to see if it favours the Spearman mode of perception or the Gestalt mode.

(1) If successive relations are educed, one would consider that such cognitive operations would give an appreciable correlation with intelligence. This was not found, so this result is rather negative to the Spearman mode. On the other hand, the Gestalt psychologists would maintain that shape perception is an immediate experience and is little influenced by cognitive processes, so the experimental result would favour this side.

(2) The correlation between the perception test and the Sense of Pitch is $r = \cdot 46$, showing that this musical sense is more important than intelligence in determining success in shape perception. The sense of pitch will be important in the first stage of the process analysed by the Spearman principle, while the music is being heard and a primary memory image formed, and important when imaginal processes are called into play at other stages of the analysis, yet it is rather strange that cognitive processes should appear to have less importance than those involved in pitch perception. This points rather to the Gestalt explanation.

(3) Constancy of response appears to be little influenced by intelligence. Yet one would expect that the intelligent person, by virtue of his ability to educe,

check, and modify the relations he observed, would tend to be correct after the first hearing, and, of course, maintain his first response as a more definite answer on succeeding auditions. This does not occur, so this tends to weaken the evidence for the Spearman view.

(4) The relation between the teacher's estimate and variability of response is given by C = ·58. This suggests a fairly large relation between the possession of good imagery equipment, or the ability to frame appropriate trial shape patterns to represent the given perception, and variability. The correlation value makes one believe that such trials of patterns take place as an important mode of test solution, and this points rather more to the Spearman view than to the Gestalt view.

(5) C = ·46 shows the relation between the teacher's estimate and success in obtaining the correct answer. This points rather to the Gestalt view.

(6) r = ·39 shows the relation between the group test in music and success in the perception test. Neither of these tests depends much on intelligence, so the overlap may be due to 'musical response patterns' of specific and general types, and therefore the overlap points to the Gestalt view rather than to the Spearman view.

(7) The character of the responses, which has been shown to indicate the influence of a definite tendency to a reduction in the number of response categories, does not at first sight point either to the Spearman or to the Gestalt view. But when the amount of reduction is examined, it is seen to be small, usually one (e.g., 8,8,7; 11,10,10), so that the number of subjects who give a wide number of categories in their responses rapidly reduces on successive hearings. From this point of view, then, the character of the responses shows a degree of stability which favours more the Gestalt view than the Spearman view.

It will be noted that none of the above indications definitely excludes one or other of the modes of response which are in question. This is not surprising. In psychology a given phenomenon is capable of several explanations. The most acceptable is the one which fits the details most exactly and which shows most consistency in explaining allied phenomena. On the whole, the experimental results point more to the Gestalt view, although it is quite probable that analysis of the Spearman type takes place, either independently or in relation to Gestalt perception. Of the seven points of evidence, six point to the Gestalt mode, and one away from it. The binomial test gives the probability of this occurring by chance as $\frac{3}{64}$, so the evidence appears to be conclusive, so far as these experimental results are concerned.

Turning now to the Sense of Rhythm, it may be asked why there should be an overlap between this function and success in the perception tests, and more especially with regard to the Sense of Time. As the tests were played without accent or any detaching of one note from another (unless specially marked on the test manuscript), the overlap with the Sense of Rhythm is certain to be due to the operation of some common ability in group perception - a result again pointing to the Gestalt view.

With regard to the Sense of Time, it should be remembered that equal notes are used in almost all the tests, but doubtless those subjects who are successful in both the Seashore and the perception tests have a well developed power of recalling the temporal relations of auditory data by means of imagery, and their development of imagery could account for the relation between the tests.

With regard to the Sense of Intensity, the correlation value on page 176 is not significant, but it is almost as large as the value obtained with S_3 and substantially bigger than the values obtained for S_4 and S_5. It is possible that this value is due to the subjects 'projecting' an accent on to the given melody at different points, that is, by the operation of central processes of an imaginal nature; some at least of the subjects could hear certain notes as being louder than others. These pseudo-accented notes would facilitate the perception of groups. This question of projection will be referred to later. One can observe the existence of the effect by introspecting. A music teacher of wide experience in teaching the piano discussed this matter with the writer and was asked if he had noticed this effect. He said that he had found it most obviously with blind pupils. The teacher had been surprised to find that many of these, in spite of outstanding ability with aural tests (e.g., the recognition of accent and time) played the piano with a striking lack of accent and intensity gradation. It was soon apparent that they heard accents in their own performances which the teacher could not hear, and were astonished to learn that he could not hear them. After this, he had to instruct them carefully to play accented notes suitably. This is an interesting example of a mental projection of intensity value so that the mind, by reason of its own activity, contributes something extra to a given experience, so that the individual perceives an experience differing from that which objective conditions would be expected to determine. This again is a characteristic of the Gestalt problem.

The effect of age on success in the perception test.

The mean scores of the three groups are:- Age 12, mean = 15·81; Age 13, mean = 13·85; Age 14, mean = 13·02. There is no significant difference between the means, and that for age 13, the larger group, is more accurate. The apparent decrease as age increases is doubtless due to the youngest group possessing pupils of superior ability, while the eldest group was deficient in these. The most satisfactory result will be to consider that ability in group perception is approximately constant over this age range, and the table of norms below will apply to this age range. (The table has been derived from all the results, but is almost exactly the same as a similar table suitable for age 13).

Score	Percentile value
$28\frac{1}{2}$	100
$21\frac{1}{2}$	90
$19\frac{1}{2}$	80
17	70
$15\frac{1}{2}$	60
$13\frac{1}{2}$	50
$11\frac{1}{2}$	40
$10\frac{1}{2}$	30
9	20
7	10
3	0

A CONSIDERATION OF THE SEPARATE TESTS.

It is of interest to observe how the subjects respond to each test. The modal response, that is, the most commonly occurring answer, can be taken as the typical or representative answer, and we can observe how this alters as the age of the group increases, and note any peculiarities which it may show. These data, together with various comments and statistical measures, will be found in the appendix, page 472.

In Tests 13 to 25 the majority of the subjects give the responses which one would expect from the objective structure of the tests, a result showing that detachment of one group from another by means of a rest is a major factor in ease of perception. This reminds us of the saying, 'Rests must be played as exactly as notes', which means, of course, that the careful observance of rest values is essential to present to the listener the phrasing, and hence the organic structure, of the music. It can be shown, with a little experimentation, that children can hear broad phrases as units or groups (e.g., the 4 phrases of the typical hymn tune). It is not so obvious that short groups of the 'motive' type can be perceived, whereas the results show that this is so.

As a practical application of this result, the teacher can introduce analysis of musical structures at an earlier age than is usually done, (e.g., age 12, or perhaps a little younger, instead of at a later age). Naturally no one accepting the doctrine of interest would urge that much of this should be done. The enjoyment of music, together with a wide and varied experience of good music, are cardinal aims in the teaching of children. Nevertheless a little analysis of motives, imitations, and other structures, is interesting to the pupils and provides an elementary basis for future analysis.

It is noteworthy how rapidly the children respond to the tests. Many of these are very short (the shortest being Test 25, of duration ·63 seconds), so the subjects have not much time in which to perceive the groups. This reminds us of an important aspect of musical perception, namely, the perception of varied group forms at a considerable speed (e.g., in listening to the instruments of an orchestra, to a fugue, and so on). This rapid activation of perceptual processes flowing in the field of time is of great importance in listening to music and these tests indicate that this is not a prerogative of the musician or trained listener, but a development of capacities found in quite young children.

The subjects who gave the response "1" in tests 26 to 42.

It was considered desirable to examine in some detail the question of the response "1". There are several possibilities which occur in attempting to explain the incidence of this response. It may be due to the subjects finding the tests to be so difficult that they can discern no organisation of the test structure into component groups. If this were the case, the response could be "1", signifying the inability of the subjects to perceive groups, or the response could be large, approximating or being equal to the number of notes in the test. The latter tendency was obvious in the harmonic tests, 33 to 36, where the number of chords composing the test was unmistakably preponderant, but it was very slight in the other tests.

Another reason for the response "1" would be the capacity of the subjects to perceive long groups. In ordinary reading, inferior readers perceive a sentence as being made up of separate words, and even, if they are very inferior, of separate letters, whereas good readers perceive a sentence as being made up of a few component sections, perhaps only of one section. This is a matter of organisation in perception and it is obvious that a similar phenomenon could occur in auditory perception. Some subjects may be capable of perceiving broad groups to the extent that the musical structures used in these tests are perceived as units. Indeed, an enlightened teacher of musical composition would instruct his pupils to think in phrases primarily and to think of the notes and chords secondarily. This dictum would emphasise the importance of progression, building up to climax points to give the composition structure and coherence. From this point of view, it is possible that subjects with a broad span of perception may give the response "1".

Again, some subjects may be indifferent to the task and use the response "1" to avoid effort. In all mental testing one has to trust the subjects not to adopt such an attitude, but there is always the possibility that it will occur in some form. The writer has noticed, however, in all the music tests that the children were interested in the tasks, no doubt to some extent because of the element of novelty, and, on being questioned, the great majority professed a liking for the tests. On the whole, it is rather unlikely that "dodging the difficulty" is an important factor, although certainly it is an indeterminate one.

The tests which received the response "1" were tests 26 to 32, 41 and 42. The test which received most "1's" was test 29 while that which received least was test 42. The order for a decreasing frequency of "1's" is 29, 41, 28, 26, 30, 27, 32, 31 and 42 and shows some relation to the order of difficulty of the test items. (As the frequency of "1's" decreases the tests should become easier, if difficulty were the sole reason for the occurrence of "1's". This is only partly true, according to the lists. In addition, the difficult tests received none of the "1" responses - the "stroboscopic" tests, 37 to 39, and, less relevantly, the harmonic tests, 33 to 36.) These observations show that difficulty is only one factor producing the "1" responses and is certainly not exclusively important.

Of the 54 subjects in Group B, 43 gave the response "1" in one or more of the above tests. The total number of these responses was 202, so it is evident that some of the subjects responded "1" frequently (the frequency ranged from 9 down to 1). Of the 11 subjects who did not give any response of "1", it was clear that these were of superior musical abilities. However, 43 is a considerable fraction of 54, so a further analysis is desirable, since amongst the 43 subjects both superior and inferior individuals can be expected.

The first analysis took place with the group of 43 subjects. There are 9 tests (26 to 32, 41 and 42) so that the tendency to respond "1" can be represented by a score ranging from 9 to 1 for these subjects, (and 9 to 0 for the group of 54 subjects). First a rank coefficient was worked out between the results of the perception test and the "1" scores. (Let us call these the U scores, in future, U representing unity.) The coefficient was $\rho = \cdot 30$ with P.E: = ·09, and is significant. Hence there is a fairly small relationship between increasing efficiency in group perception and diminished tendency to give U responses, i.e., the subjects who are superior in group perception tend to give few U responses. Contingency coefficients were worked out between U categories and the teacher's estimate of musical talent, and also between these categories and the results of the group test of musical abilities. In each case the coefficient was of zero order and was not significant.

It is not sound statistically to work out correlations in this way, since 11 of the 54 subjects in the group have been omitted and this procedure is likely to have altered the 'normal' distribution of the variates concerned, so calculations were worked out for the whole group of 54 subjects. The following Bravais-Pearson values of the correlation coefficients were obtained (M represents the group test of musical abilities, pooled, P the perception test, g the test of mental age, U the scores based on "1" responses, and S_1, S_2, S_3, S_4, S_5, S_6, the Seashore tests.) The probable errors are given after the values of r.

U and M	$r = -\cdot 03 \pm \cdot 10$
U and P	$r = -\cdot 55 \pm \cdot 07$
U and g	$r = -\cdot 01 \pm \cdot 10$
U and S_1	$r = -\cdot 28 \pm \cdot 09$
U and S_2	$r = -\cdot 32 \pm \cdot 09$
U and S_3	$r = -\cdot 17 \pm \cdot 10$
U and S_4	$r = -\cdot 02 \pm \cdot 10$
U and S_5	$r = -\cdot 12 \pm \cdot 10$
U and S_6	$r = -\cdot 14 \pm \cdot 10$

The mean square contingency coefficient between the categories determined by U scores and the teacher's estimate was C = ·12. This corrected gives C = ·15. Since the probable error for C = 0 is ·10, this low degree of relationship is not significant. We can conclude that there may be a tendency for those who are judged to be superior by the teacher to give few U responses, but that this tendency, if it exists, is not marked.

The negative signs of the above values of r are quite consistent. A subject with a large U score is one who gives many U responses, but such a person will have an inferior U rank for computing ρ. Hence if ρ is positive the corresponding r value will be negative and vice versa. In all the above correlation coefficients, therefore, a marked tendency to give U responses tends to accompany reduced values of the other variates, and conversely. The following conclusions can therefore be drawn:-

(1) Intelligence.

No significant relationship exists, but the value is more likely to be negative than positive, so that there is probably a tendency for intelligent subjects to give few U responses. This is doubtless due to such subjects reasoning about similarities of structure within a given test.

(2) The pooled result of the group test of musical abilities.

A similar conclusion to the preceding one, but even less decisive, can be drawn. This agrees with the result obtained from the teacher's estimate.

(3) The perception test.

A fairly large relationship exists between ability in this test and the tendency to give small U responses. Hence, subjects who are successful in the perception tests are unlikely to give U responses. Put in this way, the result seems absurd for it is clear that those who do detect groups in a musical structure are not those who do not! But this is not a reductio ad absurdum, although it may seem like it, because (1) the perception test contains 39 tests, of which only 14 tests are considered for U responses, and of the latter only 7 received U responses, (2) the result is in substantial agreement with the value of ρ obtained from part of the group of subjects, that part which definitely gave U responses, and (3) the result agrees with previous results, where a deficiency in the power of group perception was observed to accompany the tendency to give U responses or a smaller number of groups than would be expected, results derived from test items not included in the perception test. It is possible therefore to draw a perfectly sensible conclusion, although the correlation coefficient may be somewhat exaggerated, and a conclusion which is free from "circular reasoning". Namely, there exists a special ability, or set of abilities, subserving the perception of groups, and subjects possessing this ability do not tend to give U responses. While it may be true that a further step in the organisation of this ability is the emergence of a higher ability, namely that of perceiving one large group instead of a few smaller ones, no indication of this is provided by the experimental results. It may occur at later ages, require special training or wider experience, or it may not occur at all. The results do not answer any of these questions. The results for intelligence, group test in music and teacher's estimate are all consistent with the above view of a special ability or set of abilities.

(4) The Seashore tests.

S_1 (Sense of Pitch):- A small and significant relation exists between Sense of Pitch and the tendency to give few U responses.

S_2 (Sense of Intensity):- A slightly higher and significant relation exists between this sense and the tendency to give few U responses.

S_3 (Sense of Time), S_4 (Sense of Consonance), S_5 (Tonal Memory), S_6 (Sense of Rhythm):- In all these cases, the correlations are small and not significant. The suggested order of descending size is S_3, S_6, S_5, S_4. The correlation results on page 503 cast doubt on the significance of these results although the significant correlations above are capable of reasonable explanation.

In conclusion, the tendency to give responses of "1" appears to be due to inferior ability rather than to superior ability. This is marked in the case of the Seashore tests of Pitch and Intensity, and in the test of ability in group perception. An interesting possibility occurs to explain why no definite result appears with relation to the group test and the teacher's estimate, namely that the tendency to perceive 'long' groups is one aspect of that set of abilities called 'musical ability', but the tendency to perceive 'short' or small groups is another aspect, so that in a broad sampling of these musical abilities, as is provided by the group test or the teacher's estimate, both of these tendencies, which could be called roughly 'synthetic' and 'analytic' respectively, may be represented, though probably to a small extent.

The table in appendix, page 418 shows the modal responses, with the corresponding percentages in brackets, for tests 43 to 67.

The subjects who gave the response "1" to tests 43-67 and to tests 26-67.

This discussion will be found in the appendix, page 500.

(Tests 26 - 42 have already been discussed in this connection, pages 181-185.)

As before, it was found that subjects who gave the response "1" were generally inferior.

THE ORDER OF DIFFICULTY OF THE TESTS.

This order is shown on the accompanying manuscript pages and is a trifle different from the order obtained from the tests when they are grouped in sections. This arises from the use of alternative answers. The present order of difficulty is obtained by taking the best supported of the alternative answers, or the best answer as judged by a special analysis of the results (that is, the answer supported by the more musical subjects.) The percentage of the whole group supporting the answer to a test is also shown. This was called N in a previous section (page 445.) Since the perception of groups depends on various factors (the presence of rests, accents, etc.), it is of interest to examine the relative effectiveness of these factors. In the table below the type of segregating factor is given with the average value of N for the tests using it.

Character of tests	Tests	Average value of N
Use of rests	13 to 25	92·4
Arpeggios (dominant to tonic resolution)	57 to 62	53·7
Use of accent (chromatic scale passages)	40 to 42	42·0
Broken scale passages of "Alberti" type (using 3rds, 5ths, octaves)	30 to 32	40·1
Arpeggios using chords of the 7th.	56	31·1
Passages using whole tone scale	63 to 67	30·9
Arpeggios of common chords	26 to 29	24·3
Major scale	50 and 51	24·3
Melodic passages (sequential)	43 to 55	11·4
Use of rhythmic figures	37 to 39	9·4
Harmonic sequences (dominant to tonic chords)	33 to 36	9·0


TEST 24. RESPONSE 2. 98.1%
21 R = 3 96.1%
23 R = 3 96.1%
16 R = 2 94.2%
19 R = 2 94.2%
26 R = 2 94.2%
13 R = 2 93.2%
16 R = 4 93.2%
20 R = 4 93.2%
22 R = 4 90.3%
15 R = 2 89.3%
18 R = 2 86.4%
17 R = 6 84.5%
40 R = 2 69.8%


60 R=2 62.1%
61 R=2 59.2%
62 R=3 58.2%
59 R=2 49.6%
57 R=2 47.6%
32 R=4 46.6%
58 R=2 45.6%
31 R=6 41.7%
42 R=3 40.3%
67 R=6 39.8%


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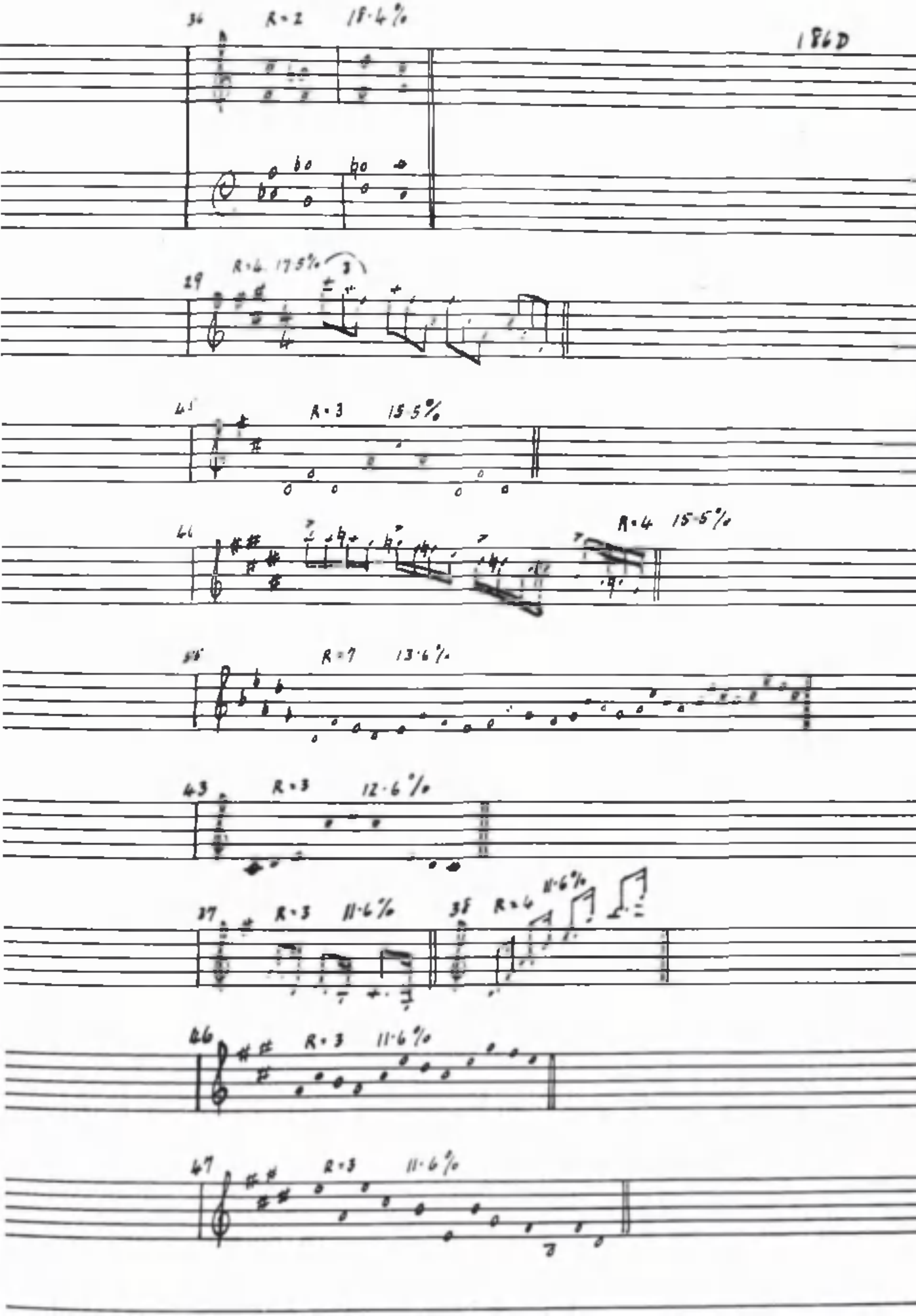
66 R=5 36.9%
30 R=6 32.0%
13 R=1 31.1%
56 R=5 31.1%
28 R=3 30.1%
3
3
3
50 R=6 28.2%
27 R=5 28.2%
3
65 R=6 26.2%
26 R=6 21.4%
3
51 R=6 20.4%
64 R=6 20.4%
49 R=3 19.4%
53 R=4 18.4%


36 R=2 18.4%
29 R=4 17.5%
R=3 15.5%
R=4 15.5%
56 R=7 13.6%
43 R=3 12.6%
37 R=3 11.6%
38 R=4 11.6%
46 R=3 11.6%
47 R=3 11.6%


52 R=4 8.7%
48 R=4 8.7%
35 R=4 8.7%
34 R=5 4.9%
39 R=5. 4.9%
33
56 R=3

44 R = 3 2·9%

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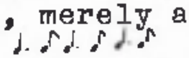
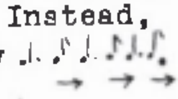
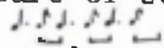
The table gives approximately the importance of each kind of structure in facilitating the perception of groups. Most of the tests use progressions of notes which occur in musical compositions so the results have a general application wider than the test material itself, although, of course, a great deal of further experimentation is desirable in the problems of group perception.

It is interesting, although not surprising, to find that the tests using rests are strikingly easier than the others when groups have to be detected. The effect of accent is seen to be less than would be expected, but it must be remembered that chromatic scale passages were used, so that the results indicate the effect of accent rather more independently of other factors than usually occurs in actual musical compositions. Such other factors could be melodic progression (e.g., leaps, occurrence of a discord), pulse, syncopation, difference of intensity levels (e.g., forte and piano), time accent, and so on. The use of the dominant-tonic resolution in arpeggio form gives the second easiest type, but the use of the dominant-tonic resolution in harmonic sequences gives the hardest type. This shows that the subjects are able to recognise the organic unity of a chord very much more easily than the organic unity of a cadence, resolution or harmonic progression. This may seem a very obvious result since the recognition of the latter would appear to be functionally more difficult; yet the ease shown in the recognition of chord unity appears to depend on the use of the familiar progression "dominant to tonic", for the subjects find tests 57 to 62 much easier than tests 26 to 29 in which arpeggios based on common chords are used. One would expect the latter tests to be the easier, yet this is not found by experiment, so it is reasonable to think that familiarity of harmonic progression has operated to aid the perception of unity within a chord, and yet this same familiarity of harmonic progression is not sufficiently focal to enable the subjects to perceive resolutions as units in tests 33 to 36.

The low position of the major scale indicating considerable difficulty need not be regarded as being other than doubtful, since in the actual scoring of the perception test three alternative answers are considered to be acceptable whereas the best supported of these is used for the order of difficulty. The three tests using "rhythmic figures" are rather unnatural from the listener's point of view. If perception were a process of apprehending isolated experiences (i.e., merely a process of sensation) then rhythmic figures like  would be recognised as six entities and processes of judgment would lead readily to the recognition of three groups. But, as has been said already, perception does not take this "static" form in these tests. Instead, a "dynamic" form occurs which may be represented by 

It is well known in the playing of musical instruments or in singing that the accurate performance of such a progression is facilitated, and accuracy aided, by the performer directing his muscular activity from the short note to the long note. Hence he comes to judge the structure of such a progression as being, not  but  . It would therefore be natural for musicians to give responses like those obtained in the experiments or at least tending in the same direction. (Or perhaps to say that the passage was meaningless, illogical, unbalanced, unmusical, and so on. This, it should be noted, is an objection based on 'phenomenal' grounds, not on objective or logical grounds. The passage  is perfectly self-contained and 'logical', according to the textbooks on the rudiments of music, and consists of three identical groups. A musician who objected to this test would virtually be a Gestalt psychologist.) If, then, musicians did give responses like those obtained, one could say that this was due to habit - a habit of perception derived from a habit of performance - that the processes indicated by the arrows in the second drawing above were primarily kinaesthetic in origin. But it is very surprising indeed that children who have never heard rules about progression should respond in this dynamic way. It is true that they also might be influenced by kinaesthetic derivatives, but, if so, these must be very important since the great majority of the group appear to act under this influence. While this may be the case, it does not necessitate rejecting this hypothesis if a wider view is taken of the matter by regarding the dynamic process as a correlate of Gestalt psychology, especially as it recalls certain visual processes, as mentioned already. Apart from this, it is of considerable interest to note that the experimental results show that the form of perception represented by the arrows is the natural and spontaneous form of perception adopted by the untrained listener.

There was only one test, number 56, using a sequence of arpeggios of 7th chords, so the position of this type of test on a scale of difficulty is doubtful. It is difficult to see why this test should be easier than those using arpeggios of common chords but harder than those using arpeggios of the dominant to tonic resolution.

Most surprising is the position of the melodic passages using some form of sequence (tests 43 to 55). The difficulty of these tests throws great doubt on the widely held view that children acquire by experience a skill in learning, remembering and analysing melodies which is far in advance of their skill in dealing with other musical data. This view of 'melodic sense' is apt to confuse what 'should be' with what actually 'is', and to regard 'melodic sense' as a unitary function subserving many operations dealing with melodies. It is true that most children learn and remember a fair number of melodies, but the reproduction of these by whistling or singing may not connote much in the way of functional development. Indeed, the latter would be shown much more obviously in the learning, analysis or performance of some other task in relation to melodies which are new to the children. In the previous table there is nothing to show that, as far as the perception of groups is concerned, 'melodic sense' is superior to 'harmonic sense', 'time sense', or 'intensity sense'. Actually, the writer agrees that children should learn music, firstly by rhythmic work (percussion band, marching, dancing) leading to, and integrating with, singing, the main object of this progression being hedonistic. But the hedonistic object is not sufficient since it cannot be expected to produce more than loosely developed and loosely integrated musical functions, at least for the average child. Without subordinating the pleasure principle in any way, the progress of the pupil calls for a planning of teaching material and method based on adequate testing and checking with a clear recognition of immediate objectives as well as remote objectives. (For example, it is reasonable to think that all children should be able to read at least simple sol-fa passages. This is a remote objective to a teacher with a percussion band but it does not follow that she should try to get her young charges to read percussion band scores in a few weeks. This is not even an immediate objective, for the pleasure principle would make it necessary to encourage the young children to beat noisily and enjoy themselves. The immediate objective at this stage is to encourage this play to become related and subordinated to the accompanying piano music, with another immediate objective in the form of relating action-songs, marches and other movements to percussion band work. This gives an example of pleasurable activity directed to immediate and remote objectives.)

To achieve this end considerable study into the pedagogics of music is required. For example, instead of teaching songs and hoping that a wide range of learned songs will develop musical taste without further consideration, the teacher could associate the songs with sol-fa pitch and time names, either to learn new songs (this is commonly done) or in the reproduction of known songs (this is not common). These procedures develop pitch and time pattern formations without necessarily interfering with the pupils' enjoyment of music. Other melodic activities could be the recognition of a melody when a counter theme is played above it, the determination of which form of accompaniment suits best a given melody (e.g., chords, broken chords, a single accompanying part, major or minor mode, etc.), the recognition of a melody when the first three notes have been played, or when the melody is played at a quick or a slow tempo. And so on. There is a wide field here for a teacher's ingenuity. Such devices link up, in easy stages, melodic ability of a simple form with other musical functions, and are designed to develop a comprehensive melodic ability.

It is noteworthy that the subjects are weak in detecting the sequences in tests 43 to 55, which is a strong recommendation for teaching melody by means of sequences; that is, sequence teaching is one aspect of the development of melodic ability.

It is interesting to observe that the tests using the whole tone scale appear to be easier than tests 43 to 55. The intervals used in the former tests are less familiar than those used in the latter, which suggests that familiar intervals and progressions make the detection of groups harder - no doubt because of harmonic effects. Yet one would like pupils to be so proficient in detecting melodic shape that harmonic effects could not be a hindrance - another reason for teaching sol-fa and sequences.

It can also be seen from the order of difficulty that in the dominant to tonic arpeggios (tests 57 to 62) the 3rd and 2nd inversions of the dominant 7th chords produce easier tests than the 1st inversion or the root position. The same result is true for the tests on harmonic progression (tests 33 to 36) where dominant to tonic harmony is used. The resemblance is more striking when it is recalled that the former tests involve the recognition of unity within a chord, but the latter involve unity within a harmonic progression (a pair of chords). This result suggests a resemblance between the two tasks, as was mentioned on page 187.

SUMMARY.

A test was devised to examine the ability of children to perceive grouping within a given musical structure. Some observations were made on the reactions of the subjects to the first part of the test and the second part was scored and tentatively standardised, to form what was called 'the perception test' (i.e., perception of groups).

Ability to perceive groups (i.e., motives, short phrases) in the material used showed little correlation with intelligence, but some overlap with singing ability appeared evident, (particularly in the reading of sol-fa notation).

Ability in the perception test gave significant but rather small correlations with success in the group test of musical abilities (page 20) and with certain Seashore measures (Pitch, Rhythm, Time).

The tendency to give the response '1' for the number of groups in the test items was found generally to be indicative of inferior abilities.

The relative importance of various factors like rests, arpeggio grouping, accent, etc., in facilitating the segregation of groups was examined.

NOTE:
Some references to Gestalt psychology have been made in this section and in the previous one.

Gurney's explanation[95] of the sadness of the minor triad compared with the major chord in terms of tension, balance, momentum, etc., of melodic progression reminds us of Gestalt concepts.

QUESTIONNAIRE RESULTS.

The questionnaire shown in Appendix, page 514 , was used to estimate the relative importance of various preferences with respect tc musical matters.

The administration of the questionnaire.

The questionnaire was given to school pupils and to adults. The latter were given it individually and various instructions and suggestions of methods of response given. Thus it was in the case of the adults easy to answer questions and discuss various responses. The school pupils were given the questionnaire in groups and each group worked through each section of the questionnaire under supervision. The first sheet of the questionnaire concerns the interests of the examinees. Each 'subject' was explained (e.g. 'biology' means 'nature study'), but the examinees were warned not to enter a number against any subject which after paraphrasing and explanation was still unknown to them.(e.g. philosophy and psychology for younger pupils). In the case of 'Music', listening to music was intended and this was pointed out. In the case of 'Paintings or Drawings', looking at these was intended.

Where preferences were asked for, the subjects were told that if they found it difficult to decide which item was most preferred they should say to themselves , "If I were left like Robinson Crusoe on a desert island and I had only one choice, which would I take? After that, if I were allowed a second choice, which would I take? And so on ...." Where frequency of hearing various combinations or single instruments was asked for, it was suggested that they think of the music which they heard (1) last night, (2) last week, and if possible (3) last month, or (4) over a longer period. Where an item was of little importance to the subjects, this should be left blank. The subjects were told to think out their preferences and other answers carefully and were told that they had plenty of time for each set of questions. Before starting each set, the supervisor read the instructions, gave explanations as indicated above at appropriate points, and answered any questions. Needless to say, one has to guard against suggestion in doing this. In the case of 'Modern music', it was explained that this meant recently composed music. There is no difficulty in this term for musical adults, but it was explained to the average adult. The children were told that it meant recently composed music, not dance music, but it is likely that the significance was lost on them, being confused to some extent at least, with modern and popular tunes.

The Junior Questionnaire.

Before considering the results obtained from the preceding questionnaire, which will be called the 'Senior Questionnaire", it will be well to discuss the results

BOYS

Boys	Number of subjects	Questionnaire items																
		[illegible]	SOFT	SLOW	QUICK	FIERCE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	WIRE	CON	SYM	[illegible]	[illegible]	[illegible]
Age		1a	1b	1c	1d	2a	2b	2c	3a	3b	3c	4a	4b	4c	4d	4e	4f	4g
10 to 11+	27	41	44	19	70	74	30	56	19	37	85	67	82	44	33	4	26	15
12 to 14+	40	53	40	18	70	68	43	30	13	28	90	55	78	55	15	8	25	15

GIRLS

Age	Number of subjects	Items																
		1a	1b	1c	1d	2a	2b	2c	3a	3b	3c	4a	4b	4c	4d	4e	4f	4g
10 to 11+	29	38	66	10	59	41	79	17	24	28	83	45	52	59	21	7	59	7
12 to 14+	26	8	85	19	54	46	77	35	4	31	92	25	77	54	8	19	46	19

BOYS AND GIRLS (separate)

Age	Number of subjects	Items																
		1a	1b	1c	1d	2a	2b	2c	3a	3b	3c	4a	4b	4c	4d	4e	4f	4g
Boys 10 to 14+	67	48	42	18	70	70	37	40	15	31	88	60	79	51	9	6	25	15
Girls 10 to 14+	55	26	75	15	56	44	78	25	15	29	87	35	64	56	15	13	53	13

BOYS AND GIRLS (pooled)

Age	Number of subjects	Items																
		1a	1b	1c	1d	2a	2b	2c	3a	3b	3c	4a	4b	4c	4d	4e	4f	4g
10 to 11+	56	39	55	14	64	57	55	36	21	32	84	55	66	52	11	5	43	11
12 to 14+	66	35	58	18	64	59	56	32	9	29	91	42	77	55	12	12	33	17

ALL SUBJECTS

Age	Number of subjects	Items																
		1a	1b	1c	1d	2a	2b	2c	3a	3b	3c	4a	4b	4c	4d	4e	4f	4g
10 to 14+	122	37	57	16	64	58	56	34	15	30	88	48	72	53	11	9	38	16

obtained from a shortened form of it, which will be called the 'Junior Questionnaire'. This will be found in the Appendix, page 520 .

It will be seen that this modified questionnaire has an 'Exercise' section consisting of two practice tests containing items which are, on the whole, capable of sharply divided selection. As in the case of the Senior Questionnaire, the junior form was taken as a class activity with the same kind of verbal explanations.

Results.(Junior form of questionnaire.)

This form was administered to school children, with ages ranging from 10 years to 14+. The tables on page 194 show the percentage of first choices given to a questionnaire item, expressed as a percentage of the number of individuals in the group. That is, the tables contain the values of P, where

$$P = \frac{\text{number of 1 responses to the item}}{\text{number of individuals.}} \times 100$$

It will be seen that the subjects are grouped in various ways with respect to age and sex.

Consideration of the results.

Test I. The order of preference for different types of music is shown below, the most preferred type being first; and the lists indicate various classifications according to age and sex.

Boys, 10 to 11+	Quick, Soft, Loud, Slow.
Boys, 12 to 14+	Quick, Loud, Soft, Slow.
All boys, 10 to 14+	Quick, Loud, Soft, Slow.
Girls, 10 to 11 +	Soft, Quick, Loud, Slow.
Girls, 12 to 14 +	Soft, Quick, Slow, Loud.
All girls, 10 to 14+	Soft, Quick, Loud, Slow.
Boys and girls, 10 to 11+	Quick, Soft, Loud, Slow.
Boys and girls, 12 to 14+	Soft, Quick, Loud, Slow.
Whole group, 10 to 14 +	Quick, Soft, Loud, Slow.

It may be advisable to consider at this point the standpoint which will be adopted in considering the results, especially in the matter of significance in the statistics. In the first place, it may be objected that the use of a questionnaire is of doubtful value since it is an inherent difficulty in the formation of a questionnaire that the questions are non-specific, to some degree at least. As a matter of correct scientific procedure, it could be maintained that the issues raised by this questionnaire can only be settled by aural testing, that is, by getting groups of subjects to listen to numbers of musical compositions of different types. The writer agrees, yet it is clear that such an experimental study would be one of considerable length and difficulty. In fact, the difficulties arising in the course of it might not be very much less than those arising from the use of a questionnaire. Further, the questions in the questionnaire arise from very common experiences, namely the listening to various types of music, which, in these days of school music teaching and wireless broadcast listening, may be everyday experiences. In these ways, the subjects tend to have an equality of experience which would have been very much less possible in the past, up to about fifteen years ago, so that, broadly speaking, the situation differs only in degree from the experimental situation. Hence the questionnaire can be taken to give broad distinctions, prevailing trends, which may give conclusions which will agree with controlled experimental results; but one cannot assume that this is the case. One can only draw these broad conclusions as preliminaries to experiment, realising that they point to special problems for which experimental verifications are desirable, and that they provide temporary and approximate results. With regard to the significance of the statistics, it is true that one should test for significance in the search for definite results, but in view of the labour involved in the numerous questionnaire data, little will be done here in the testing of significance, especially when the desirability of experimental verification of the broad questionnaire results is accepted. Thus the conclusions drawn from the questionnaire will lack a good deal of definiteness, but similarity of trend in the various series of results will be taken as a reasonable, though not, of course, certain, indication of significance. Finally, it may be asked, "Why ask questions of the generalised form used in the questionnaire?". The answer is, because it is sought to show that the questionnaire form is adaptable to musical investigations, and, much more important, because the questionnaire should give some information, about the attitudes of people towards various kinds of music. These attitudes, which are of the nature of 'sentiments', will dispose people to seek to hear some compositions more than others, will be of help to the teacher in preparing schemes of work (since the attitudes will help to decide which compositions should be used in order to interest his pupils readily or to give a balanced experience of music; for example, if he believes that a class has a preference for quick, soft music, compositions of this type will tend to arouse interest, while compositions of the loud, slow or loud-slow type of a direct and obvious appeal can be introduced to 'balance' the interest of the pupils, or at least to provide the opportunity for this), and will be of interest for programme construction. It would be illuminating to compare the questionnaire results with an analysis of broadcasting programmes.

Returning to the lists of preferences for Test I, it will be seen that boys tend to prefer quick, loud music to soft, slow music, whereas girls tend to prefer quick, soft music to loud, slow music.(i.e. boys will tend to prefer quick loud music and probably quick or loud music to the other varieties indicated.)

The standard error of a difference of percentages is $\sqrt{\frac{p_1q_1}{N_1} + \frac{p_2q_2}{N_2}}$, where the symbols have the usual meanings, and can be used for the differences in the tabulated values. There is not a significant difference between the 'loud' and 'soft' values for the boys of age 10 to 11+, but there is between the 'soft' and 'slow' values. There is not a significant difference between the 'loud' and 'soft' values for the older boys but there is between the 'loud' and 'slow' values and the 'quick' and 'loud' values. Comparing the two groups of boys, there is no significance in the position of 'soft' compared with 'loud' in the younger group as compared with the older group, so that the order obtained from the whole group can be accepted. If the whole group of boys is compared with the whole group of girls, the percentage difference of 'soft' in the lists is significant when tested by the statistical criterion and shows a definite sex-difference. In the table for girls (p. 194) the percentage for test Ia in the case of the older group is surprisingly small. The value differs significantly from the corresponding value for the younger girls and also from each of the two values for boys. This marked reduction in the preference for loud music in the case of the older girls may be due to the onset of adolescence with its disturbance to emotional balance, for there is no significant increase with age for boys. That is, if we suppose that the onset of adolescence in girls produces emotional disturbances (e.g. fear, timidity, worries, introversion, increased pudor, reserve and shyness.) which is a reasonable assumption, whereas emotional disturbances in boys occur later than in the case of girls and generally point to an increase in quasi-aggressive tendencies, these results about attitude to music appear consistent and are of interest in showing the possibility of the attitudes of an individual to music being indices of character development.

Test II.

2a will be designated by the word 'March', 2b by 'Dance' and 2c by 'Images'. The preference series become:-

Boys, 10 to 11+	March, Images, Dance.
Boys, 12 to 14+	March, Dance, Images.
All boys, 10 to 14+	March, Images, Dance.
Girls, 10 to 11+.	Dance, March, Images.
Girls, 12 to 14.+	Dance, March, Images.
All girls, 10 to 14+.	Dance, March, Images.
Boys and girls, 10 to 11+	March, Dance, Images.
Boys and girls, 12 to 14+	March, Dance, Images.
Whole group, 10 to 14+	March, Dance, Images.

In the case of the younger boys the difference in the pereentages for the first two items of the series is on the 'border-line' of the significance criterion, and the same is found for the second two items. For boys age 12 to 14+, the difference corresponding to the first two items is significant, while that for the second two is not. For the whole group of boys the first difference is significant; the second is not.

When the older group of boys is compared with the younger to observe the influence of age, it is found that no significant difference occurs between the percentage for 'March' or for 'Dance', but the difference is signi-ficiant for 'Images'. A similar comparison for the two age groups of girls yields no significant differences. The differences for the three items in the case of the younger group of girls are significant, while for the older girls the difference corresponding to 'Dance' and 'March' is significant, but that for 'March' and 'Images' is not. When the whole group of boys is compared with the whole group of girls, significant differences are found for 'March', for 'Dance' and for 'Images', showing that definite sex differences occur in the preference of individuals for the varieties of music designated by these titles.

It can be concluded that individuals of age 10 to 14+ tend to prefer music evoking muscular activities rather than music promoting introspections, or, to put it another way, the response of the subjects to music tends to transmute auditory sensory experience into physical activity rather than into intellectual, emotional or imaginal activities. The younger boys support 'Image' music more than the older boys and this may be due to contempt for "girls' play" like dancing, and inhibited conditions produced by the injunction of adults not to "dance about so much". As for the older boys the first of these hypotheses no doubt holds good, but physical activity is so appealing that a measure of support is given to 'Dancing'. It is interesting to see that while both sexes prefer overt activity to introspective activity, the former takes the shape of the disciplined regularity of marching for boys but the more graceful, free, 'rubato' activity of dancing for girls. A teacher of eurhythmics maintained strongly in conversation with the writer that girls had dancing ability as a "natural gift" whereas boys had not, and this common opinion, although capable of various formulations, is consistent with the above results. There is a suggestion that girls of the older group have more introspective attitudes towards music than the younger girls, which could be due to the effects of age and adolescence and would support the view advanced on page 197 , while the quasi-aggressiveness of adolescence in boys could explain the suggestion that the older boys may have less introspective activity in listening to music than the younger boys.

The percentages for items 2a, 2b, 2c on page 194 for the group of 56 children, age 10 to 11+, and 66 children, age 12 to 14+, agree well and suggest that age effects are small compared with sex effects. The percentages for the whole group of 122 children show no significant difference corresponding to 'March' and 'Dance' but 'Image' shows significant differences from both of these.

Test 3

The items are 3a, which will be called, roughly, 'Sad'; 3b called 'Peaceful' and 3c called 'Happy'. The order of preference in every list derived from the tabulated results is Happy, Peaceful, Sad. The values of the percentages for the items in the various tables agree very well, with the exception of 'Sad' for girls age 12 to 14+ where the value of the corresponding percentage is very low. This, in conjunction with the other consistencies, may be due to emotional disturbances caused by adolescence, e.g. a "flight-from-reality" effect. This is plausible when it is found that the percentage for 'Sad' in these older girls is significantly less than that for the younger girls. It must be admitted that the choice of the term 'Happy music' may have considerable 'suggestion' power, and since happiness is an end sought by mankind it may be the case that the choice of the subjects is determined, not by the qualities ascribed to certain types of music, but by wider motives and ideals. Nevertheless, it was decided to retain the term in the questionnaire, because a consideration of the results of test 3 and test 1 would suggest prescriptions of the qualities of 'Happy', 'Sad' and 'Peaceful' music, in the views of the subjects, not of course as definite proofs, but as speculations worthy of experimental study. Speculating, therefore, 'happy' music, for boys, is likely to be of the quick-loud type, and 'peaceful' and 'sad' music of the soft-slow type. For girls, 'happy' music is likely to be of the soft-quick type, and 'sad' music of the loud-slow type, for example, as played on the organ in church, hymns, or broad maestoso pieces. To express this in another way, happy music for boys will be of the allegro or presto type (as in sonata movements) whilst happy music for girls will be of the allegretto type (e.g., divertissements , scherzos perhaps, 'Mozartian' movements of a 'light' nature.) It was also observed that many of those subjects who preferred peaceful and sad music, particularly the latter, appeared to be more introverted than those who did not, suggesting that such preferences might be used for certain character tests.

Test 4.

The preference lists are:-

Boys, age 10 to 11+	Wireless, Gramophone, Concerts, Own Performance, Church, Friends. School.
Boys, age 12 to 14+	Wireless, Gramophone and Concerts(equal), Church, Own Performance and Friends (equal), School.
All boys, age 10 to 14+	Wireless, Gramophone, Concerts, Church, Friends, Own Performance, School.
Girls, age 10 to 11+	Concerts and Church (equal), Wireless, Gramophone, Own Performance, Friends and School (equal).
Girls, age 12 to 14+	Wireless, Concerts, Church, School and Friends, Gramophone, Own Performance.

All girls, age 10 to 14+	Wireless, Concerts, Church, Gramophone, Own Performance, Friends and School (equal)
Boys and girls, 10 to 11+	Wireless, Gramophone, Concerts, Church, Own Performance and Friends, School.
Boys and girls, 12 to 14+	Wireless, Concerts, Gramophone, Church, Friends, Own Performance and School (equal).
Whole group, 10 to 14 +	Wireless, Concerts, Gramophone, Church, Friends, Own Performance, School.

Wireless broadcast music takes first place in the list. (the displacement for girls, age 10 to 11+, is not supported by a significant difference in the corresponding statistics.) Many children have the opportunity of hearing school gramophones, but the pleasure of hearing these may be tinged with negative emotions due to school attitudes (note the position of school music in the tests!) The children used in these tests had such opportunities, but the liking for the gramophone could be largely influenced by the use or absence of a gramophone at home, so the position of 'Gramophone Music' in the lists cannot be expected to be uniform. It is interesting to see that the gramophone is not so popular as the wireless set - but of course, the costs relating to the former are comparatively heavy. 'Friends' and 'Own Performance' have a consistently low place in the lists showing that the children have passive attitudes towards music - they prefer to listen instead of making music themselves. While some form of modesty, real or assumed, could explain this, it is likely to be only a contributory factor. Byrd and the Elizabethan singers (who formed a large section of the population) would be aghast at such a situation. Convinced that music making was a fine joy, they would lament that we of the twentieth century, with all our opportunities, were not getting more fun out of music than they did; in fact, less. The questionnaire results are verified in many other ways; men who do not actively engage in sports prefer to watch them - children, on the whole, prefer the cinema to more active and personal activities - people who can play musical instruments or who can sing quite well cease to do so because they can hear "much better performances on the wireless." This may be due to a compensatory tendency. The person may find compensation for inferiority by identification with the expert.

BOYS

AGE	NUMBER	QUESTIONNAIRE ITEMS																
		LAND 1a	SOFT 1b	SLOW 1c	QUICK 1d	MARCH 2a	DANCE 2b	SMOKE 2c	SAD 3a	PEACE 3b	HAPPY 3c	GRAM 4a	WIRE 4b	COMIC 4c	[illegible] 4d	SCHOOL 4e	CHURCH 4f	FRIEND 4g
10 to 11+	27	47·9	56·5	32·6	63·6	62·6	39·1	45·9	29·2	50·9	70·3	72·1	76·6	60·1	25·9	31·8	44·8	39·1
12 to 14+	40	52·5	51·6	33·2	63·8	61·3	48·3	39·3	27·9	47·1	73·9	66·0	73·0	66·0	34·6	30·5	60·6	36·9

GIRLS

AGE	NUMBER	ITEMS																
		1a	1b	1c	1d	2a	2b	2c	3a	3b	3c	4a	4b	4c	4d	4e	4f	4g
10 to 11+	29	45·7	66·4	31·0	56·9	46·0	65·4	35·7	32·3	45·5	67·2	54·9	62·0	67·2	40·1	36·8	57·9	27·3
12 to 14+	26	29·3	71·2	40·9	58·7	45·9	62·6	38·0	23·9	51·0	73·3	51·3	74·7	67·3	20·2	42·2	57·8	36·6

BOYS AND GIRLS (separated)

AGE	NUMBER	ITEMS																
		1a	1b	1c	1d	2a	2b	2c	3a	3b	3c	4a	4b	4c	4d	4e	4f	4g
BOYS 10 to 14+	67	50·6	53·5	32·3	63·6	61·7	44·7	43·2	28·6	48·6	72·6	68·6	76·5	63·6	31·1	31·0	42·3	37·8
GIRLS 10 to 14+	55	38·0	68·6	35·7	57·7	45·8	65·6	36·8	28·3	48·1	70·1	53·2	68·0	67·3	30·7	39·3	57·8	30·8

BOYS AND GIRLS (pooled)

AGE	NUMBER	ITEMS																
		1a	1b	1c	1d	2a	2b	2c	3a	3b	3c	4a	4b	4c	4d	4e	4f	4g
10 to 11+	56	46·7	61·6	31·7	60·0	53·9	56·2	42·1	30·8	48·0	68·7	63·2	69·0	63·8	33·3	34·4	51·6	33·0
12 to 14+	66	63·4	59·3	35·6	61·7	55·2	54·0	38·8	26·3	48·7	73·6	60·2	73·7	66·5	28·9	35·1	47·6	36·0

ALL SUBJECTS

AGE	NUMBER	ITEMS																
		1a	1b	1c	1d	2a	2b	2c	3a	3b	3c	4a	4b	4c	4d	4e	4f	4g
10 to 14+	122	44·9	60·3	33·8	61·0	56·6	56·1	40·3	28·4	48·4	71·6	61·6	71·5	66·3	30·9	36·8	49·3	34·6

One can devise extenuating arguments to justify such attitudes but these are not convincing to anyone seeking a full and rich life. The attitude to school music is partly a manifestation of this passive attitude, partly due to negative emotions attached to school activities. Music heard in church or at concerts is connected with social activities and it can be seen that 'Concerts' and 'Church' have close positions in the lists. If the percentage values of 'Church' are examined for the whole group of boys and the whole group of girls, it is found that there is a significant difference, i.e., the girls definitely prefer church music more than do the boys. This sex difference is not due to the possibility that more of the girls go to church services as compared with the boys. Actually most of these boys and girls did attend church services of some sort. The difference is probably due to the girls having emotional attitudes to religion of greater intensity and variety than the boys.

The humble position of school music in the lists is thought-provoking. It suggests that, although much has been done in recent years to make school music courses more systematic, efficient and interesting, much remains to be done on the side of developing interest and creative activity. (The writer does not wish to appear to criticise school music unfairly; similar conclusions could aptly be drawn in respect of other school subjects.)

The foregoing results have been based on the number of 1 responses made by the subjects, the responses 2, 3 etc. being ignored. This neglect of part of the data is hardly satisfactory, but it has the justification that the 1 responses are probably a good deal more definite as indices of preferences than are the other responses; yet it would seem desirable to give weight to these latter responses. This can be done by transforming the responses of each subject in a questionnaire test into percentile ranks. For example, if there are four responses, 1, 2, 3 and 4, these can be changed into 87½, 62½, 37½, and 12½. If there are three responses, 1, 2, and 3, in a test, these become 83⅓, 50, 16⅔. And so on for other classifications. This was done for the responses of the group which has just been considered. The tables on page 202 show the mean percentile ranks belonging to various items for various groupings among the children.

Results.

Test I. The order of preference is shown by the following lists.

Boys, age 10 to 11+ Quick, Soft, Loud, Slow.

Boys, age 12 to 14 +	Quick, Loud, Soft, Slow.
All boys, age 10 to 14 +	Quick, Soft, Loud, Slow.
Girls, 10 to 11 +	Soft, Quick, Loud, Slow.
Girls, 12 to 14 +	Soft, Quick, Slow, Loud.
All girls, 10 to 14+	Soft, Quick, Loud, Slow.
Boys and girls, 10 to 11+	Soft, Quick, Loud, Slow.
Boys and girls, 12 to 14+	Quick, Soft, Loud, Slow.
Whole Group, 10 to 14+	Soft, Quick, Loud, Slow.

The only differences between these lists and those on page 195 are reversals of the following adjacent names:- (1) Soft-loud in list 3, (2) Soft-quick in lists 7, 8 and 9. The differences of the percentages corresponding to these pairs are not significant on page 194, so the lists on the preceding page can be accepted as rather more accurate. It can be deduced that the quick-soft varieties of music are preferred to the loud-slow varieties.

Test 2.

Boys, age 10 to 11+	March, Images, Dance.
Boys, age 12 to 14+	March, Dance, Images.
All boys, age 10 to 14+	March, Dance, Images.
Girls, age 10 to 11+	Dance, March, Images.
Girls, age 12 to 14+	Dance, March. Images.
All girls, age 10 to 14+	Dance, March, Images.
Boys and girls, age 10 to 11+	Dance, March, Images.
Boys and girls, age 12 to 14+	March, Dance, Images.
Whole Group, 10 to 14+	March, Dance, Images.

When these lists are compared with those on page 198 it will be seen that the adjacent names Dance-Images are reversed in the third of the above lists and Dance-March in the seventh. The corresponding pairs on page 198 are not separated by statistical differences which are significant. The average percentile ranks for these pairs in the above list agree closely.

As before, it is seen that physical activity is a more popular accompaniment to listening to music than introspective activity, and that both age-groups of girls are superior to both age-groups of boys with respect to a preference for 'dancing' music but inferior with respect to a preference for 'marching' music.

Test 3.

All the preference lists are the same for the various groups, namely Happy, Peaceful, Sad. This was found before on page 199. The values of the mean percentile ranks are very similar for all the groups. The older girls, as was observed before, show a reduced preference for sad music which, compared with the values for the boys' groups, appears noteworthy.

Test 4.

The preference lists are:-

Boys, 10 to 11+	Wireless, Gramophone, Concerts, Church, Friends, School, Own Performance.
Boys, 12 to 14+	Wireless, Gramophone and Concerts (equal), Church, Friends, Own Performance, School.
All boys, 10 to 14+	Wireless, Gramophone, Concerts, Church, Friends, Own Performance, School.
Girls, 10 to 11+	Concerts, Wireless, Church, Gramophone, Own Performance, School, Friends.
Girls, 12 to 14+	Wireless, Concerts, Church, Gramophone, School, Friends, Own Performance.
All girls, 10 to 14+	Wireless, Concerts, Church, Gramophone, School, Friends, Own Performance.
Boys and girls, 10 to 11+	Wireless, Concerts, Gramophone, Church, School, Own Performance, Friends.
Boys and girls, 12 to 14+	Wireless Concerts, Gramophone, Church, Friends, School, Own Performance.
Whole Group, 10 to 14+	Wireless, Concerts, Gramophone, Church, School, Friends, Own Performance.

These lists are almost the same as those on page 200. If the following changes were made, the above lists would be identical with the previous ones. 1st list - 'Own Performance' in front of 'Church'. List 2 - 'Friends' and 'Own Performance' equal. List 4 - 'Church' equal with 'Concerts', 'School' and 'Friends' equal. List 5 - 'School' and 'Friends' in front of 'Gramophone'. List 6 - 'Own Performance' in front of 'School'. List 7 - 'School ' after 'Friends'. List 9 - 'School' after 'Own Performance'. These changes are comparatively few, and the discrepancies between items in the above lists and items in the lists on page 200 are not justified by appropriate significant differences in statistics belonging to the latter. Also, in the above lists, the items showing lack of agreement with the previous lists are of much the same order of size. Conclusions similar to those noted on page 200 could be drawn from these lists.

It will be seen that the order determined by the 1 responses agrees well with the more laborious percentile rank method, and that the values of the mean percentile ranks agree well, on the whole, for individual items. The orders of preference provide standards of average response to the questionnaire and supply a method of examining the attitudes of an individual to various types of music.

The Senior Questionnaire.

This was referred to on page 192. The first page of the questionnaire ('Games or Sports', etc.) is a 'shock-absorber', but its results are worthy of consideration. The questionnaire was applied to three groups of subjects - young school children, secondary school children of the fourth and fifth years of the school course, and adults. The responses were transformed into percentile ranks as described in the previous section and the mean values are tabulated on page 522 of Appendix.

Young school children.

The numbers in the groups were:- Boys, 9 to 11+, 74; girls, 9 to 11+, 74; boys 12 to 14+, 35; girls, 12 to 14+, 26. Total group, 209.

Consideration of the results.

The questions which give an idea of the musical contacts of the subjects will be considered first. The tables below give percentages of the group indicated.

"Have you a wireless set?"

All boys		All girls		Whole group	
Yes	No	Yes	No	Yes	No
33·9	66·1	41·0	59·0	37·3	62·7

"Have you a gramophone?"

All boys		All girls		Whole group	
Yes	No	Yes	No	Yes	No
46·8	53·2	34·0	66·0	40·7	59·3

From the table 'Heard most' on page 526 it will be seen that there is little difference between 'gramophone music' and 'broadcast music'. This agrees well with the figures above about the possession of either mechanism.

Of course 'possession' does not necessarily imply 'use', but as children of these ages are away from home for a large fraction of the week, their opportunities of hearing either are limited. Further, as the parents are generally fairly poor, the repertoire of gramophone records tends to be small, consisting of a few popular records, so the frequency of playing these could compare favourably with the frequency of listening to broadcast music. It might be thought that the number of wireless sets should exceed the number of gramophones (circe 1937). The writer would have expected this, but it must be remembered that the rapid sale of wireless sets recently has been facilitated by 'hire-purchase' methods and the issue of effective sets at low prices.

Even the possession of gramophones shows some complications. Some of these are relics of the days when the possession of a piano or gramophone (even if not used) conferred social status on the owner. Others are relics of the days when portable gramophones could be obtained for cigarette vouchers or in some other form of gift scheme. If the questionnaire were used in the present year (1940) the number of wireless sets would probably be increased and the number of gramophones decreased. It is, however, interesting to note that the numbers are approximately equal in the tables. The gramophone is more popular than one would probably expect, and this supports the view of the writer that the use of the gramophone for cultural and recreational purposes would be greatly increased if record libraries were established, for the cost of records is the Achilles' heel of gramophone playing. These would be quite expensive organisations, with special difficulties accompanying their operations, yet the idea is no more fantastic than the provision of 'toy libraries' for children, which have had marked success in some American cities.

"Do you sing in a choir?"

All boys		All girls		Whole group	
Yes	No	Yes	No	Yes	No
17·4	82·6	12·0	88·0	14·8	85·2

Hence about one in seven in the group sings in a choir. About half of the choir singers among the girls sing in junior choirs attached to churches as well as in the school choir. The figure for boys is about three-quarters, divided among church choirs, Boys' Brigade or Boy Scout choirs, while about one quarter support school choir work.

"Do you sing songs by yourself in public?"

All boys		All girls		Whole group	
Yes	No	Yes	No	Yes	No
22·0	78·0	21·0	79·0	21·5	78·5

Most of this singing is done in connection with the organisations mentioned above. The figures given in this and the previous paragraph fall far short of Byrd's ideal, "I wish all men would learn to sing", yet they could be a good deal worse. It is of interest to compare these figures with those to be given later for older subjects.

"Do you hum, sing or whistle when alone?"

Boys			Girls			Whole group		
A lot	A little	No	A lot	A little	No	A lot	A little	No
44·0	51·0	4·6	22·0	72·0	6·0	33·5	61·2	5·3

The difference between the percentages for 'A lot' for boys and girls is significant, and so is that for 'A little'. Individual repetition of musical themes is more of a masculine than a feminine activity. It is probably related to the physical activity of the boys, that is, actual activity and preference for 'marching' music. It is also a method of filling in time, using up surplus energy, and dispelling loneliness. It facilitates repetitive activity either in the form of work, individual or group, or in some other way. (e.g., the marching of an organisation like the Boy Scouts). Since girls, of the ages used, do rather less of these activities, spend more time at home and are more self-contained, the sex difference is comprehensible.

"Do you play a musical instrument?"

Boys/

Boys		Girls		Whole group	
Yes	No	Yes	No	Yes	No
15·6	84·4	8·0	92·0	12·0	88·0

The instruments and the times of study are :- Boys - Four play the piano (6 months, 6 months, 1 year and 3 years respectively), two play the violin (6 months, 2 years), two play the cornet (2 months, 1½ years), one plays a harmonium (1 month), eight play mouth-organs (2 months, 2 months, 1 year, 1 year, 1 year, 1 year, 3 years, 3 years).

Girls:- Eight play the piano (5 months, 6 months, 6 months, 6 months, 8 months, 8 months, 8 months, 1 year), one plays the violin (2 months).

The mouth-organ has some value as a musical instrument and has, for young people, the merit of popularity on account of its portability and small cost. Nevertheless it is worth while to consider the results when this factor is eliminated, so that a comparison of standard musical training can be made. The table below gives the data.

Boys		Girls		Whole group	
Yes	No	Yes	No	Yes	No
8·3	91·7	8·0	92·0	8·1	91·9

The agreement is now very close. A contributory factor is, of course, the financial one. In homes where pennies have to be watched week by week, even the small fees of the poorly qualified music teacher may be out of the question. The fact that about 1 out of 12 individuals in the group is learning to play an instrument does not mean that this is the fraction of competent players or of persons who will become competent players. Nevertheless the figure is not unimpressive.

"Have you heard music in church or chapel?"

100% for each group.

"Have you heard a large orchestra playing in a large hall?"

Boys		Girls		Whole group	
Yes	No	Yes	No	Yes	No
28·4	71·6	29·0	71·0	28·7	71·3

"Have you heard a singer or a choir at a concert?"

Boys		Girls		Whole group	
Yes	No	Yes	No	Yes	No
99·1	0·9	99·0	1·0	99·0	1·0

Only one boy and one girl said "No" to this question.

"Does any other person at home play or sing?"

Boys		Girls		Whole group	
Yes	No	Yes	No	Yes	No
48·6	51·4	44·0	56·0	46·4	53·6

The following is the analysis of the details of this playing or singing at home:-

Singing - Sister (23 cases), brother (20 cases), mother (14 cases), father (7 cases), aunt (1 case).

Piano - Brother (5 cases), mother (4 cases), father (4 cases), sister (4 cases).

Piano-accordion - Father (4 cases), brother (2 cases), sister (1 case).

Violin - Brother (2 cases), sister (1 case).

Harmonium - Father (2 cases).

Cornet - Brother (3 cases).

Flute - Brother (1 case).

The 'singing' contacts at home are about twice as many as the 'instrumental' ones. In the case of the instrumental activities, the male members of the family involved are about twice as numerous as the female members. It may also be asked "What relation exists between the numbers of adults playing at home and the number of children who play?" The following list shows the details about adult-child playing:-

Piano (father - daughter), Piano (mother - daughter), Piano (brother - schoolgirl), Harmonium (father - son), Piano (sisters, and mother sings), Piano (mother - daughter), Piano (father - daughter), Violin (sister singer, schoolgirl plays violin), Violin (elder brother cornet, schoolboy violin). Of the eighteen instrumental learners (excluding mouth organ playing) in the group page 210, the nine shown above have an adult musical influence.

"How many people at home, including yourself, hear your wireless set?"

The average number per subject is 2·3. It is better to compute the average number per wireless set; this is 6·2, and gives an approximation to the influence of wireless broadcast listening on the numbers of the population. It can be said that 6 people, as a rough average, have the opportunity of listening to broadcast music, for each set.

"How many people at home, including yourself, hear your gramophone?"

The average is 6·5 per gramophone. It can be seen that these figures, taken in conjunction with the others on page 207, show that the influence of gramophone listening is comparable with that of broadcast listening; that is, it is greater than one would probably expect.

<u>Liking for the hearing of music.</u>

	Like very much	Rather like	Neutral	Rather dislike	Very much dislike
Boys	44·7 %	29·4	14·7	5·5	2·8
Girls	66·0	16·0	11·0	3·0	4.0
Whole group	56·5	23·0	12·9	4·3	3·3

It is clear that a liking to hear music is rather more of a female quality than a male one at the ages considered.

(The differences in the percentages in the first two categories are significant).

The effect of broadcast music on interest in music.

	Definitely become less	Slightly less	No change	Slightly increased	Definitely increased
Boys	5·5 %	7·3	23·9	9·2	55·0
Girls	4·0	6·0	21·0	7·0	62·0
Whole group	4·7	6·7	22·5	8·1	57·9

Here no significant sex-difference can be found. It is obvious that the subjects claim to have developed an increased interest in music as a result of wireless broadcasting.

(a) "Sad music is music that actually makes me feel sad"

True	False	Doubtful
64·6%	7·2	28·2

(b) "Sad music is music in which the composer tries to suggest sadness by some thought, picture or imagination in my mind without actually making me feel sad".

True	False	Doubtful
33·0%	33·0	34·0

If the numbers corresponding to the percentages in these two tables are tested by the χ^2 method, the distribution of the second table does not differ significantly from a chance distribution of the 1:1:1 type whereas that for the first table does. It would appear therefore that children tend definitely to regard what is called 'sad' music as music which actually produces emotional states of sadness. There are, however, certain complications. Question (b) may be one which is related to actual experiences of the child but the child has never formulated the question or observed the phenomenon, perhaps because the phenomenon occurs infrequently or is of fleeting or slight intensity. The question certainly appears to be a difficult one to answer, perhaps because of its intrinsic difficulty. Probably it is safe to conclude that the children do not know which answer to give, and that the question is not suitable for this age-group. Another difficulty arises when the answers to questions (a) and (b) are considered in relation to each other. One could expect that if either is answered affirmatively the other should be answered negatively or 'doubtfully'. But this expectation would present the matter in a clear-cut manner which is not realised in practice. The table below shows the frequencies of the various responses arranged in the usual cell fashion.

Actual sadness.

Descriptive sadness.	True	False	Doubtful
True	38	9	22
False	49	2	18
Doubtful	48	4	19

These possibilities are all comprehensible. To obtain a relation between these variates, a mean square contingency coefficient can be worked out. This is C = ·18. The probable error of this for C = 0 is ·05 so that the calculated value is more than three times the probable error from the zero value and is therefore significant. Consequently the distribution differs significantly from a chance distribution. The result is that 'trueness' in question (a) tends to accompany falseness or doubt in question (b), although this is not a powerful tendency, as shown by the value of C. The conclusion of the previous page still holds with regard to the children's reaction to 'sad' music.

The interests of the children.

The results below are based on the tables on page 522. It will be recalled that the children were told that they were not expected to give answers to subjects about which they knew nothing, but a brief explanation was given of what each subject meant. It is likely that the younger children who respond to 'Philosophy' know the name merely. The additions made by the subjects to the list have been tabulated on page 523. These are of interest for the development of questionnaire lists of a similar type but will not be considered in the discussion of the results. ('Private reading' was found to be mainly schoolboy magazines, or schoolgirl magazines. This material is 'light' but hardly literature although a case can be made out for it forming an introduction to cultural reading).

The order of preference is:-

Boys, 9 to 11+. Games, Cinema, Cards, Light Literature, Theatre, Music, Paintings or Drawings, Poetry, Mathematics, Dancing, Serious Literature, Physical Science, Psychology, Philosophy, Chemistry, Biology.

Girls, 9 to 11+. Games, Cinema, Light Literature, Theatre, Paintings or Drawings, Dancing, Music, Poetry, Mathematics, Serious Literature, Cards, Biology, Physical Science, Psychology, Philosophy, Chemistry.

Boys, 12 to 14+. Games, Cinema, Theatre, Paintings or Drawings, Music, Cards, Physical Science, Light Literature, Poetry, Chemistry, Dancing, Mathematics, Serious Literature, Biology, Philosophy, Psychology.

Girls,12 to 14+. Games, Music, Dancing, Theatre, Paintings or Drawings, Cinema, Poetry, Light Literature, Mathematics, Cards, Physical Science, Serious Literature, Biology, Chemistry, Psychology, Philosophy.

The order of preference for the whole group is:- Games, Cinema, Theatre, Paintings and Drawings, Music, Light Literature, Card Playing, Poetry, Dancing, Mathematics, Serious Literature, Physical Science, Chemistry, Biology, Psychology, Philosophy.

<u>Instrumental combinations preferred.</u>

The order of preference is shown below:-

Boys, 9 to 11+. Pipe band, Piano, Crooner, Dance band, Pipe organ, Cinema organ, Theatre orchestra, Singer, Brass band, Violin, Large orchestra, Choir, String quartet.

Girls, 9 to 11+. Piano, Dance band, Singer, Pipe band, Pipe organ, Cinema organ, Violin, Theatre orchestra, Crooner, Choir, Brass band, Large orchestra, String quartet.

Boys, 12 to 14+./

Boys, 12 to 14+. Crooner, Dance band, Pipe band, Singer, Theatre orchestra, Brass band, Piano, Large orchestra, Cinema organ, Pipe organ, Choir, Violin, String quartet.

Girls, 12 to 14+. Crooner, Dance band, Piano, Singer, Pipe organ, Violin, Pipe band, Large orchestra, Theatre orchestra, Brass band, Cinema organ, Choir, String quartet.

Crooner, Dance band, and Piano have consistently high places; String quartet is consistently last. It is often maintained that music for the string quartet is music in its highest and purest form (e.g., Schubert's quartets and especially Beethoven's), so it might appear that the children by giving a high place to crude musical performances like those of the crooner or dance band should inevitably show their crude taste by placing the string quartet last. This may be true, but it must be noted that their opportunities for hearing the latter are few.

It is surprising that 'Large orchestra' should be so low in the lists. One would expect that it would be higher, even if only because of its loudness, an appeal which might be expected to weigh heavily with children. It is likely that this appeal is off-set by the probability that when they do hear a large orchestra, the music played is not suited to them. Perhaps if they heard light music like the 'Blue Danube' waltzes played by a large orchestra, the preference would be greatly increased. (The writer was greatly impressed by the applause given to this performance at a concert provided by the Scottish Orchestra some years ago. The adult audience appeared to enjoy it more than the symphony which was played.)

'Theatre Orchestra' has a higher place than 'Large Orchestra' yet not so high as might be expected. It may be that the children believed that this meant 'an orchestra in a theatre', and theatre visits are not common, instead of a type of orchestra playing light music, so the preference estimate may be lower than it should be.

The violin, about whose beauty and emotional effects so many adults rhapsodise, has a surprisingly low place. It is strange that 'Choir' should have such a consistently low place, since the way to musical insight for children should surely be the vocal approach, mainly, so that a higher place for 'Choir' could have been expected.

The results for groups of the same age on page 523 agree well, on the whole.

'Dance band' appears to be more appealing to the girls' groups than to the corresponding boys' groups. This is in accord with previous results about the girls' interest in dancing. Theatre orchestra, Brass band, Pipe band, and Cinema organ appear to appeal more to boys' groups than to girls' groups, while the opposite is true for Piano. (Perhaps the noise of these former appeals to boys more than to girls, while the softer, 'salon' qualities of the piano appeal to girls.)

The increase in preference for Violin and Pipe organ for the group of older girls is larger than one would expect after scanning the boys' groups. This may be due to the emotional development of the girls. (On page 201 it was observed that girls had more interest in church music than boys). The term 'Pipe organ' may seem redundant, since 'Organ' should be sufficient, but to many children the latter term might connote 'Harmonium' or 'Mouth organ'.

The order of preference for the whole group is:- Piano, Dance band, Pipe band, Crooner, Singer, Pipe organ, Theatre orchestra, Cinema organ, Violin, Brass band, Large orchestra, Choir, String quartet.

Preference for some styles of music. (Operas, etc.).

In all cases the order is 'Dance or jazz music', 'Modern music', 'Light music', 'Classical music', 'Operas'. There is an expansion of interest in these styles as age increases. The girls appear to be more interested in classical music than the boys, whereas the boys appear to be more interested in dance music. This latter result does not agree with previous results about dancing but the result lacks weight for the following reasons. (1) Girls, by reason of a greater interest in dancing, might be expected to show a greater interest in dance music than boys do, but the appeal of loud music to boys could be an opposing factor yielding the above result. (2) The term 'Modern music' is hardly suitable for children and this may have encouraged the boys to prefer the familiar title 'dance music'.

Preferences for some styles of music. (Songs, etc.).

The preference lists are:-

Boys, 9 to 11+. Songs, Hymns, Marches, Modern dances, Waltzes, Symphonies, Operas, Overtures, Sonatas.

Girls, 9 to 11+. Hymns, Songs, Waltzes, Modern dances, Marches, Operas, Symphonies, Overtures, Sonatas.

Boys, 12 to 14+. Marches, Songs, Hymns, Waltzes, Modern dances, Symphonies, Operas, Overtures, Sonatas.

Girls, 12 to 14+. Songs, Hymns, Marches, Waltzes, Modern dances, Operas, Overtures, Sonatas, Symphonies.

It is clear that Symphonies, Operas, Overtures and Sonatas are consistently low in the lists. This can be explained as being due to lack of experience in hearing music of this nature, together, no doubt, with attitudes of dislike derived from the conversation of adults. The writer on one occasion heard a newspaper boy whistling the opening theme of 'Sonata Facile' in C, by Mozart, complete with "shake" and repeating the tune time after time. When asked if he liked classical music the boy replied: "That's not classical music, that's '18th Century Drawing Room'!" (A form of the Mozart piece plagiarised by the dance bands, with 'musical-box effects'.) Classical music can be popular provided it is not called classical and especially if it is given an appealing title.

The position of classical music and operas agrees with that found in the previous section.

There appears to be an all-round increase of interest in the questionnaire items as age increases. This is interesting in the case of Sonatas and Symphonies. Suggested sex-differences are:- (1) Boys appear to be more interested than girls in Sonatas, Symphonies, Marches, Overtures, and Operas. (2) Girls appear to be more interested than boys in Waltzes and Hymns.

It might be expected that modern dances should be preferred by girls, but it is reasonable to say that modern dances, on the whole, are intermediate between waltzes and marches in several respects and could therefore be expected to show some dubiety. These appearances of sex-differences are consistent with previous results and with broad differences in the temperaments of boys and girls.

The order for the whole group is:- Hymns, Songs, Marches, Waltzes, Modern dances, Operas, Symphonies, Overtures, Sonatas.

<u>Preferences.</u> (Soprano, Contralto, Tenor, Bass).

The preference lists are:-

Boys, 9 to 11+. Tenor, Soprano, Bass, Contralto.

Girls, 9 to 11+. Soprano, Tenor, Contralto, Bass.
Boys, 12 to 14+. Tenor, Soprano, Contralto, Bass.
Girls, 12 to 14+. Tenor, Soprano, Contralto, Bass.

Voices of a high pitch or 'tessitura' are evidently preferred by boys and girls to voices of a low pitch. This is a rough way of stating the relation, since the fundamental tones of the middle notes of a contralto are, on an absolute scale of pitch, higher than those of a tenor. Timbre and empathy are contributory factors. The higher notes may appeal because they are more familiar, by reason of the child's use of its own voice. In addition, it may be that a low pitched voice evokes emotional stresses of an infantile nature, or those developed when the child was young, recalling the stresses in child-parent relations and particularly child-father relations. On the intellectual level there is the further consideration that articulation is generally clearer in the case of sopranos and tenors than in the case of contraltos and basses.

But another influence can be noticed when the boys' groups are compared with the girls' groups of the same ages. The boys prefer men's voices more than the girls, and the girls prefer women's voices more than do boys. The order of preference for all the boys is:- Tenor, Soprano, Contralto, Bass. The order of preference for all the girls is:- Soprano, Tenor, Contralto, Bass. The order of preference for the whole group is:- Tenor, Soprano, Contralto, Bass. It appears to be true therefore that two broad influences are operative, namely the 'pitch' or 'quality' influence and the sex influence.

<u>Preferences.</u> (Solo, Duet, etc.)

'Solo' in the lists below means 'a solo singer'.

Boys, 9 to 11+.	Solo, Male choir, Duet, Mixed choir, Quartet.
Girls, 9 to 11+.	Solo, Duet, Quartet, Mixed choir, Male choir.
Boys, 12 to 14+.	Solo, Duet, Quartet, Mixed choir, Male choir.
Girls, 12 to 14+.	Solo, Duet, Mixed choir, Quartet, Male choir.

The differences between the means for 'Mixed choir' and 'Quartet' are small, as is quite natural since the former is the latter on a larger scale, so that an interchange of these is not significant. On this view the lists agree well with each other. There is a greater difference between the means for 'Male choir' for the two younger groups than between the two older groups which may be due to a sex-preference somewhat like that referred to above.

The order for 'all boys' is:-	Singer, Duet, Male choir, Mixed choir, Quartet.
The order for 'all girls' is:-	Singer, Duet, Quartet, Mixed choir, Male choir.

The order for the whole group is:- Singer, Duet, Mixed choir, Quartet, Male choir.

Heard most - Instrumental combinations.

The frequency of hearing various combinations decreases according to the following series:-

Boys, 9 to 11+. Singer, Pipe band, Pipe organ, Dance band, Choir, Brass band, Piano, Crooner, Cinema organ, Violin, Theatre orchestra, Large orchestra, String quartet.

Girls, 9 to 11+. Singer, Piano, Dance band, Pipe organ, Pipe band, Brass band, Choir, Cinema organ, Crooner, Theatre orchestra, Violin, Large orchestra, String quartet.

Boys, 12 to 14+. Dance band, Singer, Pipe band, Choir, Crooner, Piano, Theatre orchestra, Pipe organ, Brass band, Violin, Cinema organ, Large orchestra, String quartet.

Girls, 12 to 14+. Singer, Dance band, Piano, Choir, Pipe band, Pipe organ, Brass band, Cinema organ, Theatre orchestra, Crooner, Violin, Large orchestra, String quartet.

Whole group. Singer, Dance band, Piano, Pipe band, Pipe organ and Choir (equal), Brass band, Cinema organ and Crooner (equal), Theatre orchestra, Violin, Large orchestra, String quartet.

The instrumental forms which are consistently low are Cinema organ, Violin, Theatre orchestra, Large orchestra, String quartet. 'Crooner' has a low place, but 'jumps' in popularity with the older boys. This may be because 'crooning' has aspects which are overtly erotic, but this would be a difficult problem to discuss. It may be merely a manifestation of crude taste. In addition, the freedom of children to hear various programmes is restricted by the influence of adults. Although 'Crooner' has a low place in the 'frequency' list (possibly because dance music is generally played late, rather than early, in the evening), it has a high place in the 'preference' list, especially for the older groups, (page 214). The reverse is true for 'Choir', which is probably due to negative emotions connected with school and a distaste for self-activity in music performance. 'Pipe band' which has a high place, is accounted for by the activity of junior organisations, in the main. The same applies, but less strongly, in the case of 'Brass band', but here religious organisations provide the main source, apart, of course, from the contribution of broadcast music.

In the frequency order for the whole group it is encouraging to see that 'Pipe organ' and 'Choir', which are equal, are more frequently heard than 'Cinema organ' and 'Crooner', which are also equal.

Heard Most (Gramophone, etc.)

The frequency lists are:-

Boys, 9 to 11 .	Church, Gramophone, Wireless, School, Concerts, Own Performance, Performance of others.
Girls, 9 to 11.	Church, Wireless, Gramophone, Concerts, School, Own Performance, Performance of others.
Boys, 12 to 14 .	Gramophone, Wireless, Church, School, Concerts, Own Performance, Performance of others.
Girls, 12 to 14 .	Church, Wireless, School, Gramophone, Concerts, Own Performance, Performance of others.
Whole group.	Church, Wireless, Gramophone, School, Concerts, Own Performance, Performance of others.

It is clear that Church, Wireless, Gramophone agree in being heard most frequently. Probably it is surprising that 'Church music' should be heard so much, yet the influence of this is more likely to be under-estimated than over-estimated. Psalms and hymns are commonly sung in school to start the proceedings of the day, to illustrate phases of religious instruction, in the preparation of some concert or 'display' and in music lessons. One reads so much about the poor attendances at church that it is important to remember the factor of denominational attendance. For example, if a new housing scheme is built, a good many churches of different denominations are established there and it is a matter for surprise to note, not how badly a church of one denomination is attended, but how well the churches as a whole are attended. Further, many families of children are sent to religious services although the parents may give little or no support in the way of attendance. The organisations attached to places of worship serve to increase the frequency of hearing of church music. Some children may attend such organisations for two evenings each week and also on Saturday afternoons, apart from Sunday services. At home, psalms and hymns may be played or sung - the parents may have a special regard for the "good old tunes". (Psalm tunes are quite popular lullabies in Scotland; Moody and Sankey still retain a hold on the affections of some of the older adults.) These considerations give greater credence to the position of 'Church music'. The group of older girls appears to hear church music more than do the other groups.

The positions of 'School music', 'Concerts', 'Own performance' and 'Performance of friends or other amateurs' are comprehensible. The latter two suggest, as was indicated before on page 205, that personal activity in the way of music making is not popular - an unfortunate state of affairs.

On page 526 (SCHOOL MUSIC) it will be seen that the mean percentile ranks for the two older groups are greater than those for the two younger groups. (About 47 as compared with 31). It might be thought that this tests the accuracy of the questionnaire and finds it wanting, but actually it is quite consistent, because the music period with younger children may be shortened or ignored, especially under pressure from the teaching of the three R's, if the class teacher lacks efficiency or interest in music teaching. At the later stages more time and specific teaching are given.

Effects of listening to music.

The following abbreviations will be used to indicate the items of the questionnaire for this section. (items on page 518).

"Movement"	- Music produces in me feelings of activity or striving that make me want to tap, dance, march, or move in some way.
"Non-movement"	- Music produces in me feelings of activity or striving without making me want to move.
"Peace"	- Music produces in me feelings of peace or rest.
"Pleasure"	- Music brightens me up by giving me a feeling of pleasure without any other special effect.
"Images"	- Music produces in my mind pictures and imaginations.
"Thoughts"	- Music produces in me thoughts of my own without pictures.
"Indefinite thoughts"	- Music produces in me vague thoughts of noble or deep things that the composer is trying to express.
"Analysis"	- Music makes me attend to the instruments, the notes or chords, or the composer's intentions so that I may understand, appreciate or criticise the music.

The order of diminishing value in mean percentile rank is shown in the lists below:-

Boys, 9 to 11+. Movement, Pleasure, Peace, Images, Analysis, Non-movement, Indefinite thoughts, Thoughts.

Girls, 9 to 11+. Movement, Pleasure, Peace, Images, Analysis, Non-movement, Thoughts, Indefinite thoughts.

Boys, 12 to 14+. Movement, Pleasure, Images, Peace, Non-movement, Thoughts, Indefinite thoughts, Analysis.

Girls, 12 to 14+. Movement, Images, Peace, Pleasure, Thoughts, Non-movement, Analysis, Indefinite thoughts.

All boys. Movement, Pleasure, Peace, Images, Non-movement, Analysis, Indefinite thoughts, Thoughts.

All girls. Movement, Pleasure, Images, Peace, Analysis, Non-movement, Thoughts, Indefinite thoughts.

All, 9 to 11+. Movement, Pleasure, Peace, Images, Analysis, Non-movement, Indefinite thoughts, Thoughts.

All, 12 to 14+. Movement, Pleasure, Images, Peace, Non-movement, Thoughts, Analysis, Indefinite thoughts.

The most common effect of music is evidently the tendency to physical movement; next come feelings of pleasure, no doubt mainly general euphoria, followed by feelings of peace (or emotional quiescence) and imaginal effects. 'Analysis', 'Non-movement', 'Indefinite thoughts', 'Thoughts', are consistently found in the second half of the lists. (The item to which 'Indefinite thoughts' refers is described by the phrase 'vague thoughts of noble or deep things that the composer is trying to express'. It is very difficult to clarify this indefinite phrase. To one person it may seem nonsense, to another it may be perfectly comprehensible; the writer has used a phrase which appeared to cover the somewhat mystical statements, beliefs or hypotheses expressed by certain musicians, biographers, music critics, and others interested in music and the arts. The phrase may refer to something incapable of definition or exposition, some immediate fact of experience, or the phenomenon may be explicable in terms of physiological changes or emotional or conative activities. Perhaps the psycho-analyst would wish to relate the phenomenon to variations in unconscious activation. Perhaps kinaesthetic influences are important. No one seems to know.)

'Non-movement activity' and 'Vague thoughts' appear to be more pronounced in the boys' groups than in the girls' groups. These results are acceptable if we suppose that the girls are more inclined than the boys to transform the heightened tension, produced by listening to music, into activity of a physical nature, as in dancing, instead of 'contemplating' music.

4th and 5th YEAR SECONDARY PUPILS.

This set of subjects consisted of 84 boys and 41 girls in the fourth year and 31 boys and 1 girl in the fifth year. No indications of sex-difference can be expected from the fifth year results. The average age of the 4th year group is 15·5 years; that for the 5th year is 16·9 years. The tables on page 528 of Appendix show the results.

Consideration of the results.

The table below gives the percentage of the group.

Question	Yes	No.
Have you a wireless set?	88·5	11·5
Have you a gramophone?	52·2	47·8
Do you sing in a choir?	25·5	74·5
Do you sing by yourself in public?	8·9	91·1
Do you hum, sing or whistle when alone?	61·1 (a lot)	38·9 (a little)
Do you play a musical instrument?	43·3	56·7

This table may be compared with those on page 207 The increase in the percentage of those possessing a wireless set is probably caused by the effect of selection, since the parents of fourth and fifth year secondary pupils are, on the whole, better off financially than those of elementary pupils, A greater wish for culture is doubtless a partial explanation. Similar considerations apply to the possession of a gramophone, although the increase in the above percentage over that for elementary pupils is comparatively small. The percentage of those singing in a choir again shows an increase but the increase is not impressive when the systematic music teaching of the secondary school, the fact that selection has operated to produce a group of higher general culture, and the fact that efficient choir training is more available, are borne in mind.

The percentage of those singing solos shows a reduction, probably due to an increase of self-criticism and a reduction of leisure time for the work of the organizations which would encourage solo-singing.

There is an increase in the percentage of those claiming to hum, sing or whistle a lot. This may be due to an increase in the number of attractive themes known to them and also to the increase in self-assertive individuality of the adolescent.

The percentage of those playing a musical instrument shows a substantial increase. This is likely to be due to various factors of selection - economic, cultural, ability.

The analysis of the instruments played is:- 45 play the piano, the average length of training being 3·3 years; the shortest time was 1 year, the longest 8 years.

7 play the bagpipes, the length of training being about 1 year.

5 play the violin, the times being 1, 4, 8, 9 years and the fifth unrecorded. Of these five, one has played the saxophone for 1 year and another plays the mandoline.

The others are - guitar, 5 years; E flat horn, 3 years; mandoline and violin, as above; drums, 4 years; piano accordion, 3 years; harmonium, 1 year; flute; trombone, 4 years; mouth organ; drum, 3 years, and flageolet, 6 months; saxophone, 1 year, and violin, 9 years (as above); euphonium and mouth organ, 4 years; flageolet, 1 year, and mouth organ, 6 years.

Question	Yes	No.
Have you heard music in church or chapel?	94·8	5·2
Have you heard a large orchestra playing in a large hall?	99·4	0·6
Have you heard a singer or a choir at a concert?	96·2	3·8
Does any other person at home play or sing?	54·1	45·9

In the case of the second item above there is a marked increase in the percentage of affirmative answers as compared with the younger children. Increase of opportunity by reason of age, spending power and home influence is doubtless important to account for the change, but the facilities provided in recent years by the Glasgow Education Authority in the way of afternoon concerts by the Scottish Orchestra form an important influence. In the replies to the last item, there is not much difference between the secondary group and the younger group.

The analysis of the details of this playing or singing at home is :-

Singing	- Brother (17 cases), sister (13 cases), mother (11 cases), father (9 cases).
Piano	- Sister (26 cases), mother (14 cases), brother (12 cases), father(6 cases), aunt (1 case).
Harmonium	- Mother (3 cases), brother (1 case), sister (1 case).
Organ	- Father (4 cases).
Violin	- Brother (3 cases), father (1 case).
Piano-accordion	- Father (2 cases).
Bagpipes	- Father (1 case), brother (1 case).
Banjo	- Brother (1 case).
Ukulele	- Father (1 case).
Mandoline, piccolo and flute	- Father (1 case).

It is evident that the piano is the commonest 'contact' in home music, with singing a close second. Of the 68 school pupils who play some instrument, 42 have the stimulus, if this word may be used, of the playing of an older person at home.

'How many people at home, including yourself, hear your wireless set?'

The average number per wireless set is 5·2. The corresponding average for the gramophone is 4·3. (Of the 139 wireless sets, 1 is not used; of the 80 gramophones, 12 are not used.)

Liking for the hearing of music.

Like very much	Rather like	Neutral	Rather dislike	Very much dislike.
57·3	36·3	5·7	0·6	0

When these figures are compared with those for younger pupils, page 212, it will be seen that the first figure above is much the same, the second is increased, and the others are reduced. This is partly accounted for by selection, since those who dislike music are, in the writer's experience, either suffering from physiological difficulties, low intelligence or emotional disturbance. Such people seldom survive the educational barriers of the secondary course. In addition, age and experience will doubtless have some influence in developing an interest in music. One would expect this to increase the second figure rather than the first as is seen in the table.

The effect of broadcast music on interest.

Definitely become less.	Slightly less.	No change	Slightly increased	Definitely increased.
0	0·7	6·6	24·5	68·2

There is no doubt as to the effect of broadcast music. These results show a substantial increase favouring broadcast music over those for younger pupils, but this could be accounted for by the wider possession of wireless sets at the older level.

'Sad music is music that actually makes me feel sad.'

	True	False	Doubtful
5th Year.	40·6	18·8	40·6
4th Year	40·8	20·8	38·4

When the χ^2 test is applied to the actual numbers of these distributions, the distribution for the 4th year pupils differs significantly from a chance distribution of the 1:1:1 form.

'Sad music is music in which the composer tries to suggest sadness by some thought, picture or imagination in my mind without actually making me feel sad.'

	True	False	Doubtful
5th Year	40·6	28·1	31·3
4th Year	38·4	25·6	34·4

Neither of these distributions differs significantly from the 1:1:1 form, so the distributions may be due to chance. It appears that the view that sad music actually produces sadness is more widely held than the other, yet the two views are not incompatible. The issue is not a clear-cut one, but it is illuminating to see how far the holding of the one view <u>tends</u> to accompany the holding of the other. The mean square contingency coefficient was worked out for each of the two distributions below.

<u>5th Year.</u>

<u>Actual sadness.</u>

<u>Descriptive sadness.</u>

	True	Doubtful	False.
True	1	7	5
Doubtful	6	3	1
False.	6	3	0

<u>4th Year.</u>

<u>Actual sadness.</u>

<u>Descriptive sadness.</u>

	True	Doubtful	False.
True	7	30	12
Doubtful	15	24	4
False.	29	2	2

The value of C for the 5th year group is ·61, the P.E. for C = 0 being ·12
The value of C for the 4th year group is ·53, the P.E. for C = 0 being ·05.

The values of C are significant and indicate negative relationships. Hence the statements about sad music <u>tend</u> to be incompatible, the values of C denoting numerically a marked or substantial relationship, i.e., a substantial inverse relationship if the negative sign is considered. So that, on the whole, the subjects tend to experience sadness when sad music is heard rather than the experiences denoted by "descriptive sadness."

The values of C for the secondary pupils are higher than that for the younger group (C = ·18, page 214), and the value of C for the 5th year pupils is a little higher than the value for the 4th year pupils. This is probably due to greater accuracy of introspection as age increases.

The interests of the pupils.

The results below are based on the tables on page 528. The additions made by the subjects to the list of interests will not be considered, although they suggest ways of refining the questionnaire list and also suggest less intensity and breadth of interests on the part of the fifth year pupils as compared with the fourth year pupils.

The preference lists are:-

Boys, 4th year	Games, Cinema, Light Literature, Theatre, Music, Dancing, Chemistry, Paintings or Drawings, Mathematics, Cards, Serious Literature, Poetry, Physical Science, Biology, Psychology, Philosophy.
Girls, 4th year	Games, Cinema, Theatre, Dancing, Music, Light Literature, Paintings or Drawings, Poetry, Serious Literature, Cards, Mathematics, Chemistry, Physical Science, Biology, Psychology, Philosophy.
All 4th year	Games, Cinema, Theatre, Light Literature, Music, Dancing, Paintings or Drawings, Chemistry, Poetry, Cards, Serious Literature, Physics, Mathematics, Biology, Psychology, Philosophy.
All 5th year	Games, Cinema, Music, Light Literature, Theatre, Dancing, Chemistry, Physical Science, Paintings or Brawings, Cards, Serious Literature, Mathematics, Poetry, Psychology, Philosophy, Biology.
Whole group	Games, Cinema, Theatre, Music, Light Literature, Dancing, Paintings or Drawings, Chemistry, Cards, Serious Literature, Poetry, Mathematics, Physical Science, Psychology, Biology, Philosophy.

Instrumental combinations preferred.

Preference lists are :-

Boys, 4th year	Dance band, Cinema organ, Piano, Pipe band, Brass band, Theatre orchestra, Crooner, Singer, Large orchestra, Violin, Pipe organ, Choir, String quartet.
Girls, 4th year	Cinema organ, Piano, Dance band, Singer, Theatre orchestra, violin, Pipe band, Choir, Large orchestra, Pipe organ, Crooner, Brass band, String quartet.
All 4th year	Cinema organ, Dance band, Piano, Theatre orchestra, Pipe band, Singer, Brass band, Crooner, Violin, Large orchestra, Choir, Pipe organ, String quartet.
All 5th year	Dance band, Cinema organ, Theatre orchestra, Piano, Brass band, Large orchestra, Pipe band, Singer, Pipe organ, Crooner, Choir, Violin, String quartet.
Whole group	Cinema organ, Dance band, Piano, Theatre orchestra, Pipe band, Brass band, Singer, Crooner, Large orchestra, Violin, Pipe organ, Choir, String quartet.

Dance band, Cinema organ and Piano are consistently high, while Pipe organ, String quartet and Choir are low. These positions, together with that of Large Orchestra, show that the development of musical taste in these pupils is crude, and is disappointing when one reflects that they have had so many years of competent instruction at school. It may be thought that the popularity of the cinema organ is a strange phenomenon, especially since this type of organ is no longer common in cinemas; that is, when pleasurable associations with the cinema are no longer possible. Probably one reason is the diversity of the programmes provided by such performances with a consequent variety of registration. (Some good music is played on these organs.) Yet the constant use of the tremulant is sufficient to ruin the pieces played, however proficient the player technically or however kaleidoscopic his registration.

The low position of 'Large orchestra' is rather disappointing, since, in addition to the opportunities for listening to this provided by broadcasting, these pupils have been able to attend orchestral concerts during school hours, a privilege provided by the Glasgow Education Authority in conjunction with the management of the Scottish Orchestra. However the preference for 'Large orchestra' increases with age from the younger pupils to the fourth year group and up to the fifth year group, so one can hope that these concerts will continue. Other items showing an apparent increase with age are:- Theatre orchestra, Brass band, Pipe organ, Choir. Apparent decreases are seen with Dance band, Pipe band, Piano, Violin, Cinema organ, String quartet, Singer, Crooner.

The position of 'Crooner' is lower in the lists for secondary pupils than for the younger pupils - a most gratifying result.

With regard to sex-difference, boys appear to prefer more than girls the following:- Theatre orchestra, Dance band, Brass band, Pipe band, Cinema organ, String quartet, Crooner. Girls appear to prefer Piano, Violin, Pipe organ, Choir, Singer. (These results agree with those of the younger group in respect of Theatre orchestra, Brass band, Pipe band, Cinema organ, Piano, Violin, Singer, String quartet, an agreement which adds validity to the conclusions.)

It may seem that the preference for Dance band shown by the boys does not agree with the hypothesis that girls are more interested in dancing than boys are, but the quasi-erotic and perhaps social appeal of dancing emerging in the 4th and 5th years could account for the preference, and of course the crude noisy sound of the dance band may have a special appeal.

Preferences (Operas, etc.)

The preference lists are:-

Boys, 4th year	Dance music, Modern music, light music, Classical music, Operas.
Girls, 4th year	Dance, Light, Operas, Modern, Classical.
All, 4th year	Dance, Light, Modern, Operas, Classical.
All, 5th year	Light, Dance, Modern, Operas, Classical.
Whole group	Dance, Light, Modern, Operas, Classical.

Dance music tends to be most popular, while Operas and Classical music are least popular. These lists agree substantially with those for the younger children (page 217). Again there is evidence of crude taste since these pupils have had years of listening to music of first class quality played by the school gramophone. 'Modern music' to the pupils will connote recently composed music, probably of a light nature. It will hardly involve to any appreciable extent the music of Holst, Vaughan Williams, Stravinsky, Schönberg, Debussy, Delius, etc. To put it another way, pupils, in the absence of adequate experience are tending to react to the name rather than to the music. The table on page 529 shows that the older boys and the 4th year girls have less preference for 'Dance or jazz music' than have the 4th year boys, which agrees with the results of the previous section. The girls show a marked preference for Operas as compared with the boys. This is doubtless due to the dramatic artistic qualities of these as well as to their singing and choral constituents.

Preferences (Songs, etc.)

Boys, 4th year	Marches, Waltzes, Modern dances, Songs, Hymns, Overtures, Symphonies, Operas, Sonatas.
Girls, 4th year	Waltzes, Marches, Modern dances, Songs, Operas, Overtures, Sonatas, Hymns, Symphonies.
All, 4th year	Waltzes, Marches, Modern dances, Songs, Operas, Hymns, Overtures, Symphonies, Sonatas.
All, 5th year	Waltzes, Marches, Songs, Modern dances, Overtures, Operas, Hymns, Symphonies, Sonatas.
Whole group	Waltzes, Marches, Modern dances, Songs, Operas, Overtures, Hymns, Symphonies, Sonatas.

These lists are much the same as those for the younger children except that Songs and Hymns, which figured prominently at the head of the lists for the young children, have been displaced to a humbler position in these new lists. This would not be a surprising feature of musical development but the low position of Symphonies, Sonatas, Overtures, Operas, could make one question if the development were substantial.

Effects of age.

A reduction in preference as age increases is shown for Songs, Sonatas, Waltzes, Modern dances, Marches, Hymns. Increases are shown for Overtures and Operas. The reductions for Waltzes and Modern dances agree with similar reductions in the previous section.

Sex-difference.

Boys show greater preference than girls for:- Songs, Symphonies, Modern dances, Marches, Overtures, Hymns.(Some of the differences are slight and are not likely to be significant.)

Girls show greater preference for Sonatas, (probably due to piano playing), Waltzes, Operas. This latter has been noted already. These items agree fairly well with those obtained for the younger pupils.

Preferences. (Soprano, Contralto, Tenor, Bass.)

The preference lists are:-

Boys, 4th year	Tenor, Bass, Contralto, Soprano.
Girls, 4th year	Tenor, Soprano, Contralto, Bass.
All, 4th year	Tenor, Bass, Soprano, Contralto.
All, 5th year	Tenor, Bass, Soprano, Contralto.
Whole group	Tenor, Bass, Soprano, Contralto.

The mean values for Soprano and Contralto are much the same. The girls prefer women's voices more than the boys do, and the boys prefer men's voices more than the girls do. Girls prefer the high 'quality' voices, Tenor and Soprano, to the low 'quality' voices, Contralto and Bass. If the table on page 530 is compared with the table on page 525, it will be seen that the older pupils give more support to Tenor and Bass compared with the younger pupils, less support to Soprano and much the same to Contralto. While this might be due to the older pupils having a lower 'tessitura' in their voices compared with the younger pupils and therefore having a more intimate acquaintance with the deeper notes, it might also be due to a change in attitude to the male adult compared with the female adult, i.e. a shedding of fears and resentments towards the former and a shedding of the positive child-mother attitudes toward the latter.

Preferences. (Solo singer, Duet, etc.)

4th year boys	Male choir, Solo, Mixed choir, Duet, Quartet.
4th year girls	Solo, Male choir, Duet, Mixed choir, Quartet.
All, 4th year	Solo, Male choir, Duet, Mixed choir, Quartet.
All, 5th year	Solo, Male choir, Mixed choir, Duet, Quartet.
Whole group.	Solo, Male choir, Mixed choir, Duet, Quartet.

The position of 'Male choir' is likely to be a little high in the case of the 4th year boys because a choir for these boys had been formed about four months before the questionnaire was given. Subject to this modification the lists for the 4th year boys and 5th year boys agree exactly and agree with the list for the 4th year girls in respect of Solo, Male choir, Quartet.

These lists resemble those for the younger pupils except that 'Male choir' in the above lists has a high place instead of a low one, as in the lists for the younger pupils. But the position of 'Bass' (previous section) has undergone a similar displacement, so these displacements may have a causal connection.

With regard to sex differences, the girls show a preference for Solo and Duet.

Heard most. (Large orchestra, etc.)

The frequency lists are:-

Boys, 4th year.	Dance band, Cinema organ, Crooner, Piano, Singer, Theatre orchestra, Brass band, Pipe band, Choir, Large orchestra, Violin, Pipe organ, String quartet.
Girls, 4th year.	Dance band, Singer, Cinema organ, Piano, Crooner, Theatre orchestra, Choir, Large orchestra, Pipe organ, Brass band and Violin (equal), Pipe band, String quartet.
All, 4th year.	Dance band, Cinema organ, Piano, Crooner, Singer, Theatre orchestra, Brass band, Choir, Pipe band, Large orchestra, Pipe organ, Violin, String quartet.
All, 5th year.	Dance band, Cinema organ, Crooner, Theatre orchestra, Singer, Piano, Brass band, Pipe organ, Large orchestra, Pipe band, Choir, Violin, String quartet.

Whole group   Dance band, Cinema organ, Crooner, Piano, Singer, Theatre orchestra, Brass band, Pipe band, Choir, Large orchestra, Pipe organ, Violin, String quartet.

These lists agree quite well with one another. 'Crooner' has a higher place in these lists than in the preference lists. This is probably due to the fact that so much 'crooning' accompanies the activities of dance bands. If the above lists are compared with the corresponding ones for the younger children (page 220) it will be seen that Cinema organ and Crooner have a higher place in the above lists while Pipe organ and Singer have lower positions. The change in the position of Pipe organ is probably due to a loosening of church ties by the adolescent, while the general appearance of undeveloped taste indicated by the above lists (since they agree pretty well with the preference lists and since the adolescent has more freedom to listen to the broadcast music which he prefers than the young child has) show that school music has probably less effect in cultivating the taste and initiative of secondary pupils, to the extent of actively controlling the kind of music they hear, than one would have hoped. It may be that the crudeness of taste is an expression of quasi-aggressive and escapist tendencies on the part of the adolescent.

The effect of age.

Increases in frequency of hearing as age increases appear to occur with Large orchestra, Theatre orchestra, Brass band, Cinema organ, Pipe organ, while decreases appear to occur with Dance band (as was found with the preference lists), Pipe band, Piano (but there are relatively more pianists in the 4th year group), String quartet, Choir, Singer, Crooner.

The effect of sex.

Boys appear to hear more frequently than girls, Dance band, Brass band, Pipe band, Cinema organ, String quartet, Crooner, while the reverse appears to be true for Large orchestra, Theatre orchestra, Piano, Violin, Pipe organ, Choir, Singer. (These changes agree with those for younger pupils in respect of Dance band, Brass band, Pipe band, Piano, Cinema organ, String quartet, Singer, Crooner.)

Heard most. (Gramophone, etc.).

The frequency lists are:-

Boys, 4th year.	Wireless, Concerts, Church, Gramophone, School, Own performance, Performance of others.
Girls, 4th year.	Wireless, Concerts, Church, School, Performance of others, Own performance, Gramophone.
All, 4th year.	Wireless, Concerts, Church, Gramophone, School, Performance of others, Own performance.
All, 5th year.	Wireless, Gramophone, Own performance, Church and Concerts (equal), School, Performance of others.
Whole group.	Wireless, Concerts, Church, Gramophone, School, Own performance, Performance of others.

Wireless, Concerts, Church have high places, while School music, Own performance and Performance of others have low places. Compared with the lists for the younger pupils, Church music (though still high) has a lower position while 'Concerts' has a higher position.

Effects of age.

Apparent increases in frequency of hearing as age increases are shown by Gramophone music and Own performance, while apparent decreases are shown by Wireless (which may be due to extra school preparation), Concerts (perhaps same reason), School music (accounted for by school time-table), Church music, Performance of others.

Effect of sex.

Boys appear to hear more than girls do the following:- Gramophone music, Wireless music, Concerts, Church music, while the reverse appears to be true for Own performance, School music, Performance of others. The largest differences and therefore the most likely to be significant are those for Wireless, Gramophone music and Performance of others.

Effects of listening to music.

The abbreviations which are used in the table on the following page have been explained on page 222 .

The order of diminishing value in mean percentile rank is shown below:-

Boys, 4th year	Movement, Pleasure, Peace, Images, Non-movement, Thoughts, Vague thoughts, Analysis.
Girls, 4th year	Movement, Images, Pleasure, Peace, Thoughts, Vague thoughts, Non-movement, Analysis.
All, 4th year	Movement, Pleasure, Images, Peace, Thoughts, Non-movement, Vague thoughts, Analysis.
All, 5th year.	Movement, Peace, Pleasure, Non-movement, Images, Vague thoughts, Thoughts, Analysis.
Whole group.	Movement, Pleasure, Peace, Images, Non-movement, Thoughts, Vague thoughts, Analysis.

Generally high are Movement, Pleasure, Peace, with Thoughts, Vague thoughts and Analysis generally low. The fact that Analysis is last in the lists is a little surprising since secondary pupils get a fair amount of practice and instruction in listening to the instrumentation, form, and so on, of a piece of music.

Effects of age.

Reductions in the mean percentile rank of 5th year pupils as compared with 4th year pupils are shown in the case of Movement, Pleasure, Images (probably due to the high value for the 4th year girls), and Thoughts, while increases are shown for Non-movement activity, Peace, Vague thoughts, and possibly Analytical attitude. These changes suggest a more passive attitude to music on the part of the older pupils. While this might be due to a reduction in leisure time and a greater intensity of study effort, it is doubtful if this reason is important since it could equally account for an increase in more active responses to music. When the table on page 531 is compared with that on page 527 for the younger pupils there are increases in the mean percentile ranks of all the items in the case of the older pupils except in the case of Analytical attitude. This is surprising but is likely to be a significant manifestation of the orientation of the adolescent mind. If the increases are arranged in order of descending size the following order of items is obtained:-

Movement-activity, Thoughts, Non-movement activity, Peace, Vague thoughts, Pleasure, Imaginal-activity.

Apart from the case of Thoughts ("Music produces in me thoughts of my own without pictures"), there is no clear indication of the development of musical taste or judgment as the age of children increases. For example, a substantial increase for Imaginal-activity would have been impressive.

Sex-differences.

Girls are more likely than boys to experience Movement-activity (perhaps due to dancing interests), Imaginal-Activity, Vague thoughts of "noble or deep things", but less likely to experience Non-movement activity, Peace, Pleasure, Thoughts, Analytical activity. This list agrees with the results of the younger pupils in respect of Non-movement activity, Peace, Pleasure, Imaginal-activity, Thoughts, Analytical activity.

A D U L T S.

The group of adults was made up of persons well-known to the writer and was, in consequence, capable of being classified into three constituent groups. The adults concerned were drawn mainly from professional and clerical occupations.

Group A contained 15 men and 9 women; group B contained 16 men and 14 women; group C contained 12 men and 4 women (the latter very small number was the result of the great difficulty experienced by the writer in getting questionnaires returned - the adults filled up the questionnaire individually in their own time.) Group C contains individuals with no special musical interests. In the writer's opinion, it consists of average subjects. Many questionnaires were issued to these 'average' subjects, but it was difficult to get them returned. (The other groups presented no such difficulty.) This is a common difficulty in the questionnaire method applied to adults, e.g. as in social enquiries.

Group B consists of people with a good deal of musical interest, and contains a number of executants. Group A consists of people with very superior musical interests - people to whom music is a primary consideration or essential component of living. No individual was classified in Group A unless he or she displayed exceptional power for remembering melodies or harmonies, enthusiasm for some activity in music - reaching the strength demanding some form of self-abnegation, or some other strong quality superposed on a general interest in music.

The average age of the group was 32 years, extreme ages being 18 and 60. Most of the ages clustered pretty closely round the average.

Tabulated results are on page 532 of the Appendix.

Consideration of the results.

The table below gives the percentage of the group.

'Have you a wireless set?'

Group	Yes	No
A, men	100%	0
A, women	88·9	11·1
All A	95·8	4·2
B, men	81·3	18·7
B, women	92·9	7·1
All B	86·7	13·3
All C	87·5	12·5
Whole group	90·0	10·0

The percentage of the whole group possessing sets is much the same as in the case of secondary pupils, as could be expected. The most musical group tends to possess most sets.

'Have you a gramophone?'/

/'Have you a gramophone?'

Group	Yes	No
A, men	60·0%	40·0
A, women	44·4	55·6
All A	54·2	45·8
B, men	50·0	50·0
B, women	78·6	21·4
All B	63·3	36·7
All C	57·1	42·9
Whole group	58·8	41·2

The percentage of the whole group possessing gramophones is greater than for any of the groups previously studied. The figures for the A groups might be expected to be larger.

'Do you sing in a choir?'

Group	Yes	No
A, men	46·7 (86·7)	53·3
A, women	33·3 (66·7)	66·7
All A	41·8 (79·2)	58·2
B, men	25·0	75·0
B, women	33·3	66·7
All B	28·6	71·4
All C	7·1	92·9
Whole group	28·8	71·2

The numbers in brackets show the percentages for Group A if previous choir membership (of several years' duration) is taken into account. This consideration makes very little difference to the values in the other groups. Choir experience therefore appears to be a factor connected with musical interest and abilities, i.e. according to the order A,B,C.

'Do you sing by yourself in public?'

Group	Yes	No
A, men	26·7%	73·3
A, women	44·4	55·6
All A	33·3	66·7
B, men	26·7	73·3
B, women	16·7	83·3
All B	22·2	77·8
All C	13·3	86·7
Whole group	24·2	75·8

Singing solos appears to be a factor connected with musical ability and interest but is **rather more a feminine** than a masculine feature. It is commoner among adults than adolescents but less common than among children. Self-consciousness and social adjustment could account for this.

'Do you hum, sing or whistle when alone?'

Group	A lot	A little	No
A, men	66·6%	33·3	0
A, women	55·6	44·4	0
All A	62·5	37·5	0
B, men	50·0	50·0	0
B, women	38·5	38·5	23·1
All B	44·8	44·8	10·3
All C	56·3	31·3	12·5
Whole group	47·8	44·9	7·2

This form of activity is found more among musical people than with average persons. It is more of a masculine activity than a feminine one as was found in the case of the young pupils. Adults appear to demonstrate it more than the young pupils, but less than the adolescents. This may be accounted for by the adolescent's wish for self-expression and demonstration, that is, it is a manifestation of his general desire for adjustment.

'Do you play a musical instrument?'

Group	Yes	No
A, men	67.7%	33.3
A, women	100.0	0
All A	79.2	20.8
B, men	75.0	25.0
B, women	64.3	35.7
All B	70.0	30.0
All C	33.3	66.7
Whole group	64.3	35.7

The playing of a musical instrument agrees with the order A, B, C. It might be thought that this is a case of circular reasoning. Not altogether - in fact, the circumstances which refute this objection are the important ones. In grading the groups the writer was not prepared to accept the playing of an instrument as a touchstone of musical ability and interest - although certainly it has some slight indicative qualities,-but sought rather to find evidence of musical interest, sensitivity or enthusiasm shown in several ways. The A men gave fewer affirmative responses than the B, yet they appear to have stronger and wider musical interests and their playing, although less proportionally in a numerical estimate, is more personal, more sustained and more intense. The percentage for A men shows that the playing of an instrument, although related to musical interest, is not an essential component of it. There is a significant difference between the percentages for men and women in the A group which is perhaps due to the women manifesting interests and activities which are mainly reproductive while the men manifest interests and activities which have greater creativeness and initiative. This is a belief of the writer, which may be wrong, but it would, if true, explain the difference.

The analysis of the instruments played is:-

A, men (15 subjects)	Piano (4 cases), Organ (2 cases), Piano and Organ (3 cases), Piano and Brass instruments (1 case).
A, women (9 subjects)	Piano (7 cases), Piano and Violin (1 case), Piano and Clarinet (1 case).
B, men (16 subjects)	Piano (5 cases), Violin (2 cases), Organ (1 case), Violin and Piano (1 case), Bagpipes (1 case), Mouth organ (2 cases).
B, women (14 subjects)	Piano (9 cases).
C, all (15 subjects)	Piano (3 cases), Guitar (1 case), Mouth organ (1 case)

The next three questions, about 'church', 'orchestra', and 'singer or choir', received 100°/o responses as one would expect.

'Does any other person at home play or sing?'

Group	Yes	No.
A, men	66.7%	33.3
A, women	88.9	11.1
All A	75.0	25.0
B, men	75.0	25.0
B, women	42.9	57.1
All B	60.0	40.0
All C	33.3	66.7
Whole group	58.6	41.4

There is an increase in the affirmative percentage from the young children to the adolescents and to the adults. Probably an important reason forthis is the effect of selection but all the figures for home music-making have been quite impressive. The results of the table on previous page agree with the grading A, B, C, so persons with strong musical interests and activities tend to have 'more musical homes' than persons with weaker musical interests and activities.

The form of home contacts is shown by the following analysis:-

Group A (24 subjects).

Singing	Father (3 cases), Mother (4 cases), Brother (3 cases), Sisters(5 cases), Sons (3 cases), Wife (4 cases).
Piano	Father (3 cases), Mother (1 case), Brother (5 cases), Sister (5 cases), Husband (1 case).
Violin	Brother (2 cases), Wife (1 case).
Organ	Husband (1 case).

Group B (30 subjects).

Singing	Father (1 case), Mother (2 cases), Sister (2 cases), Wife (1 case).
Piano	Father (2 cases), Mother (3 cases), Brother (3 cases), Sister (9 cases), Daughter (2 cases), Wife (2 cases).
Bagpipes	Brother (1 case).
Euphonium	Son (1 case).

Group C (16 subjects).

Singing	Mother (1 case), Sister (1 case), Daughter (1 case).
Piano	Father (1 case), Sister (1 case).
Violin	Sister (1 case).

'How many people at home, including yourself, hear your wireless set?'

The averages are:-

Group A, 3·7; group B, 4·0; group C, 4·4; whole group, 4·0. The averages for the gramophone are :- Group A, 3·2; group B, 4·1; group C, 4·8; whole group, 3·9. The values of the averages for wireless or gramophone decrease steadily along the series:- Young children, adolescents, group C, group B, group A. The effect of selection is a partial explanation, no doubt, since financial resources tend to increase and size of family group to diminish according to this series. Nevertheless, the results point to the hypothesis that homes with increased incomes and small intimate family groups show more interest in listening to music than homes with smaller incomes and larger family groups.

Liking for the hearing of music.

Group	Like very much	Rather like	Neutral	Rather dislike	Very much dislike
A, men	100%				
A, women	100				
All A	100				
B, men	87·5	12·5			
B, women	92·3	7·7			
All B	89·7	10·3			
C, men	58·3	33·3	8·3		
C, women	100				
All C	68·8	25·0	6·3		
Whole group	88.4	10.1	1.4		

A liking for hearing music very much appears to be correlated with the order A, B, C as one would expect. Although the percentage for C women is based on a tiny number of cases it has a certain value for verification purposes. It appears that a strong liking for hearing music is rather more a feminine than a masculine tendency as was found before in the case of young children (page 212). The results for musical expression when alone would, in conjunction with this result, suggest that the female is rather more passive in musical attitude than the male, while the male is rather more active in attitude; or, to put it another way, that women tend to be 'extraverted' in their attitudes to music while men tend to be 'introverted'. The tables on pages 212 , 227 and above show that a shrinking in the range of the responses indicated above occurs as age increases, a retraction away from the 'dislike' end occurring; and the percentage of 'Like very much' responses increases as age increases.

The effect of broadcast music on interest.

Group	Definitely become less	Slightly less	No change	Slightly increased	Definitely increased
A, men			14·3%	14·3	71·4
A, women			44·4	11·1	44·4
All A			26·1	13·0	60·9
B, men			12·5	18·8	68·5
B, women		8·3	33·3	16·7	41·7
All B		3·6	21·4	17·8	57·1
All C	6·7		13·3	20·0	60·0
Whole group	1·5	1·5	21·2	16·6	59·1

The subject who responded 'Definitely become less' is a peculiar person. He has many disputes over trifles with the mother and sister with whom he lives, is partially blind, but works hard at a lucrative profession. He is highly ego-centric and resents advice, correction or the slightest frustration. The mother and sister are interested in music generally and classical music in particular so it would be sufficient for the latter persons to express a few favourable opinions about broadcast music for this person to develop a resentment against it. Actually he is seldom at home, so for several reasons it is fair to regard his response as an overstatement.

The woman who responded 'Slightly less' is one of six sisters, all unmarried, who stay in the same house as their widowed mother. The subject is the eldest, the age range of the family being about 36 to 45 years of age. She is distinctly fidgety and nervous, and is inclined to try to dominate her sisters, but with evident lack of success. Her tastes in music, which favour the classical and serious, are different from those of her sisters. She complains of the indifference shown by the rest of the family to her tastes and projects in music, so it is likely that her response 'Slightly less' arises from resentments in home life.

The younger children (page 213) give more support to the 'less' categories than the adolescents or adults. The adults testify to more 'increase' effects than the young children, but less so than do the adolescents.

The men support 'Slightly increased' responses more than do the women, and this tendency is even more marked in 'Definitely increased' responses. The women tend to claim 'no change' more than the men do, which may be due to the conservatism attributed to women more than to men. The high percentage of 'Definitely increased' responses for A men is of interest, particularly when it is found that the most musical of this highly musical group support this response. One reason for this is the selective, intelligent and tasteful way in which these subjects listen to the available programmes.

<u>'Sad music is music that actually makes me feel sad'</u>.

Group	True	False	Doubtful.
All A	50·0%	37·5	12·5
All B	43·3	26·7	30·0
All C	50.0	12.5	37·5
All men	41·9	34·9	23·3
All women	55·6	14·8	29·6
Whole group	47·1	27·1	25·7

When the χ^2 test is applied to the actual numbers of the responses composing these distributions, the last two differ significantly from a chance distribution of the 1:1:1 form. The group of women therefore tends definitely to experience sad emotions when listening to 'sad' music, while it is doubtful whether or not men do, on the whole. From the results of the separate groups, A, B, and C, it seems likely that the most musical group contains more individuals denying the question than do the other groups. That is, while the percentage of those claiming to experience sadness is much the same for the three groups, the percentage of those denying the question increases as the musical ability and interest of the groups increases. This suggests that emotional experiences tend to become reduced as musical interest and experience increases, that is, that musical people tend to have more 'detached' attitudes (of the critical, analytical type) than the less musical i.e. musical people do not tend to project their own feelings on to the music they hear. The percentages for 'True' are greater than those for the adolescents, but less than those for the young children. This may be accounted for by the interest of the adolescents in dance music, which is seldom of the 'sad' type; if this is true, it suggests a decrease in emotional experience of a 'sympathetic' or 'resonance' type as age increases.

'Sad music is music in which the composer tries to suggest sadness by some thought, picture or imagination in my mind without actually making me feel sad.'

Group	True	False	Doubtful
All A	45·8%	25·0	29·2
All B	43·3	6·7	50·0
All C	43·8	18·8	37·5
All men	48·8	16·3	34·9
All women	37·0	14·8	48·1
Whole group	44·3	15·7	40·0

When the χ^2 test is applied to the actual response distribution, significant differences from the 1:1:1 type are found in the case of group B, all men, and whole group, so definite conclusions can be drawn from these. The general form of the table shows that less support is given to 'False' and more to 'Doubtful' than in the last table, while the support for 'True' is much the same. The general trend of opinion is to favour the trueness of the previous statement rather than the trueness of the above statement. The group of men gives more support to the trueness of the latter than do the women, which agrees with the previous observation of a sex-difference.

However, as was noted before, it is necessary to consider how far the responses to the two questions, taken in conjunction, agree with each other. This is seen in the tables in the Appendix, page 541. Here also will be found mean square contingency coefficients, C. These values of C are all significant, and are negative, so that affirmation of 'Sadness' tends to accompany denial of 'Descriptive sadness' and conversely, 'doubtful' being operative in swinging the trend of opinion from one form of response to the other. The values of C are much the same as those for adolescents (page 229) but are greater than that for young children. The general trend of opinion is to support an affirmation of sympathetic emotional experience rather than the experiences connoted by 'descriptive sadness'. The values of the coefficient C for the A, B and C groups show a greater precision of differential judgment as the musical quality of the group increases.

The interests of the subjects.

The preference lists are:-

A, men	Music, Serious literature, Poetry, Theatre, Psychology, Light literature, Paintings or Drawings, Games , Philosophy, Cinema, Mathematics, Biology, Chemistry, Physical Science, Cards, Dancing.
A, women	Music, Theatre, Light literature, Serious literature, Cinema, Dancing, Poetry, Paintings or drawings, Games, Psychology, Philosophy, Cards, Biology, Physical science, Mathematics, Chemistry.
All A	Music, Serious literature, Theatre, Poetry, Light literature, Cinema, Paintings or drawings, Games, Psychology, Philosophy, Dancing, Mathematics, Biology, Cards, Physical sciance, Chemistry.
B, men	Music, Games, Serious literature, Psychology, Paintings or drawings, Physical science, Cinema, Light literature, Theatre, Philosophy, Poetry, Mathematics, Biology, Dancing, Chemistry, Cards.
B, women	Music, Light literature, Cinema, Theatre, Dancing, Games, Serious literature, Paintings or drawings, Poetry, Psychology, Cards, Mathematics, Physical science, Philosophy, Biology, Chemistry.
All B	Music, Games, Cinema, Serious literature, Light literature, Theatre, Paintings or drawings, Psychology, Dancing, Poetry, Physical science, Mathematics, Philosophy, Biology, Cards, Chemistry.
All C	Serious literature, Psychology, Music, Games, Light literature, Paintings or drawings, Theatre, Cinema, Poetry, Philosophy, Chemistry, Physical science, Biology, Dancing, Mathematics, Cards.
All men	Music, Serious literature, Psychology, Games, Theatre, Poetry, Paintings or drawings, light literature, Cinema, Philosophy, Mathematics and Physical Science (equal), Biology, Chemistry, Dancing, Cards.

All women	Music, Light literature, Cinema, Theatre, Serious literature, Dancing, Games, Paintings or drawings, Poetry, Psychology, Cards, Philosophy, Mathematics, Physical science, Biology, Chemistry.
Whole group	Music, Serious literature, Theatre, Light literature, Games, Cinema, Psychology, Paintings or drawings, Poetry, Dancing, Philosophy, Mathematics, Physical science, Biology, Cards, Chemistry.

Compared with the lists for the adolescents (page 230), and young children (page 215), it will be seen that the following items have obtained higher positions in the above lists:- Music, Psychology, Philosophy. Items which have obtained lower positions are:- Card playing, Games, Dancing, Cinema, and, on the whole, Mathematics. These changes are comprehensible as the effects of maturing taste in adult life, but the high position of music is interesting, suggesting that interest in music is more of an adult pre-occupation than one for children or adolescents.

The interests of the adults are more in the field of the arts than the sciences. It is perhaps unexpected that Physical science, Chemistry and Biology should have such low positions. It is sometimes maintained that an interest in music accompanies an interest in mathematics or science. The lists above throw great doubt on this statement, for even in the case of the A group, where this statement, if true, would be expected to be most verifiable, the position of the sciences is low.

<u>The effect of sex.</u>

Men show greater interest than women in the following:- Serious literature, Psychology, Philosophy, Mathematics, Biology, Physical science, Chemistry, Poetry. (The introduction of biology into the secondary school curriculum has been maintained by some educationists to be justified because it is more interesting to girls than physics or chemistry. The questionnaire goes to prove that women and girls have relatively little interest in these sciences at all, - a conclusion which many teachers support, - and show no evidence of preferring biology to the other two sciences.)

Women show greater interest than men in Music, Light literature, Theatre, Cinema, Dancing, Card playing. These results agree well with the corresponding results for adolescents.

The effect of group category (A, B, C.)

The following items receive more support from the more musical :- Serious literature, Philosophy, Music, Paintings or drawings, Theatre, Poetry, while the following receive less :- Games, Psychology, Biology, Physical science, Chemistry, Cinema, Dancing.

Preferences (Instrumental).

The lists are:-

A, men	Large orchestra, Choir, String quartet, Piano, Singer, Pipe organ, Theatre orchestra, Violin, Brass band, Cinema organ,Dance band, Pipe band, Crooner.
A, women	Large orchestra, Piano, Singer, Violin, Choir, Pipe organ, Theatre orchestra, String quartet, Cinema organ, Dance band, Brass band, Pipe band, Crooner.
All A	Large orchestra, Piano, Choir, Singer, Violin, Pipe organ, String quartet, Theatre orchestra, Brass band, Cinema organ, Dance band, Pipe band, Crooner.
B, men	Large orchestra, Violin, Piano, Theatre orchestra, Choir, String quartet, Singer, Pipe organ, Dance band, Cinema organ, Brass band, Pipe band, Crooner.
B, women	Large orchestra, Piano, Singer, Theatre orchestra, Violin, Dance band, Cinema organ, Pipe organ, String quartet, Choir, Brass band, Pipe band, Crooner.
All B	Large orchestra, Violin, Piano, Theatre orchestra, Singer, Pipe organ, String quartet, Dance band, Cinema organ, Choir, Brass band, Pipe band, Crooner.
All C	Theatre orchestra, Large orchestra, Choir, Singer, Cinema organ, Piano, Pipe organ, Brass band, Dance band, Pipe band, Violin, String quartet, Crooner.
All men	Large orchestra, Theatre orchestra, Choir, Violin, Piano, Singer, Pipe organ, String quartet, Brass band, Cinema organ, Dance band, Pipe band, Crooner.
All women	Large orchestra, Piano, Singer, Violin, Theatre orchestra, Pipe organ, Cinema organ, Choir, String quartet, Dance band/

	/Dance band, Brass band, Pipe band, Crooner.
Whole group	Large orchestra, Piano, Theatre orchestra, Singer, Violin, Choir, Pipe organ, String quartet, Cinema organ, Dance band, Brass band, Pipe band, Crooner.

If these lists are compared with those for adolescents (page 231) and young children(page 216) it will be seen that the items which attain higher positions as age increases are:- Large orchestra, String quartet, Theatre orchestra, Violin, Choir, while those receiving lower positions are:- Cinema organ, Dance band, Brass band, Pipe band and Crooner.

<u>The effect of sex.</u>

Men prefer more than women do the following:- Large orchestra, Theatre orchestra, Brass band, Pipe band, Pipe organ, String quartet, Choir, while women prefer more than men do the items - Piano, Cinema organ, Singer, Crooner, and, on the whole, Dance Band. (These results agree with those for adolescents in respect of Theatre orchestra, Brass band Pipe band, Piano, String quartet, Singer, Crooner. In the case of the items which show a lack of agreement, the differences in mean percentile ranks are so small that the apparent disparity loses considerable weight, especially if the factor of performance or participation is also considered, as,for example, singing in a girls' choir.)

<u>The effect of category.</u>

Items showing increase of support as the musical quality of the group increases are :- Large orchestra, Piano, Pipe organ, String quartet, Choir, Singer.

Items showing decrease of support are:- Theatre orchestra, Dance band, Pipe band, Cinema organ, Crooner.

These observations on category difference are of great interest for they serve to show the differences between the 'musical mind' and the less musical mind, and consequently suggest the types of music which could be used for promising tests for objective measurements.

<u>Preferences (Operas, etc.)</u>

The lists are:-/

/The lists are:-

A, men; A, women; All A	Classical music, Operas, Light music, Modern music, Dance or jazz music.
B, men; B, women; All B	Light music, Classical music, Operas, Dance or jazz music, Modern music.
All C.	Classical music, Operas, Light music, Dance or jazz music, Modern music.
All men; all women, whole group.	Classical music, Operas, Light music, Modern music, Dance or jazz music.

To these adults modern music has the established meaning of music showing innovation of harmony, form and rhythmic structure, so 'modern music' is not really comparable in position with the position obtained from the results of younger subjects. When the lists for the adults are compared with those for the younger subjects the obvious changes are the increased support given to Classical music and Operas in the above lists and to decreased support given to Light music and Dance or jazz music, results which are comprehensible on the view that increasing age should produce a refinement of taste.

The position of Modern music in the list for the A group is not high (a result which is natural enough) but is higher than for the other groups. This is almost certain to be due to the effect of experience and comprehension.

The effect of sex.

Men prefer more than women do the items, Classical music, Modern music, and, with doubt cast by the A group, probably Dance music. Women prefer more than men do the items, Operas and Light music, but this is a very doubtful result. (The results for adolescents agree in respect of Operas, Dance music, Modern music.)

The effect of category.

Items showing increase of support as the musical quality of the group increases are :- Operas, Classical music, Modern music, while the reverse is true for Dance music.

Preferences (Songs, etc.)

The lists are:-

A, men	Symphonies, Operas, Overtures, Sonatas, Songs, Waltzes, Marches, Hymns, Modern dances.
A, women	Symphonies, Songs, Operas, Waltzes, Overtures, Sonatas, Hymns, Marches, Modern dances.
All A	Symphonies, Operas, Songs, Overtures, Sonatas, Waltzes, Marches, Hymns, Modern dances.
B, men	Waltzes, Songs, Symphonies, Marches and Overtures (equal), Operas, Sonatas, Hymns, Modern dances.
B, women	Waltzes, Songs, Operas, Overtures, Symphonies, Hymns, Marches, Modern dances, Sonatas.
All B	Waltzes, Songs, Overtures, Operas, Symphonies, Marches, Sonatas, Hymns, Modern dances.
All C	Songs, Waltzes, Operas, Marches, Hymns, Symphonies, Overtures, Sonatas, Modern dances.
All men	Symphonies, Songs, Waltzes, Overtures and Operas (equal), Sonatas, Marches, Hymns, Modern dances.
All women	Songs, Waltzes, Operas, Symphonies, Overtures, Hymns, Sonatas, Marches, Modern dances.
Whole group	Songs, Symphonies, Waltzes, Operas, Overtures, Sonatas, Marches, Hymns, Modern dances.

When compared with the lists for adolescents (page 233), it is seen that Waltzes, Marches, Modern dances, which headed the lists for the adolescents, have been reduced in position in the above lists - again a comprehensible result of increasing age.

The effect of sex.

Men prefer more than women do the items, Sonatas, Symphonies, Marches, Overtures, while women prefer more than men do the items, Songs, Waltzes, Modern dances, Operas, Hymns.

The effect of category.

Items showing increase of support as the musical quality of the group increases are - Songs, Sonatas, Symphonies, Overtures, Operas, while the reverse is true for Waltzes, Modern dances, Marches, Hymns.

Preferences (Soprano, etc.)

The lists are:-

A, men	Soprano and Tenor (equal), Bass, Contralto.
A, women	Soprano, Tenor, Contralto, Bass.
All A	Soprano, Tenor, Bass, Contralto.
B, men	Tenor, Bass, Contralto, Soprano.
B, women	Tenor, Soprano, Contralto, Bass.
All B	Tenor, Soprano, Contralto, Bass.
All C	Tenor, Bass, Contralto, Soprano.
All men	Tenor, Bass, Soprano, Contralto.
All women	Soprano, Tenor, Contralto, Bass.
Whole group	Tenor, Soprano, Bass, Contralto.

These lists agree quite well with those obtained previously and serve to verify the principles suggested already, namely that listeners tend to prefer the high quality of voice in preference to the low, but the other principle appears to operate also - listeners tend to prefer the singing of individuals of their own sex. The table on page 537 shows that women prefer more than men do the items Soprano and Contralto, while men prefer more than women do, the items Tenor and Bass.

The effect of category.

Items showing increase of support as the musical quality of the group increases are Soprano and Bass, while the reverse is true for Contralto and Tenor.

Preferences (Solo, etc.)

The lists are:-

A, men	Male choir, Mixed choir, Solo, Quartet, Duet.
A, women	Solo, Duet, Mixed choir, Quartet, Male choir.

All A	Solo, Mixed choir, Male choir, Quartet, Duet.
B, men	Mixed choir, Solo, Male choir, Duet, Quartet.
All B	Solo,Male choir, Mixed choir, Duet, Quartet.
All C	Solo, Mixed choir, Male choir, Quartet, Duet.
All men	Solo, Mixed choir, Male choir, Quartet, Duet.
All women	Solo, Male choir, Mixed choir, Quartet, Duet.
Whole group	Solo, Mixed choir, Male choir, Quartet, Duet.

Solo tends to have a high place, while Quartet and Duet have low places. However, the latter combinations are heard comparatively seldom and the quality of the music is hardly impressive. (It must be added that publishers are steadily helping to remedy this. 'Two part songs' for school children can be obtained widely and are generally of very good quality.)

The lists are much the same as those obtained with younger subjects except that the young children give a higher place to Duet than do the adolescents or adults.

The effect of sex.

Men prefer more than women do the items, Mixed choir and Male choir while the reverse is true for Solo, and probably Duet and Quintet. This may be due to sex-preference as mentioned in the preceding section, with a masculine liking for volume and massive effects and a feminine liking for an individual, personal, intimate situation.

The effect of category.

Items showing increase of support as the musical quality of the group increases are:- Mixed choir, Quartet, Male choir, while the reverse is probably true for Duet.

Heard most (Large orchestra, etc.)

The frequency lists are:-

A, men	Piano, Choir, Singer, Large orchestra, Theatre orchestra, Pipe organ, Cinema organ, Violin, Dance band, String quartet, Brass band, Crooner, Pipe band.
A, women	Piano, Singer, Theatre orchestra, Large orchestra, Violin, Pipe organ, Choir, Cinema organ, Dance band, Crooner, Brass band, String quartet, Pipe band.
All A	Piano, Singer, Choir, Large orchestra, Theatre orchestra, Pipe organ, Violin, Cinema organ, Dance band, String quartet, Brass band, Crooner, Pipe band.
B, men	Piano, Dance band, Singer, Theatre orchestra, Large orchestra, Violin, Choir, Cinema organ, String quartet, Brass band, Pipe organ, Crooner, Pipe band.
B, women	Piano, Dance band, Large orchestra, Theatre orchestra, Singer, Choir, Pipe organ, Cinema organ, Violin, Crooner, Brass band, String quartet, Pipe band.
All B	Piano, Dance band, Theatre orchestra, Singer, Large orchestra, Choir, Cinema organ, Violin, Pipe organ, Brass band, Crooner, String quartet, Pipe band.
All C	Dance band, Cinema organ, Theatre orchestra, Singer, Large orchestra, Piano, Choir, Crooner, Brass band, Violin, String quartet, Pipe band, Pipe organ.
All men	Piano, Singer, Theatre orchestra, Dance band, Large orchestra, Choir, Cinema organ, Violin, Pipe organ, Brass band, String quartet, Crooner, Pipe band.
All women	Piano, Dance band, Large orchestra, Theatre orchestra, Singer, Choir, Cinema organ, Pipe organ, Violin, Crooner, Brass Band, String quartet, Pipe band.
Whole group	Piano, Dance band, Singer, Theatre orchestra, Large orchestra, Choir, Cinema organ, Violin, Pipe organ, Brass band, Crooner, String quartet, Pipe band.

The list for group C has a fair resemblance to that for adolescents. Crooner, String quartet and Pipe band are uniformly low in the above lists while Piano tends to have a high place. The position of Dance band for group B is disappointingly high. This is partly due to the influence of others at home, yet the musical quality of group B is fairly high, so high that one would expect the members of the group to have more than enough initiative to cut the Gordian knot of home influence in this matter.

If the mean percentile ranks for corresponding items in the tables for 'Preference' and 'Frequency' are compared for group A (pages 534 and 538) it will be seen that the following receive more support in the way of preference than of frequency of hearing:- Large orchestra, Violin, Pipe organ, String quartet, Choir, (that is, the hearing of these gives a good return in the way of strength of preference.) The opposite is found for Theatre orchestra, Dance band, Cinema organ, Singer, Crooner.

The effect of sex.

Men appear to hear more than women do the items, Brass band, Pipe band, String quartet, Singer, while the opposite appears to be true for Crooner, and possibly Pipe organ. (The mean values resemble each other well, so that the differences appear less important than the resemblances.) These results agree quite well with those already found.

The effect of category.

Items showing increase of frequency of hearing as the musical quality of the group increases are - Large orchestra, Piano, Violin, Pipe organ, String quartet, Choir, Singer, while the opposite is found for Dance band, Brass band, Pipe band, Cinema organ, Crooner.

Some answer may be attempted to the question 'What relation exists between the types of music which the subjects prefer and the types which they hear most frequently?' Rank coefficients of correlation ρ , were worked out between the ranks of the preference lists and the ranks of the frequency lists and are shown in the table below.

Group	Coefficient ρ	P.E. of ρ
All boys, young children	·50	·15
All girls, young children	·70	·10

Group	Coefficient ρ	P.E. of ρ
Whole group, young children	·70	·10
4th year, boys	·84	·06
4th year, girls	·77	·08
All secondary pupils.	·84	·06
A, men	·75	·09
A, women	·84	·06
All A	·84	·06
B, men	·65	·12
B, women	·79	·08
All B	·58	·13
C, men	·58	·13
C, women	·50	·15
All C	·53	·14
All men	·63	·12
All women	·65	·12
Whole group, adults.	·66	·11

These coefficients are all significant and indicate marked or high relationships between 'frequency' and 'preference'. (The results are broad group results. A more detailed analysis would have consisted in obtaining measures of relationship for individuals and pooling these results, a matter of considerable labour.) The relationship appears to increase as the musical quality of the adult groups increases, probably because an increase in this quality leads to a greater discrimination in the quality and type of the music heard. No reliance can be placed on the results for C, women, because of the small number comprising the group, and a tentative conclusion can be drawn that men show less relationship between the preference and frequency lists. This seems to be due to the men hearing more frequently than they like certain items, and conversely, to a greater extent than women do. The difference therefore may be a definite sex-difference explicable by the males possessing more initiative in musical activities and holding more definite opinions than the women and by the women showing more suggestibility and a greater tendency to reproductive activity. The interpretation of the coefficients for younger subjects depends on a knowledge of the extent to which they can select the type of music heard.

Heard most (Gramophone, etc.)

Frequency lists are:-

A, men	Wireless broadcast music, Own performance, Church, Concerts, School music, Gramophone, Performance of friends or other amateurs.
A, women	Wireless, Church, Own performance, Performance of others, Concerts, Gramophone, School music.
All A	Wireless, Own performance, Church, Concerts, Performance of others, Gramophones, School music.
B, men	Wireless, Own performance, Church, Performance of others, Concerts, Gramophone, School music.
B, women	Wireless, Own performance, Church, Performance of others, Concerts, Gramophone, School music.
All B	Wireless, Own performance, Church, Performance of others, Concerts, Gramophone, School music.
All C	Wireless, Gramophone, Concerts, Church, Performance of others, School music, Own performance.
All men	Wireless, Concerts, Own performance, Church, Gramophone, Performance of others, School music.
All women	Wireless, Own performance, Church, Concerts, Performance of others, Gramophone, School music.
Whole group	Wireless, Own performance, Church, Concerts, Gramophone, Performance of others, School music.

The position of 'School music' is obvious. There are two cases where 'School music' is not at the foot of the lists. In the case of "A, men", this is explained by the fact that some members of the group are school music teachers. In the case of "All, C", the position is explained by the fact that several of the members have children or brothers or sisters of school age.

The lists agree well with those previously obtained except that 'School music' has a humble position in the adult lists, while 'Own performance' has advanced in position, which is natural, since a greater percentage of the adults play musical instruments, as compared with the younger groups. Wireless broadcast music and church music have again high places, 'Wireless music' being consistently first. Even in the most musical groups 'Own performance' is heard less than broadcast music. This may or may not be surprising or disappointing, depending on one's convictions as to the relative importance of performance and appreciation, but in the case of the group "A, women", where all the subjects play a musical instrument, it is a little unexpected to find that 'Own performance' has third place in the lists while it is second in the lists for "A, men", "B, men" and "B, women."

The effect of sex.

Men appear to hear more than women do the items Gramophone (which is doubtless due to the fact that the men have more gramophones than the women - page 241), Wireless music, and Concerts, while the opposite is found for Own performance, Church music, and Performance of friends or other amateurs. These results agree with those for adolescents in respect of Gramophone music, Wireless music, Concerts, Own performance, Performance of friends or other amateurs. The apparent disagreement for Church music is not serious - the position in the case of adolescents is based on a slight difference between means, while that for adults is based on larger differences and is consistent with the interests of the subjects.

The effect of category.

Items which show an increase of support as the musical quality of the group increases are :- Concerts, Own performance, Church music, and School music, which is anomalous in questions put to adults, with 'Performance of friends or other amateurs' as a doubtful case.

Effects of listening to music.

The abbreviations which are used in the following table have been explained on page 221 .

The order of diminishing value in mean percentile rank is shown in the following table:-

A, men	Analysis, Vague thoughts, Peace, Non-movement, Movement, Thoughts, Images, Pleasure.
A, women	Vague thoughts, Analysis, Movement, Thoughts, Images, Non-movement, Peace, Pleasure.
All A	Analysis, Vague thoughts, Peace, Movement, Non-movement, Thoughts, Images, Pleasure.
B, men	Pleasure, Movement, Thoughts, Peace, Non-movement, Vague thoughts, Analysis, Images.
B, women	Pleasure, Peace, Movement, Non-movement, Analysis, Thoughts, Vague thoughts, Images.
All B	Pleasure, Peace, Movement, Thoughts, Non-movement, Vague thoughts, Analysis, Images.
All C.	Images, Vague thoughts, Pleasure, Peace, Movement, Non-movement, Thoughts, Analysis.
All men	Peace, Movement, Vague thoughts, Pleasure, Analysis, Non-movement, Thoughts. Images.
All women	Peace, Pleasure, Vague thoughts, Analysis, Movement, Non-movement, Thoughts, Images.
Whole group	Peace, Pleasure, Vague thoughts, Movement, Analysis, Non-movement, Thoughts, Images.

Comparing these lists with those for younger groups (page 223 and page 236) it is seen that 'Analysis' and 'Vague thoughts' have advanced in position, while 'Movement' and 'Images' occupy lower positions. These results are quite comprehensible. 'Vague thoughts' means 'Music produces in me vague thoughts of noble or deep things that the composer is trying to express' and an attempt to clarify this statement brings us up against the question of what music means, with all its complexities of philosophical, poetic and aesthetic theory. Mendelssohn's famous saying that music has a meaning more definite than written forms may have been quite clear to an artist of his eminence, but it is far from clear to lesser mortals. Similarly, Beethoven's remark (quoted in Romain Rolland's book), "Music is a higher revelation than the whole of wisdom and the whole of philosophy. He who penetrates the meaning of my music shall be free from all the misery that afflicts others," is hardly applicable to the ordinary listener. Yet the high position of 'Vague thoughts' shows that the adult subjects in listening to music are placing emphasis on the task of seeking meaning in music.

The effect of sex.

Men give more support than women do to Analytical attitude, and perhaps to Movement activity and Non-movement activity. The opposite is true for Peace, Pleasure, and perhaps Vague thoughts. It is not found that women support 'Movement-activity' more than men (although girls support it more than boys) and this, together with the fact that 'Movement-activity' occupies a lower position in the adult lists than in the lists for younger groups, suggests strongly that this form of response to music diminishes as age increases, especially in the case of women. Some differences between the men and women of group A are of interest. The men give less support than the women do to Movement-activity, Pleasure, Imaginations, Thoughts, and Vague thoughts, but more to Non-movement activity, Peace, Analytical attitude. This suggests a more critical and serious attitude on the part of the men, while the result for 'Peace' may be partly explained as an 'escapist' phenomenon.

The effect of category.

Items showing an increase of support as the musical quality of the group increases are - Vague thoughts and Analytical attitude.

Items showing a decrease are - Movement-activity, Peace, Pleasure, and perhaps Thoughts. The result for 'Pleasure' may seem paradoxical, but it means that pleasure as such (as general euphoria say) is of less importance and less frequent occurrence in the case of the musical compared with the less musical. The paradox disappears when we say that music gives great satisfaction to the musical person ('satisfaction' including 'pleasure') while music gives pleasure to the less musical.

Summary

A questionnaire, mainly about various preferences and about opportunities for hearing music, was submitted to young school children, adolescents and adults. The uniformity of the various responses was, on the whole, good and suggested that the questionnaire was evoking significant results.

Effects due to sex, age and musical development were noted and some applications to educational practice were suggested.

H. J. Foss [85] refers to some results obtained from a

B.B.C. questionnaire (one much more limited in scope than the questionnaire used here.) This was answered by 187 individuals and the results for Operas, Military Band, B.B.C. Orchestra, Sacred Organ Music, Secular Organ Music, Symphonies, Classical Music and Singers agree well with those obtained by the writer. This is mentioned because the B.B.C could serve the cause of music by extensive questionnaire surveys. It has opportunities far wider than those of the private investigator.

PHYSICAL PHENOMENA IN LISTENING TO MUSIC.

Some persons when listening to music are conscious on occasion of a powerful experience which might be called roughly a 'thrill' in the body. The writer has been acutely aware of this phenomenon in his own experience for as much of his life as he can remember, and he finds this effect to be much more intense in its physical and emotional aspects than any other phenomenon which at all resembles it: it is an effect seldom experienced with such intensity save in listening to music. It was decided to examine, by means of a questionnaire, the manifestations of this 'thrill' effect in various groups of subjects. The questionnaire constructed for this purpose will be found in the Appendix, page 543.

This 'thrill' has emotional accompaniments, but more characteristic is the physical disturbance which is so obtrusive. It is a little difficult to decide just how far this phenomenon has been discussed by others because 'emotional effects of music', 'exciting effects of music', and similar descriptions do not necessarily imply this 'thrill' effect. The thrill effect may be a culmination of emotional and exciting effects produced by listening to music - but not always, or at least the matter requires analysis. Several books refer to the strong emotional effects of music (e.g., Parry,[75] page 7; Hirn[76], page 90) but in general terms. Direct reference to the occurrence of this physiological thrill is given by Dr. P.E. Vernon[52,30], and by Dr. R. H. Thouless[77], page 463 ff).

RESULTS.

Statistics, detailed lists and some comments will be found in the Appendix, pages 544 to 564.

CONSIDERATION OF THE RESULTS.

"Have you ever found that some kinds of music produced an actual thrill in your body?"

The incidence of affirmative responses is high, as can be seen from the percentages on pages 544, 549 and 555, and appears to increase with age and with increasing musical abilities. This may be due, partly at least, to increasing accuracy in introspection and to increased facilities in opportunity of detecting the phenomenon. The question does not cover the intensity of the experiences nor the frequency of their occurrence in individuals, but from the writer's enquiries it appears very likely that the more musical people experience this thrill with greater intensity and with more frequency than do the less musical. The percentage of affirmative answers is greater for males than for females. In the case of group B, page 555 , the difference in the percentages for men and women is significant. (In the case of group A, both men and women record 100% of affirmative answers, but this group, by reason of its attainments, is exceptional.) The sex difference may explain this, say in terms of inhibitory power, but there is an important consideration worthy of attention in connection with this. Very few men failed to fill up the questions satisfactorily and very little explanation of the task was needed, but a number of women stated that they found difficulty with the questions. When the writer asked them to give the answers one by one and asked them to think carefully about the various points at issue, the answers were quite in keeping with those of other women - they seemed perfectly straightforward answers. So why the delay and the difficulty?" The writer received a strong impression that the answers were being given grudgingly. Indeed the impression recalled vividly that which an investigator receives when administering the word association test when an 'emotional' word is pronounced. It is possible therefore that inhibitory forces were at work - that the women had some repressions about the experiences in question. This is rendered more likely by the fact that the women in question were unmarried and generally of a repressed type. Of course, the word 'thrill' has objections. Its ubiquitous use by the 'flapper', its sexual significance in some contexts, and its somewhat wide meaning render it liable to misapprehension. Nevertheless, it is a common word which covers the details of the phenomenon adequately. The reference to parts of the body may evoke unconscious mechanisms. Even so, the position is unaltered - namely that repressing forces may account for the sex difference shown by the percentage.

"Write a line to show how the effect increased, decreased or changed in any way at different ages".

The subjects generally report an increase as age increases. As was mentioned before, this is a difficult question to answer, but we may take the result as being tentatively true. The percentage of the group stating that an increase occurs is greater for the adolescents than for the adults or for the youngest group. This is comprehensible. The adolescents have a longer period for retrospection than the younger pupils. On the other hand, emotional responses in the adult tend to be more controlled as age increases. The 'increase' percentages for the adults increase in value as the musical quality of the group increases. This is doubtless due to the emotional sensitivity of the musical towards musical compositions together with a widening of the field of this sensitivity as age increases - that is, an increase of the number of foci from which emotional experiences may derive.

"Draw lines under the different parts of the body in which this effect was present".

The values of the percentages for different parts of the body agree fairly well, the values for Head, Stomach and Arms being much the same at different ages. The values for Chest tend to increase with age while those for Legs tend to decrease. The order of descending size derived from the percentages is:-

Youngest group:-	Legs, Head, Arms, Stomach, Chest.
Adolescents:-	Legs, Head, Arms, Chest, Stomach.
Adults:-	Head, Chest, Stomach, Legs, Arms.

As age increases, more support is given to Head, Chest, Stomach. With regard to sex differences, it is possible that females give more support than males to Stomach and rather less to Arms and Legs. As the musical quality of the groups of adults increases the tendency to support Chest increases.

"State the part of your body in which this effect seems to begin."

The value of the percentage for 'Head' is much the same in all the groups. The value for 'Chest' is much the same as we pass from the youngest group to the adolescents but increases in the adult groups. The value for 'Stomach' is much the same for the youngest group and for the adults but has a small value for the adolescents. The value for Arms and Legs is roughly constant, for the two younger groups, and disappears for the adults. The value for Spine increases in the adult group. As in the previous paragraph, the tendency to support 'Head' and 'Trunk' (i.e., to report greater centralisation) increases with age.

The order of descending value in percentages is given by:-

Youngest group:- Legs, Stomach, Head, Chest, Arms, Spine.
Adolescents:- Legs, Head, Chest, Stomach, Arms, Spine.
Adults:- Chest, Stomach, Head, Spine.

If the value for Chest and Stomach are pooled then there is little difference between the results for males and females. In the adult groups, it is possible that the men tend to have the phenomenon beginning in the chest rather than in the abdominal regions (although this may be an illusion due to difficulty of introspection and to 'travel' effects) and conversely for women. This is certainly true for the A and B groups (the group C for women is of slight value), but the differences in the percentages for men and women are not significant.

"Describe how this effect travelled from one part of your body to another".

It is not easy to introspect exactly about this physical effect. Some individuals may succeed in reporting most of the travel effects, while others may only report part of these, so that the classification of the types of response on pages *545, 551 and 557* are by no means to be regarded as rigid. It is likely that there is a good deal of overlap.

The percentage of those unable to describe the travel effects is approximately constant (about one-third of the group): a rather surprising result. The percentage of 'Stationary' answers is variable, being greatest for the youngest but smallest for the adolescents. The percentages for 'diffuse tingle with little movement' increase as age increases. Thrill movements involving Stomach are most common, then follow in order Head, Legs, Chest. Those concerned with Chest have increasing support as age increases; those concerned with Stomach and Head are fairly constant; while the percentages for Legs are made variable by the high value for the adolescents.

"Write a line about the kinds of music that produced this effect".

If the types of responses are broadly classified into the classes 'loud, rhythmic music' and 'refined music' (by which is meant music showing expressive qualities, decorum, restraint, thought in design, etc.), it will be seen that 'loud, rhythmic music' obviously covers about half the responses for the yougest group and the adolescents while 'refined music' covers about one quarter of the responses for the former and about one-eighth of the latter. These are broad classifications and necessarily do not include some possible additions. For the adults, the 'refined music' covers at least one-third of the responses, and the others are distributed in a detailed way.

"Have you ever had this experience or any experience like it, etc.".

The descending order of incidence is:-

Youngest group:-	Film, Reading, Theatre, No reply, "No", etc.
Adolescents:-	Film, No reply, Reading, Theatre, "No", etc.
Adults:-	Film, Theatre, Reading, No reply, "No", etc.

These results are fairly consistent, with Film heading the list. The corresponding fractions of the total responses for each group are, approximately:-

Youngest group:-	$\frac{1}{2}$, $\frac{1}{5}$, $\frac{1}{12}$, $\frac{1}{9}$, $\frac{1}{20}$, etc.
Adolescents:-	$\frac{1}{2}$, $\frac{1}{6}$, $\frac{1}{7}$, $\frac{1}{8}$, $\frac{1}{20}$, etc.
Adults:-	$\frac{1}{5}$, $\frac{1}{5}$, $\frac{1}{5}$, $\frac{1}{7}$, $\frac{1}{11}$, etc.

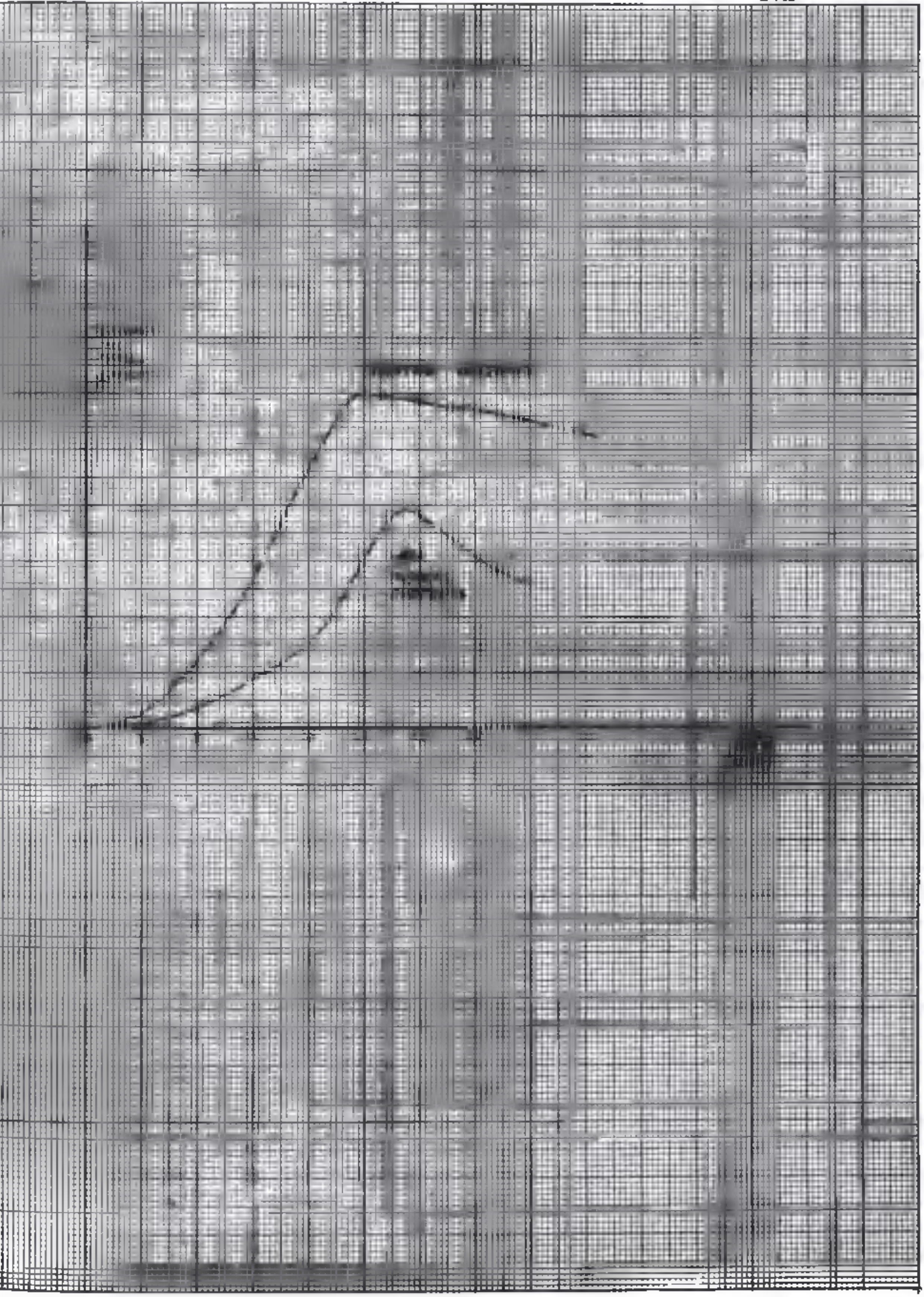
The fractional value for the incidence of Film decreases at the adult stage, while the values for Reading and Theatre increase as we pass from the youngest to the adult groups.

Discussion of the phenomenon.

The writer has for a long time regarded this physical sensation as being of peculiar interest. He can recall it vividly in its occurrence at eight years of age, in listening to music, and at intervals ever since then. The phenomenon will now be considered in the light of the questionnaire results, the writer's personal experience and his enquiries with other persons.

1. The phenomenon is experienced by almost all individuals. If introspection were sufficiently accurate, it is likely that those denying the experience would be even less than is indicated by the percentages already given.

2. There are wide individual differences, apparently, in its incidence and growth at different ages. Musical subjects report an earlier age of incidence than do less musical subjects. The former report ages from 4 to 8 years while the latter report ages in the adolescence span, about 15 to 20 years. However, the writer has observed some cases where children of from 2 to 5 years of age showed considerable excitement when music of a loud rhythmic character was played to them, the manifestations taking the form of facial flushing, singing, shouting, screaming, dancing, marching, rolling on the floor, and wrestling and fighting. A marked reduction in inhibitory control was evident. It is rather likely, then, that the lower limits reported by adults, especially the less musical adults, are too high. At the same time the writer believes that the phenomenon begins earlier and is stronger and more frequent in the more musical than in the less musical. The writer suggests the graph (on page 272) to represent the influence of age; the graph,

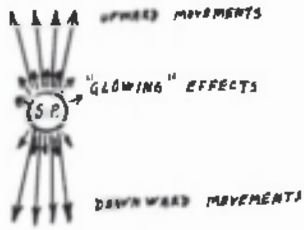


of course, can only suggest trends of variation. It has no experimental foundation.

3. The nature of the phenomenon.

(a) Physical experiences.

One is more aware of this phenomenon once it has commenced to travel, but careful introspection shows that it is preceded by a state of physical and emotional disturbance - a state of tension. This appears to be localised, physically, about the region of the diaphragm and solar plexus, yielding sensations of 'tightness', 'tingling' or 'glowing', whilst mentally there is an awareness of emotional tension, attributed to the region of the brain. Then occurs a form of disruption, like an escape of energy, and 'thrilling' or 'tingling' sensations travel from the region of the solar plexus upwards and, less noticeably, downwards. These sensations are most noticeable in the surface of the skin and in the region of the spinal column and are accompanied by pleasurable emotional experiences and heightened blood pressure. The latter is observed by the appearance of heightened facial colour and introspectively by changes of blood pressure in the brain. One is aware of some kind of activation in the organs of the body and in the underlying tissues. (Sir Jagadish Bose has noted the power of sound in stimulating or retarding the growth of plant life.) It is evident that the vaso-motor or sympathetic nervous system is active during these changes. While the travel effects are occurring, 'glowing' or 'radiating' experiences appear to occur, apparently in the region of the diaphragm. This is represented diagrammatically below, the solar plexus being marked S.P.



That is, the phenomenon has both a travelling aspect and a quasi-fixed aspect. The latter consideration, taken in conjunction with faulty introspection, since the whole period of the phenomen is brief, the effects of changes in blood pressure, skin sensations (e.g., the 'goose-flesh' or 'tingling' sensations associated with the action of the arrectores pili), probably explain why some subjects report that the effect is stationary and, in a few cases, not in the trunk regions.

Darwin[78] refers to three general principles of expression:- I. The Principle of Serviceable Associated Habits. II. The Principle of Antithesis. III. The Principle of the Direct

Action of the Nervous System. "When the sensorium is strongly excited, nerve force is generated in excess, and is transmitted in certain definite directions, depending on the connection of the nerve cells and partly on habit; or the supply of nerve-force may be interrupted." The third principle is expressed in a form which makes us hesitate to accept it. One is apt to be cautious, and rightly so, of statements using words of vague connotation - 'sensorium', 'nerve force generated in excess', 'mental energy', 'surplus energy', and so on - yet Darwin's principle is perfectly clear and perfectly in harmony with the facts of the 'thrill' phenomenon, to anyone who is acquainted with it. Indeed the writer considers that this phenomenon illustrates better than any other this third principle of Darwin. Actually Darwin refers to music in his book - "Fine music causes a shiver to run down the backs of some persons", Chapter 3. ('Fine' understates the case). "We know that strong sensations, emotions or excitements - pain, rage, terror, joy, or the passion of love - all have a special tendency to cause the muscles to tremble; and the thrill which runs down the backbone and limbs of many persons when they are powerfully affected by music, seems to bear the same relation to the above trembling of the body as a slight suffusion of tears from the power of music does to weeping from any strong and real emotion" - Chapter 8.

(b) The psychological side.

It is well to recall that an emotional state has three components, namely cognition, conation and affect (or feeling). The latter, according to the James-Lange theory, has some dependence on bodily changes. The afferent nerve impulses from the viscera and vaso-motor system produce an important constituent of affect. It might be thought that the above discussion of the thrill phenomenon was merely repeating commonplace facts of theories of emotion. This is only partially true, for there are some interesting aspects of the matter which are worthy of attention. Diagram 1 represents an emotional state, the relative sizes of the areas being arbitrary.

Cognition
Conation
Affect

Diagram 1.

This could represent, for example, anger. Certain changes in the cognition and conation aspects could result in the emotional state of fear, the affective component being much the same. Does this representation of an emotional state differ from that experienced in listening to music?

The writer believes that it does in some respects. The cognition component when one is listening to music is less directed towards persons than when one is experiencing anger, fear, tender emotion, and the usual emotions connected with instincts, and, to a less extent, with sentiments. One may often experience anger directed towards persons, but less frequently against things. In listening to music, the 'object' to which one's attention is directed is still more nebulous and less personal. That is, one's cognition is of a peculiar type - one might almost call it 'objectless'. The cognitive component of the emotional state is, in a sense, relatively weak. Again, the conative tendencies are less definite and specialised as compared with instinct and sentiment situations, so that the emotional states in listening to music are of the form shown in diagram 2.

Cognition
Conation
Affect

Diagram 2.

Here the cognitive and conative aspects are represented as being of relatively little importance as compared with ordinary emotional states since they have much less definite objects. As a result, the energy liberated in the organism in connection with the affect has less opportunity for dissipation into action, so that the affect is particularly strong and obvious to the individual. In this experience of the physical thrill, which can be of great intensity, one comes nearer to an awareness of relatively 'pure' affect than in other experiences. (It is quite possible for one group of individuals both to experience the thrill more and to analyse music more than another group, for sometimes both analysis and thrill effect may accompany the hearing of a single piece of music, (E.g., symphony, fugue), though it is likely that these occur either at different times, or, if together, analytical activities are slight and inclined to be swamped by the thrill effect while it lasts.)

These views, of course, assume that the organism does obtain affective experiences in listening to music. The reasons for the organism so doing are explained by many writers in terms of associations and transferences, e.g., Darwin, Hirn, Parry, and while these views are doubtless true, the broad principle can be accepted that a repeated stimulation of the organism tends to evoke a response, with which is connected a state of mind of which affect is a component. If the stimulation is strong and often repeated the tendency to respond is thereby increased. If action is inhibited or otherwise interfered with, the affect tends to increase. This seems to agree with the result obtained previously that loud, rhythmic music is the most common type of music to evoke the thrill response. Music of a high pitch is rather more likely to evoke it than music of a low pitch. (It is a part of the Helmholtz theory that, owing to the shape of the internal cavity of the human ear and its consequent power of resonance, high notes produce a particularly strong impression.) This may account for the unpleasant experience which many people have when a piece of chalk scrapes on a blackboard, when a knife scrapes on china, or when a tuning fork or metal plate is strongly bowed. (Yet certain scraping movements of the skin can produce unpleasant experiences much greater than are warranted by the accompanying pain. These resemble the preceding ones and make it possible that skin sensations form a common factor in both, among other factors.) If an individual taps, marches or dances in time to music which is being heard, the chance of experiencing the thrill - or the intensity of it when it is experienced - appear to be reduced. The effect is rather more that of general euphoria; in fact, it appears that energy has been dissipated in the physical actions which might have been dissipated in the thrill, for the effect of general euphoria referred to resembles the state of euphoria after the thrill has occurred.

Some subjects report that a state of mental relaxation appears to facilitate the occurrence of the thrill. This state of relaxation covers such matters as freedom from perseverating emotional states, (e.g., worry and anxiety), and a lack of, or diminution in, analytical and critical attitudes towards the music. Also a hypnoidal condition may be involved as an aspect of relaxation, in which the subject becomes oblivious to his surroundings. There is, as William James has pointed out, a stream of activation in the life of an individual which does not manifest itself in consciousness, and it is reasonable to think that pulsations of activity induced by the regular stimulation caused by the rhythmic and melodic patterns of music could be part of this stream. In listening to music the mind adjusts itself to this activation - an increase of tone in muscles occurs with heightened euphoria - but if the speed or intensity of the music increases rapidly, or if great sweeps of melody rising to the higher registers occur, a sharp increase in this activation seems to occur and the increased energy takes the form of an overt thrill in the body with a corresponding change in emotional conditions. Just as a person can control his emotions to some extent by intellectual activity, like thought, reasoning and analysis, so he can reduce the likelihood of the thrill occurring - we may say with McDougall that the energy of the emotional state is dissipated by thought and action - a hypothesis in agreement with the reports that analytical attitudes tend to inhibit the thrill. These concepts of equilibrium and inhibition suggest that psychoanalytic theory may be applicable. For example, a person may inhibit, as an unconscious act possibly, the tendency to heightened emotions in listening to certain musical compositions, the inhibition perhaps operating as a result of his wish to concentrate on the design and orchestration of the music. This repressing act may succeed for a time, but fail when the stimulation of the music becomes strong. The release of the repressing system then results in strong thrills and emotional concomitants. This explanation, however fanciful it may appear, agrees with many of the writer's experiences and with those reported by others. It explains, for example, why persons with well developed analytical attitudes in listening to music, may, in spite of concentration, experience strong thrills.

Another aspect of the matter, of course, is that the affective experiences may occur in relation to sentiments. For example, when a person goes to an orchestral concert he organises a mental set or attitude towards the music which he is going to hear, and this mental set is usually complex. The presence of others, the large brightly-lit hall, the large orchestra of performers in evening dress, all convey powerful effects of suggestion that something special and worth while is about to occur. Thoughts like 'This is going to be good', 'This was worth coming for', 'I'm looking forward to the symphony', 'Good old Bach, he's the best of the lot', etc., develop attitudes of expectancy. The organism develops a state of tension, and it is common for thrill effects to occur just when the orchestra commences. These occur more commonly when the orchestra attacks the first chords of a loud piece, but can occur with soft music, (e.g., rhythmic, plaintive, pizzicato). It seems, however, that the thrilling effects are more frequent and stronger at a period varying from, roughly the second quarter to the third quarter of a two hours orchestral programme. This suggests that the stimulation of the music weakens the repressing system (which may possibly cover that force called the Censorship by Freud) and permits a greater flow of energy showing itself in affect changes. If this hypothesis is correct, it would explain as a form of catharsis the refreshing effect which many experience after listening to a fairly lengthy concert. (Howes[47], page 131, expresses views having some relation to these. Also P.E. Vernon[52].) This could be true even if the individuals did not experience the thrill because this appears to be the end-product of a cumulative process and is certain to have mild manifestations, and influences on affective systems, which do not intrude on consciousness. That listening to music may have a cathartic effect by weakening repressive systems is illustrated by certain case analyses. For example one subject reported that listening to soft music with an undulating rhythm produced the thrill and that this usually occurred in conjunction with a visual image of a small boat rocking on 'a lonely sea'. When asked for other reports about this image he stated that music often produced similar images relating to boats and floating. A drum rhythm called up the image of a motor boat as a tiny object moving across a large expanse of water. He had many experiences of floating in air in day-dreams and in nocturnal dreams. It was found that he was maladjusted in home life, that he often wished to start a new life, and it is very likely that these experiences, together with his experiences in listening to music, were expressions of the wish 'to be born again', the images of 'water', 'rocking', 'tiny', 'lonely', 'large', forming a nexus of symbols familiar to the psycho-analyst. The soft swaying music may have caused the thrill, to consider the matter from another angle, by allowing catharsis to occur in connection with the wish to be born again, since this is the style of the lullaby; in fact the subject reported that lullabies gave him great pleasure and that he thought the experience embodied in 'Rock-a-bye baby on the tree top' etc., would be attractive. It is likely that the subject wished, not only to make a new start in life, but to secure the 'Karma' pleasure of 'rocking' or 'floating' in the unborn state. It is interesting to note that his mother (and not primarily his father) ordered him to leave the family roof because of his religious, resentful and anti-social views.

Another subject reported that soft expressive music in a large church profoundly affected her, especially a particular piece played by the same organist on several occasions. She and her sister are the only two children in a prosaic Puritanical home. The father, mother and daughters all play and sing a little, claiming a great interest in music, but actually their standards, although eminently respectable, are not particularly high. Music is one of the few liberal interests in this dull and rather parsimonious home. The daughters do not attend dances as most girls do and vehemently criticise dancing and the flirting of other people, however innocuous this would be judged by the usual social standards. The subject who is being considered complains of extreme giddiness when she finds herself in the company of others, a situation which she tries to avoid. Her attitudes to religion are not so well established as her church attendance and her religious home would indicate, since after her mother's death she had strong periods of doubt verging on complete atheism which surprised and shocked her. She reported that the organ music referred to above caused a strong thrill effect which commenced in the stomach region, did not travel, and produced 'a feeling of absolute weakness'. It is likely that the organ music in the church had strong suggestive powers impinging on her repressions of love, religious, and social tendencies. The reference to the same organist may be, and from her references to his admirable personal and artistic qualities is pretty sure to be, a displacement of love affect. The 'feeling of absolute weakness' is a rather strange expression. When this was referred to, and a further report requested, she stated that she seemed to lose the power of the lower half of the body and felt utterly helpless. This may be a significant reaction of a neurotic type, symbolising sexual submission.

The subject is highly emotional, with strong enthusiasms for certain types of music, notably organ music, and has a peculiar, bashful and confidential attitude towards the men she usually encounters. She also reported that a similar experience of emotional and physical excitement accompanied by the same kind of helplessness occurred when she was passing under the influence of the anaesthetic when about to undergo an operation. This is a condition where the repressing system is being weakened, so it is reasonable to think that the experiences of the subject can be partially explained as being due to the activity of repressed tendencies which have been released from repression.

In another case, a subject reported strong thrill effects from the hearing of certain hymns. It was found that these had been very popular with her father, who played the harmonium a great deal at home. The thrill effects were not noticeable before her father's death a few years previously, but had become very strong after it, to such an extent that if any of these hymns were played in church she experienced strong thrills and burst into tears. She reported that attempts to control these manifestations were of no benefit and that weeping seemed the natural conclusion to these thrills. The family consists of another daughter and herself. The subject was greatly attached to the father and these weeping attacks appear to be due to the heightened affective tension produced by the liberation of repressed tendencies associated with herlove for her father. The hymns are stimulations evoking strong emotional responses.

The hesitation of certain women about filling up the questionnaire is, in the writer's opinion, consistent with the hypothesis that the thrill experiences are connected with the emergence of unconscious trends. The subjects have difficulty in recalling their thrill experiences, and perhaps deny them altogether, because the idea that these express or realise personal and intimate tendencies, especially in the sex field, is one which is subject to censorship and therefore almost inaccessible to consciousness.

Among those who experience the thrill effects strongly are a few individuals of well-defined 'narcissus' types. This may be explained by saying that listening to music is an activity which is directed outward to the external world, yet the music is an external 'object' only in a limited sense. In consequence, the narcissistic personality can experience thrills which liberate some of the emotional energy which should be used in outward love activities while yet preserving his tendencies to direct his love energies towards himself and not to outside personalities and objects.

Taking a wider view, the influence of music in weakening repression and liberating unconscious activation can be seen in patterns of culture other than our own. In a documentary film describing life in various parts of Abyssinia the writer noted a scene of nuptial preparation among members of the Galla tribes in the south. The bridegroom with a friend on either side of him faces the bride who has a corresponding retinue. The two groups dance facing each other, the dance consisting of stamping steps with little progressive movement, but with much movement of the body in which a thrusting forward of the pubes is a frequent occurrence. This dance is sustained for several hours each evening for seven days before the bridal couple share a hut in formal marriage. The dance appears very obviously sexual in occidental eyes. (Whether it is so to the natives may be another matter; the influence of prescribed custom to which obedience must be given may make the ceremony one of unthinking acceptance, as is shown by the unquestioning use in British marriages of ceremonial acts whose meaning is seldom considered.) It must be a most exhausting performance to the dancers, but the expression of exaltation on the faces of the dancers did not appear consistent with this. The dance is accompanied by string instruments and drums. It is very likely that the musical accompaniment facilitates the liberation of physical and emotional energy, liberates the forces of repressed sexual tendencies as the character of the dance implies and hence allows of extraordinary powers of endurance. The ceremony recalls the behaviour of the Louisiana heron before nest-building, (Quoted by Dr. R. H. Thouless[77], page 92) or of the male plover straddling an egg-shaped stone in the courting season.

Dr. Wauchope Stewart, in a lecture on church music, stated that in some districts on the Gold Coast the use of the harmonium in accompanying hymn singing had to be abandoned, and, in fact, the use of hymns curtailed, because the natives became very excited as they sang and the singing was followed later by sexual orgies. A similar anecdote was recounted to the writer by a Tibetan missionary who had managed to observe a great religious ceremony at the Lhasa lamasery, where a great body of monks, accompanied by the long native trumpets and by drums, chanted hymns which clearly weakened cumulatively their repressing systems.

The Bacchanalian dances and the orgies of Dionysius in Greek history illustrate the same tendency. Rosita Forbes, the well-known explorer, has written a book about the women of different nationalities whom she has encountered ('Women called Wild'). She recalls dance ceremonies among natives in which the censorship of the individuals is so reduced by music and dancing that not only do social restraints break down, but magic ceremonies are performed, evidently by means of suggestion to the natives in their unrepressed and highly suggestible state.

The scenes at religious revivals supported by American negroes (and by British communities, too) often show the same unrepressed and suggestible state of mind. (For some special examples, see Havelock Ellis 'Man and Woman' and Hirn[76].)

It has been maintained by many thinkers in the past that nations should listen to certain kinds of music and avoid others, so that appropriate character development may be obtained, e.g., Plato, Aristotle, Confucius[80]. The latter argued that music could be detailed into various types so that appropriate emotions could be evoked and suitably balanced so as to produce individuals well balanced emotionally just as his ethical and civic codes would balance their conduct. No facts are extant as to how this could be done in actual practice.

(c) Some additional considerations.

In the foregoing discussion some of the features of this physical thrill have been considered. Some others may now be mentioned.

The thrill is more likely to occur and with greater intensity and frequency in listening to organ music if the church is large, if the organ is raised in a gallery at the end of the church, with a little light showing, and if the church is darkened. This is due to suggestion and the listener may be conscious of the most intense religious experiences.

In hearing loud music, the thrill has probably a psychological influence in using up the repressed energy of aggressive tendencies, leaving the instincts and sentiments of aggression to operate more freely. This may be a partial explanation as to why people are often aware of enhanced confidence and prestige after an orchestral concert.

Another manifestation of the influence of sentiments is to be found in the thrill accompanying plaintive or sad music. This may be due to the operation of parental sentiments, but the thrill is less commonly found with this kind of music than with loud, rhythmic varieties. In fact, this manifestation, together with a thrill in hearing soft music, seems to be rather more characteristic of the introvert than of the extravert, and probably is a catharsis of negative emotions.

The throbbing rhythm of drums, especially if played alone, may call out powerful thrills. Dread, fear, curiosity, and possibly unconscious sex tendencies, appear to be evoked by this stimulation. The affect of the thrill produced by the drum rhythm seems to be readily organised into these emotional experiences. (For example, the beating of drums in Japanese licensed quarters[79].) The organisation of affect into emotional experiences is greatly facilitated by the dramatisation of the film, in which vision, speech and music co-operate, and to a lesser extent in a theatre performance and in reading. This is verified by the results obtained from the questionnaire.

Some subjects report that the sensation of the thrill resembles an electric shock (of the type obtained from the induction coil) or a tingling of the skin. Others speak of a 'shudder'. These are effective descriptions of the skin sensations. The shiver of fear, dread or anxiety, resembles the phenomenon, as does the shiver of cold when a cold wind is blowing. The shiver of the body attributed to bladder movements suggests that uro-genital nerve tracts may be activated in the thrill experience. Aeroembolism, said to be due to the liberation of gaseous bubbles in the blood and spinal fluid, is a physiological complaint caused by pressure changes in the bodies of airmen and divers and one symptom of this is a powerful and unpleasant tingling which travels over the surface of the body. While these phenomena may or may not be related, their resemblances in introspection are of interest.

Anticipations play a part in the development of the thrill, as is shown by the reports about 'an unexpected modulation', 'when an orchestra gets quicker and louder', 'anticipation of climax' (in music, film, theatre, reading), 'a pedal entry in an organ fugue', 'when the music becomes suddenly loud', 'when the music becomes suddenly soft', 'when the music becomes suddenly slow', 'when the music becomes suddenly quick', and so on. Here there is a directing of the energy of the organism (physical or mental or both) and this is subject to change, either by initiation, cessation or some alteration. These are dynamic conditions recorded against a background of time. There is an alteration of potential or energy flow and this alteration appears to be a factor in the development of the thrill. Putting it another way, there are anticipations and surprises which produce the thrill, the mental effect being generally pleasurable. Organ playing is especially productive of these thrill effects in the organist himself.

In playing the organ, one plays bass passages with the feet so that the neuro-muscular systems of the body are much more active than in other forms of instrumental performance. This activity raises the muscular tone of the body, with heightened euphoric effects. The sense of power of the player is increased by his personal control of varied effects of quality and intensity. In playing, one is conscious of a complex co-ordination of physical and mental activity. This is one reason why organ music is music which is liked by organists, while other people are more cautious in expressing adulation! Further, the entry of a pedal passage at the precise moment when it should enter is satisfying because part of the activity, physical and mental, of the player has been directed towards that point. That is, that particular event releases a certain amount of potential energy. If a mistake occurs, one experiences a disappointment which is acute because a highly co-ordinated activity has gone 'out of gear' or out of synchronisation. (So also in score reading, marching, dancing.) In playing Bach, particularly, the organist feels that he is living synchronously with the musical patterns, that his energy drives in the way of neuro-muscular, emotional and intellectual activity are sweeping on from point to point to the ultimate objective, the final cadence. A mistake in playing Bach's organ music comes as something of a pain or physical shock. These statements are in accord with the view that the motor activation produced by rhythmic stimulation lowers the repressive forces and permits greater energy flows which may appear physically as bodily thrills and mentally as heightened euphoria and pleasurable emotions. The writer can recall vividly his first acquaintance with Bach's Toccata in F for the organ. Arpeggio passages for feet and hands rise upwards and are balanced by massive chords. The thrilling effects of these passages with their reiteration of dramatic declamation repeated in varied forms time after time left the writer in a state of powerful mental and physical exaltation for many hours afterwards.

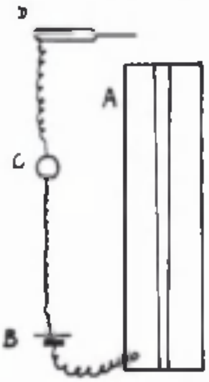
The effect of age may be noted. The hypothetical graphs on page 272 are intended to show (1) that persons of marked musical sensitivity show the tendency to physical thrills at an earlier age than do the less musical (2) that adolescence appears to increase the formation of thrill effects, very noticeably in the usual adolescent period from about 14 to 20 years, but also in the pre-adolescent period from about 8 to 14 years of age, and (3) that the onset of adult life with its responsibilities and problems appears to reduce the tendency to thrill effects. This is probably due to a strengthening of the individual's repressing system, but the extinguishing process appears to be fairly steady though never complete; that is, a very powerful thrill may occur in an individual who would believe such a thing to be no longer possible. Musical people have less of this inhibiting tendency, in spite of their analytical and critical attitudes, probably because they have wider emotional contacts with musical data than have the less musical. As to the effect of adolescence, this may be due to glandular and vasomotor changes. The emotional states of the thrill effect appear to resemble closely in their intensity and with their accompanying sense of mental disturbance (e.g., experiences suggesting that the mind is out of gear with the body, loss of contact with reality) those in religious conversion, falling in love 'at first sight', and hallucinations, experiences which are recognised as being more characteristic of adolescence than of other life periods.

Summary.

In the foregoing discussion, the writer has realised that the wide nature of the subject makes it tempting to over-emphasise partial relations and to accept analogies too readily, to generalise too freely and to over-estimate the reliability of the data. He wishes the statements of the discussion to be regarded as tentative in many cases. The most important findings are that this thrill effect is widespread in its incidence, that it is very likely to be closely related to the vaso-motor system and to affect, and consequently is likely to be linked up with many aspects of the life of an individual and of the race. It is to be noted that the thrill effect, which might on first thoughts be considered to be associated with crude music, and hence be regarded as a 'crude' reaction, is found in all sorts of individuals when listening to varied kinds of music. Indeed the wide manifestations of the phenomenon, which is found in other situations besides that of listening to music, recalls the concept of 'general affectivity' in an individual, a concept supported by Dr. Cyril Burt[80]. This phenomenon, when examined in the light of the gamut of the emotional reactions of an individual, may have a useful role in the study of character. Certainly it is an interesting aspect of an individual's reactions to music and is worthy of consideration as a supplement to tests and estimates.

SOME PSYCHO-PHYSICAL EXPERIMENTS.

1. Steadiness of movement.



The apparatus used is shown in sketch. A is a board with two brass plates, the edges of which approach closer and closer together along the length of the groove between them. B is a battery, C is a bell, and D is a metal stilus. The steadiness of movement of the subject is measured by the distance travelled along the groove before the stilus makes contact with one of the brass plates, thus ringing the bell. The mean distance travelled by the stilus in the case of musical subjects was a little less than the mean distance for less musical subjects, suggesting a little less steadiness of movement, but the difference was not significant, nor did the experiment seem worthy of further investigation.

2. The psycho-galvanic reflex.

Some early experiments with this had appeared promising and had led to the hope that psychological tests for musical ability and sensitivity could be devised and then used as stimuli for the P.G.R. so that relations between musical forms, emotional states and physiological changes could be obtained in order to formulate basic principles of individual reactions to music. The apparatus used is shown below.

FIGURE 1.

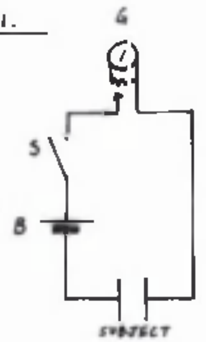
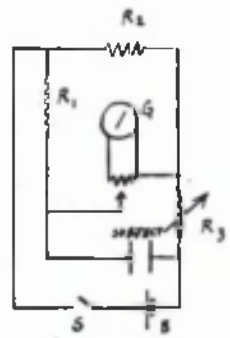


FIGURE 2.



G is a shunted galvanometer, S a switch, B a battery, R_1 and R_2 are resistances, and R_3 is a variable resistance. These circuits are respectively figures 4A and 4B in Dr. Thouless's paper[81]. After a good deal of experimentation it was decided that the Wheatstone bridge method of Figure 2 was unnecessarily complicated and the circuit of Figure 1 was used. The electrodes were of silver foil fastened to the palm and upper surface of the left hand in the manner recommended by Dr. Thouless (Part II of the paper already mentioned - April 1930). The battery B had a voltage of 2 volts. The subject was seated comfortably but was asked to move as little as possible, to avoid sudden

changes in resistance. It was found that from half-an-hour to one hour was needed before the galvanometer reading became steady or almost steady. In addition, a constant, non-decremental, change in resistance was often encountered. More seldom, but even more troublesome, were unexpected and sudden changes of resistance. These are formidable experimental difficulties and it is clear that much experimentation on method is still needed before the P.G.R. technique becomes a satisfactory measuring instrument.
The comprehensive consideration of the subject by Landis[82] has an interesting section - "The findings of Smith, who worked in the Iowa laboratory, are in a sense a check on part of the enthusiasm of the other Iowa reports. Smith found quite a few 'spontaneous reflexes' during the waiting period before the experiment. He likewise found great individual variations in the magnitude of the reflex and between the amount of deflection given for the same subject, at different times". This is substantially in agreement with the present results. Music played on the dulcitone generally produced small deflections on the galvanometer corresponding to small reductions in resistance. Music played on the gramophone produced slightly greater deflections, especially if loud marches were played. The musical subjects gave, as a rule, deflections a little larger than did the less musical. Unfortunately these results were subject to the inherent difficulties of the P.G.R. technique. On a given occasion the deflections might not appear at all or be swamped by other changes in resistance. More consistent results were obtained by listening to the beating of a metronome. The metronome was allowed to beat at a certain speed for one minute, then a rest period of half a minute was allowed. The table below gives a typical result.

Initial (no-stimulus) reading = -1·5 cm.

M.M. rate	Deflection after 1 minute.
60	1·5 cm.
90	1·5
120	1·4
150	1·35
180	1·25

The tapping of a small drum gave similar results. The subjects reported a heightening of emotional intensity in these experiments, so this section appears to confirm the effect of repeated stimuli (e.g., drum, marching, rhythmic music) on the affective and vaso-motor phenomena of the thrill'effect' (as discussed in the preceding questionnaire results). When a gramophone pick-up and valve amplifier with loud speaker was used, larger deflections were observed than those obtained from the dulcitone and gramophone. This is partly due to the effect of a loud noise (as is mentioned by Thouless[81] and Davis[83]), but it is not merely a shock effect since the initial deflection did not shrink much as time went on.

A curious event may be worthy of record. On one occasion, a musical subject with considerable repression about love matters was being tested, and no change of this resistance on this occasion had been found. The writer applied a word reaction test and considerable deflections were obtained from words with a home or love significance, but very large deflections were obtained when the names of girls were used. This suggests that a lowering of repression liberates physical and affective energy. The subject was quite unable to stop these responses by a conscious act of will. R. B. Cattell[84] suggests a hypothesis, namely, that 'the reflex is proportional to the instinctive energy aroused by the stimulus' agreeing of course that the term 'instinctive energy' is not easily defined. (This agrees with the word reactions.) His notes on the variations of the responses of single individuals are in agreement with the observations of the writer.

3. Blood pressure and pulse rate.

The results for these measures resembled those for the P.G.R, but the difficulty of obtaining consistent results and individual vagaries were even more marked.

4. Tapping experiments.

(1) Many writers on musical subjects refer to the body as the fundamental source of the time-sense. The beating of the heart, the breathing of the lungs, walking, swinging the arms, the peristalsis of visceral organs, are regular movements, and the neuro-muscular impulses operating these might be the cause of a background of rhythmic awareness which is pre-conscious or unconscious. As a result of this, one could suppose the body to be 'tuned' to special rhythmic rates which would be manifested when a subject was asked to tap out the rhythm which seemed most comfortable and natural to him. The ratio of pulse rate to 'natural rhythm' was worked out for twenty subjects and the mean value was ·8, most of the values being equal or very close to this mean. This suggests that there may be truth in the above hypothesis, but certain difficulties arise. Pulse rates do not vary much in different individuals, and if the subjects think of an 'andante' movement as the standard of a natural rhythm, it is quite likely that they may think of much the same rhythm, that is, the apparent constancy of the ratio may be due to learning. Again, if the pulse rate were at all important in determining the natural rhythm, why is the ratio

not unity? It is also strange that the natural rhythm should exceed the pulse rate in all cases examined because the pulse rate is the quickest of the overt bodily rhythms. It seems to be wiser to regard these apparent natural rhythms in reproduced movements as mainly the result of learning and memory.

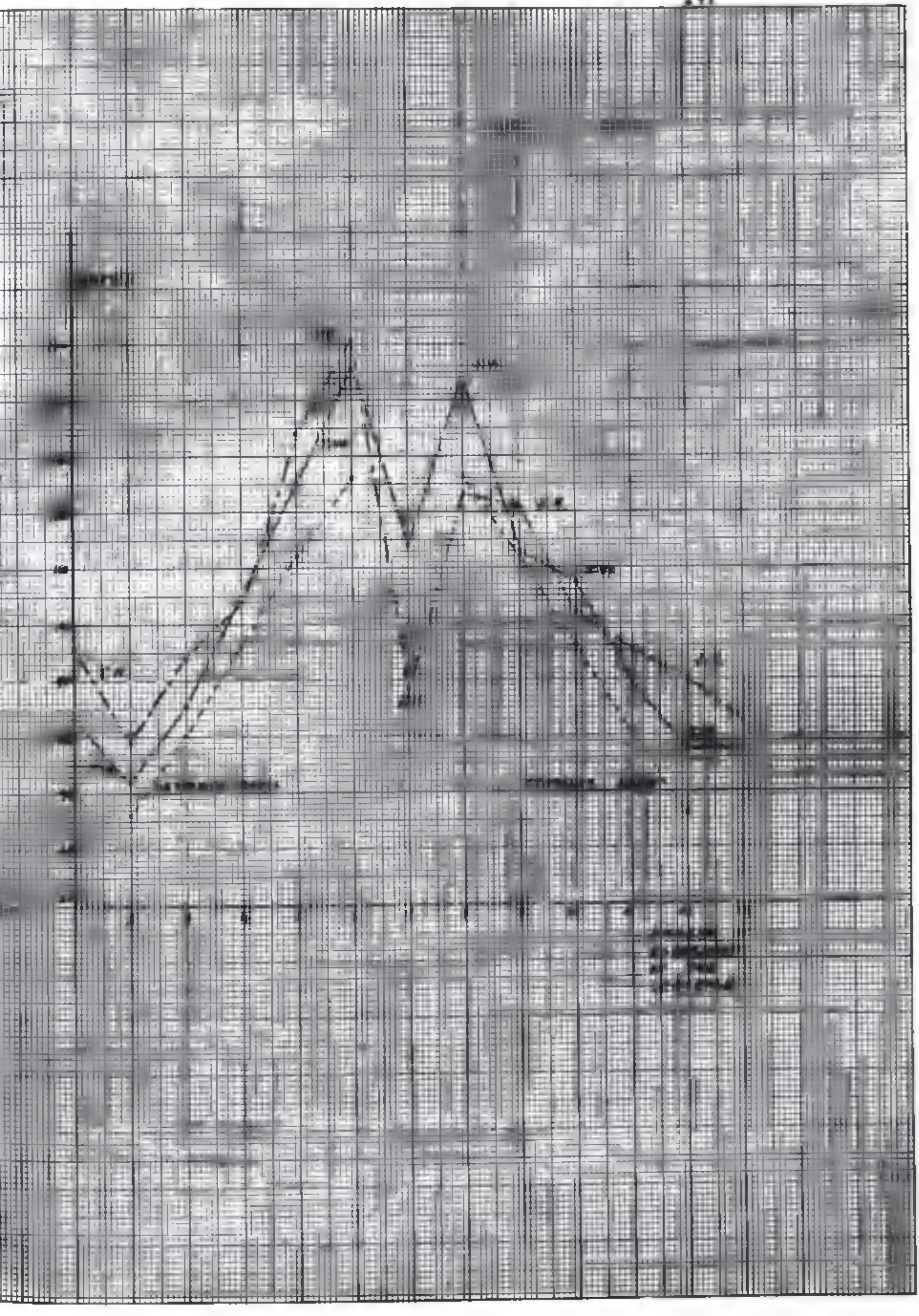
(2) When a player uses a metronome to time his playing it is common for him to think that the metronome has gone slow after a few bars. It was decided to examine the accuracy with which subjects reproduced a given metronome rate. This was done by asking the subjects to tap on a brass plate which was connected electrically to a marker in contact with the smoked drum on a kymograph. A time marker was also used to correct for any variation in the speed of the drum. To avoid complications due to varieties of movement, cramped movements and fatigue, the usual stilus was omitted and replaced by a metal thimble which fitted firmly but comfortably on the middle finger of the right hand. The subject was told to sit in a comfortable position, to relax the hand and arm, and to use small movements of the thimble against the brass plate. Practice was given in these movements. The metronome was allowed to tick for one minute and then the subject had to tap out the same rhythm. The subject was also asked not to count, either in listening to the metronome or in reproducing, and it was suggested that it might be found helpful to place the tip of the tongue between the teeth or to allow the tongue to curl back under the roof of the mouth. In many of the experiments the subjects were asked to tap the rhythm which seemed most natural to them before the metronome tests, after these and in the middle of the sequence of metronome tests. The table below shows the reproduced speeds for various subjects to the sequence of rhythms indicated in the table.

Movement required	Subjects						
	R.M.	A.N.	G.D.	A.M.	J.P.	J.R.	H.D.
Natural rhythm	120	96	96	104	97	142	96
M.M. 66	80	64	72	83	70	70	109
" 80	86	84	95	112	95	95	110
" 96	120	98	118	115	116	132	125
" 112	124	114	126	114	121	128	121
" 126	128	127	139	103	144	152	131
Natural rhythm	97	76	145	96	129	138	126

There is here evidence of the Persistence effect recorded by Dawson and Cathcart[26]. If a subject, after hearing a metronome rate, reproduces a rate greater than the one presented, this tendency continues in the reproduction of the succeeding metronome rates. It will be seen that the reproduced rates for M.M. 66 all exceed the presented rates with one exception which is almost equal to it. This is partly a persistence effect from the natural rhythm rate performed first, but not entirely, for subjects exceed the metronome rate even if they are not asked to reproduce the natural rhythm rate first, yet the tendency to exceed the presented rate is not so marked. We conclude that individuals reproduce a rate at a greater speed, (hence the phenomenon of the metronome appearing "to go slow"), an effect partly due to the "warming up" effect so often observed in muscular activities, and partly due to a 'natural rhythm' in the subjects, the result of emotional tension, learning and memory, or a genuine physiological phenomenon. After the first few reproductions of the subject, persistence is probably the dominating factor. But it is to be noted that the persistence effect does not always appear to be present, e.g., in the case of the subject A.M. In the rates performed by this subject the persistence effect appears to die out steadily as the metronome speed increases. (This subject, in many tasks, shows the character feature 'easily discouraged'.) Also, the final natural rhythms should be greater than the initial ones if persistence were always overtly present, since they should be intermediate in size between a rate of M.M. 126 or the corresponding reproduced rate and the initial rates. This is found only in two cases out of seven. One of the remaining five subjects shows a perseveration of acceleration (G.D.), while the others appear to over-compensate in reproducing the first natural rhythm and reproduce slower rates. (The original natural rhythms agree well with the writer's opinions of the subjects as 'impulsive' or 'phlegmatic'.)

(3) In another experiment two subjects were given identical tasks for a comparison experiment. These were of the same age, had similar standards of education (mainly mathematics and science), appeared to have the same strong interest in music, but one (J.W.) was a good pianist while the other (J.H.) did not play. The results are shown below.

Movement required	Subjects		continued.		
	J.H.	J.W.	Movement	J.H.	J.W.
Natural rhythm	96·0	83·1	M.M.126	123·4	144·4
M.M. 66	79·4	72·2	" 112	121·4	112·9
" 80	94·8	85·6	" 96	102·2	107·9
" 96	104·5	105·4	" 80	95·3	89·6
" 112	134·0	125·1	" 66	90·0	77·3
" 126	150·5	146·6	Natural rhythm	82·4	77·8
Natural rhythm M.M.126/	88·8	114·0			



The graph shows the relations between these figures.

The dotted lines join the points giving the stimulus rates. The first, last and central points denote the natural rhythms. The performer (J.W,) has a graph approximating more to that for the stimulus values than the graph for (J.H.), which is doubtless due to the influence of training. Both subjects reproduce rates greater than the stimulus rates, which agrees with the result on page 289 (metronome "going slow"). Both subjects show the persistence effect. In the case of the performer the initial and final natural rates agree well, but the central rate remains at a fairly high value, probably because of persistence. The values of the natural rate for (J.H.) are much the same, which could be due to his freedom from the motor training and habits of (J.W.). The persistence effects after the central natural rhythm are of interest. The graph for (J.W.) shows greater accuracy in reproducing a given rate, and, generally, greater stability, than the graph for (J.H.). Clearly such tendencies are serviceable to the performer, and a tapping test could be a promising test for those intending to be executants.

(4) The effect of rhythmic unit in a given tempo.

If the subject is asked to reproduce a series of metronome rates he may reproduce each beat by a single tap (as has been done in the preceding experiments) or he may be asked to tap a rhythmic unit for each beat. If the unit were it was found that at the slower speeds (less than M.M. 80) the use of this caused an increase in the rate of the reproduced speed greater than when equal taps were used, but a decrease at speeds above M.M. 80. Further if a sequence of increasing speeds followed by decreasing speeds were used, the values of the reproduced rates at corresponding points (e.g., M.M. 80) agreed closely - clearly more than if equal taps were used. The lilt of the unit accounts for the increase in speed at rates less than M.M. 80 while above that speed the difficulty of reproducing the rhythm tends to reduce the identity of the unit (i.e., the relative values of dotted quaver and semi-quaver). The accent effect of the unit doubtless accounts for its stabilising effects at corresponding rates. Hence a repeated figure tends to reduce the effect of persistence. The ratio of the time given to the dotted note to that for the quarter note shows a change as speed alters, as the tables below show (for subject J.W.).

Sequence of increasing speed		Sequence of decreasing speed	
Stimulus rate	Ratio	Stimulus rate	Ratio
M.M. 60	3·864/	M.M. 126	2·277/

Sequence of increasing speed

Stimulus rate	Ratio
M.M. 60	3·864
" 66	3·708
" 80	3·173
" 96	3·287
" 112	2·597
" 126	2·524

Sequence of decreasing speed

Stimulus rate	Ratio
M.M. 126	2·277
" 112	2·480
" 96	2·959
" 80	4·049
" 66	3·248

The theoretical ratio is of course 3. The fact that so many ratios greater than three are obtained with the lower speeds can be explained in two ways:- (1) a long note tends to be accented when played, or regarded as being salient or accented (2) a pianist is taught that tends to become or and is trained to focus attention on the long note so that the short note may be played quickly as a subsidiary part of a muscular sequence. The ratios which are greater than 3 are therefore explicable in terms of accent prolongation and over-compensation. The pattern breaks down into the pattern about the speed M.M. 112. In the descending sequence it will be seen that there is a sharp emergence of the value 4. This appears to be due to over-compensation when a more comfortable speed level is attained. At the lower speed of M.M. 66 the habit response is established again. The values of the ratios in the preceding tables are obtained from the complete track on the kymograph for each metronome rate. These tracks were examined part by part and it was found that the ratios were very uniform. Divergent sizes were only found rarely. In some hundreds of cases it was found that the maximum value of the ratio was 4·986 and the minimum 1·735.

These results suggest that even good pianists, however exactly they may try to play, reproduce rhythmic patterns in ways which are only approximate. Yet the playing may sound perfect, so it is likely that both player and listener perceive in auditory experiences relations which are not given phenomenally, a conclusion which recalls Gestalt psychology. The theory of pianoforte teaching would profit by a wide extension of experimentation on rhythm reproduction. The results also cast a little doubt as to whether tests like the Seashore test for Sense of Time have more than a recommendation value as compared with a prognostic value. Perhaps a test for dynamic time changes of the rubato type would be more directly serviceable.

(5) Analysis of rhythmic patterns[47].*

The reproduction of these can be examined by the kymograph method, as shown in the example overleaf. The

TIME ANALYSIS.

Bar	Pattern	Time for each note, in order. (secs.)	Time for each beat	Time for whole bar
1	♩ ♩ ♩ ♩	·448, ·426, ·434, ·413	·448, ·426, ·434, ·413	1·721
2	𝅗𝅥. ♩	1·190, ·444	(·397, ·397, ·397), ·444	1·634
3	♫ ♫ ♩ ♩	·196, ·206, ·171, ·209, ·465, ·419	·402, ·380, ·465, ·419	1·666
4	𝅗𝅥. ♩	1·266, ·432	(·422, ·422, ·422), ·432	1·698
5	♫♪ ♩ ♩ ♫	·116, ·089, ·135, ·447, ·408, ·190, ·203	·338, ·447, ·408, ·393	1·586
6	♩ ♩ ♫ ♫	·435, ·389, ·187, ·187, ·191, ·220	·435, ·389, ·374, ·411	1·609
7	𝅗𝅥. 𝄽	1·260	(·42, ·42, ·42)	1·680 (calculated)

pattern below was given to the subject to study for 15 seconds. After that he was told that he was to tap it out on the brass plate at the rate of the metronome which he was going to hear. The metronome was then set ticking for 1 minute (M.M. 126) and the subject told to begin. Attention was drawn to the need for holding down the final note of the pattern, but this act appears to be a troublesome task.

The pattern was 

The time analysis is shown on page 294. The times are given in seconds.

The test was performed at a rather quick speed and was supposed to be an exact reproduction of the written rhythm yet although the rhythm was not written in staff notation with stave lines context interpretation of the rhythm appears to occur, e.g., a slowing up in the last three bars. Other examples are:- (1) In bar 1 the time for the whole bar is the greatest, probably due to its appearing declamatory; also the time allowed for each beat suggests accenting of the standard form 'strong, weak, medium, weak'. (2) The order for increasing bar duration is 5, 6, 2, 3, 7, 4, 1. Bar 5 is the most 'filled' bar, 6 and 3 come next, while the order of the others is 1, 2 and 4, 7. The position for 5, 6 and 3 is probably due to impulses to hurry to get all the notes tapped in time while that for 2 is explained by the well known fact that 'unfilled' time is judged to be longer in duration than it is objectively. But if this is true for bar 2, why is it not true for bar 4 which is the same as bar 2? The answer is that bar 4 is not the same as bar 2 phenomenally, and as it occurs as the fourth bar of a possible 4 bar phrase, it is a point of saliency or rest. Bar 7 is another point of rest, but the terminal note is troublesome to the subject (since he has no sound to determine the end of the duration), so the position of bar 7 is not very important. (3) In bar 3, there is a time accent (or agogic accent) on the first beat of the bar, but a greater one on the third beat, that is, the succession of short notes leads to an accented note. The same thing is seen in bar 5 and in the movements from bar 5 to bar 6 and from bar 6 to bar 7. Hence even the time values of such a pattern as the one considered are subject to interpretation, or, to use another term, Gestalt perception. The length of each bar if exact reproduction had occurred would have been 1·905 seconds, so it

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* Similar work is recorded by F. Howes[47]. These analyses of rhythm reproduction appear to justify wider study for the purposes of ~~the~~ musical pedagogy.

is clear that the subject was "beating the metronome", a matter referred to already. The subject was told to reproduce the rhythm exactly and claimed to have no introspection about counting or nuances of rhythm, so it is reasonable to suppose that the factors causing these nuances were out of consciousness.

A NOTE ON THE OREGON TEST.

This test, devised by Dr. Kate Hevner,[92,93] consists of 48 classical excerpts on gramophone records. Each of the 48 tests consists of the excerpt as originally written and as modified, either in the melodic, harmonic or rhythmic structure. The subject has two questions to answer on each. (1) Which version is preferred? (2) What is the nature of the alteration? Is it melodic, harmonic or rhythmic? The test was applied to various groups of secondary school pupils, but although all groups could make headway with the first question, not even fourth or fifth year pupils could do much with the second. One reason for this is the difficulty of distinguishing clearly between melodic and harmonic changes. After all, melody and harmony cannot be sharply distinguished. In addition, rhythmic changes can be confused with harmonic changes, and, to a less extent, with melodic. A serviceable test would be obtained by standardising the results of the first question.

A small group of pupils at the end of the fourth year course who were making a special study of music for the Higher Leaving Certificate made good attempts at the test in its present form. The results are tabulated below.

Subject	Order of teacher's estimate	Order in Oregon test	Instrument played
C.S.	1	1	Piano
A.McC.	2	7	Violin (beginner)
T.F.	3	3	Piano
R.P.	4	4	Piano
N.R.	5	2	Piano
J.F.	6	6	Piano (beginner)
G.V.	7	5	Piano (beginner)
C.S.	8	8	Violin (beginner)
C.T. TWINS	9	9	Piano (poor)
B.T.	10	10	Piano (poor)

The rank difference coefficient between the two sets of ranks is $\rho = \cdot 77$, which is high. The use of piano music in the Oregon test gives pianists a decided advantage. The subject A.McC. has a great interest in music and might be called the most musical subject in the group on the appreciation side (he is a poor executant on the violin and not a pianist), yet he is 7th in the Oregon list. Also, when the writer asked the subjects individually if they could state why they preferred one tune to the other, they nearly all admitted that the reason was familiarity with so many of the tunes. Other objections are (1) the speed of presentation is hardly generous enough. A little more time than is given is needed to differentiate melodic, harmonic and rhythmic changes. (2) Some of the tests are 'flat' in pitch. (3) A few of the changes, in the writer's opinion, actually make the pieces improve a little. Nevertheless, the Oregon test is a promising and practical test worthy of wide use and further investigation.

CONCLUSION.

Various tests of psychological functions concerned with musical appreciation, including tests at the psycho-physical level, have been constructed and the results of these have been examined. Examples of the application of the tests to the study of individual reactions to music have been given. The results show that tests of this type are practicable and worthy of further extension and study, but, as in the case of all scientific work, the study of individual reactions as a precise form of investigation needs a broad background of experimental data. It is suggested also that greater systematisation of curriculum and methods in the teaching of music in schools will be a valuable ally in the development of the testing movement, leading to greater validity and reliability in test results.

Finally the writer would like to express his gratitude to his supervisor, Dr. R.H. Thouless, for many valuable suggestions, and for his constant encouragement.

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NOTE ON PREVIOUS WORK.

It is rather difficult to find references relevant to the work of this thesis because comparatively little has been done by British psychologists in measuring the abilities used in musical appreciation. Work of this type has been done more in America than in Britain, and, of course, the American standards require adjustment when American tests are applied in Britain. The references given below in numbers 6 to 54 provide a broad indication of previous work without claiming to be exhaustive.

Investigations connected with listening to music can be roughly classified into the following three categories;-

(A) Work on acoustical problems has been done by H. Banister - the localisation of sound (British Journal of Psychology, Vol. 13, page 435; 15, p.280; 16, p.265; 17, p.142); Rawdon Smith - auditory fatigue (B.J.P. 25, 1934), experimental deafness, vol. 26, an illusion in the perception of loudness, Vol. 26; A.W.G. Ewing and E.M.Smith - auditory fatigue, Vol. 25; F.C. Bartlett and E.M. Smith - listening to sounds of weak intensity, Vol. 10, 1919; P.R. Farnsworth - the pitch of a combination of tones, Vol. 15, 1924; F.A. Pattie - auditory fatigue, Vol. 20; etc.

Such work has little direct reference to the present investigation.

(B) Work on musical situations which are rather simple and quasi-acoustical has been done by C.W. Valentine[11,14], T.H. Pear[9], H.J. Watt[20], etc. (Possibly one might also include in this connection work done in America by Seashore and his followers.)

(C) More definitely musical problems are studied by Lowery[25,28], Mainwaring[62], Vernon[30], Myers[21], in Britain and by Drake[54], Hevner[92], **Dykema** (page 10, Vol.1 of thesis), Schoen[46] in America.

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by

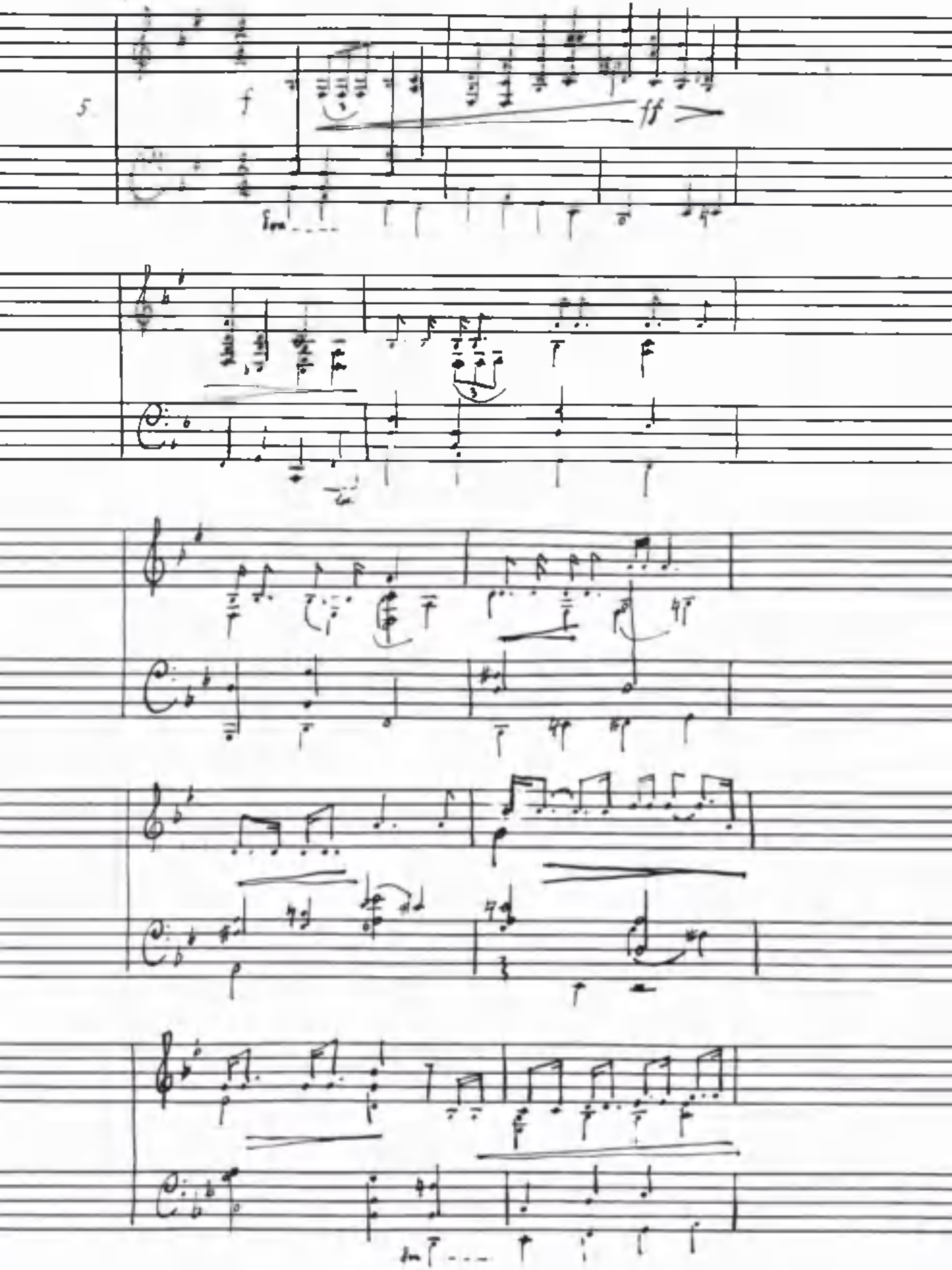
JOHN MEIKLEJOHN.

1940.

APPENDIX.

(See text, page 21.)

♩= 76 TEST II. CAVALIER. HICKEY. (BOOSEY)



(See text, page 21.)

TEST III. (PLAYED IN ORDER ①, ②)

PRACTICE EXAMPLES:- ♩=96

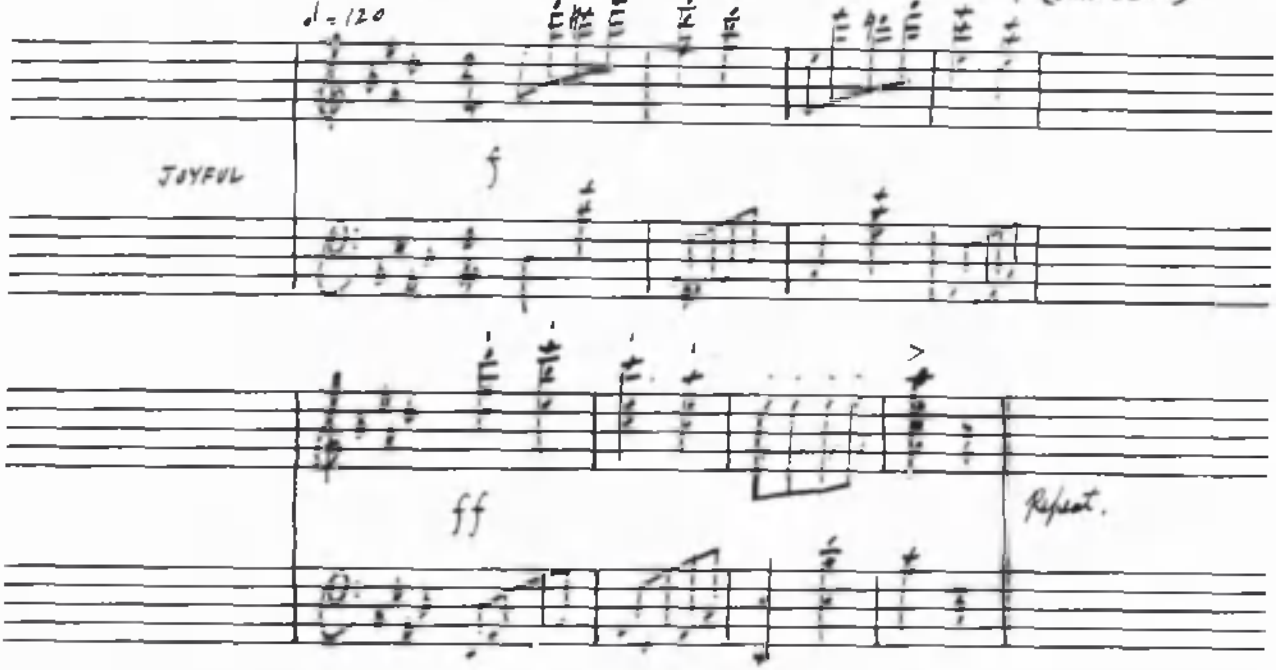

♩. = 63
4.
No.2 Correct.
♩ = 80
5
No.2. Correct.
♩ = 92
6
No.1 Correct.
♩ = 69
7
No.2 Correct.
♩ = 92
8
No.1. Correct.


♩= 108
9
No 2. Correct

[See text, page 22]

TEST V. SECOND PRACTICE EXAMPLE.

(SCHUBERT)



[See text, page 26]

TEST VIII

7② in 7① with tenor part omitted

8①

8② in diatonic version. (See Church of Scotland Hymn Book. No. 601) ✓

Rock of Ages.

9①

(over)

9② is 'Rock of Ages', Bach setting. (C. of E. Hymn Book, no. 413)

𝅗𝅥 = 66.

[Correct answers marked with 'tick']

[See text, page 35]

DISTRIBUTION OF SCORES

The numbers in each quartile are given from the lowest to the highest quartile.

GROUP A

TEST	NUMBERS IN EACH QUARTILE RANGE	CALCULATED NO.
I	5·8, 9·8, 5·6, 7·4	7·25
II	6·6, 7·8, 6·7, 7·9	(This is the
III	4, 7·5, 7, 9·9	figure to be
IV	7·5, 7·3, 6·2, 8	expected in each
V	4·6, 5·4, 10, 8·9	quartile range if
VI	8·2, 6·9, 6·9, 7·6	the distribution
VII	11·1, 3·7, 4·2, 10	were exactly normal)
VIII	6·5, 5·9, 7·2, 9·2	

GROUP B

TEST	NOS. IN EACH Q.R.	CALCULATED
I	24·5, 23·9, 31·7, 40·9	30·5
II	50·6, 27·9, 21·8, 21·7	
III	28·4, 27·2, 28·8, 37·3	
IV	34, 27·8, 26·2, 34	
V	23·8, 31·5, 29·4, 37·3	
VI	43·8, 21·5, 24, 31·6	
VII	30·6, 24·4, 28·1, 38·9	
VIII	20·6, 20·7, 36·4, 44·3	

GROUP C

TEST	NOS. IN EACH Q.R.	CALCULATED
I	10·4, 8·9, 8·5, 14·2	10·5
II	7·5, 7·5, 13·4, 13·6	
III	8·4, 7·7, 15·9, 10	
IV	7, 10·4, 10, 14·6	
V	9·4, 6·4, 7·7, 18·6	
VI	10·5, 13·8, 7·6, 10·2	
VII	7·6, 10·9, 15·9, 7·7	
VIII	9·1, 12·3, 10·3, 10·5	

SCORE DISTRIBUTIONS FOR THE WHOLE GROUP

TEST I

Score	Frequency
16 to 18	5
14 to 16	19
12 to 14	30
10 to 12	47
8 to 10	43
6 to 8	31
4 to 6	11
2 to 4	6
0 to 2	1

(Highest score 16; lowest score 1)

TEST II

Score	Frequency
9 to 10	14
7 to 9	61
5 to 7	47
3 to 5	42
1 to 3	6
-1 to 1	3

(Highest score 10; lowest 0)

TEST III

Score	Frequency
9 to 10	2
7 to 9	18
5 to 7	27
3 to 5	58
1 to 3	46
-1 to 1	29
-3 to -1	10
-5 to -3	2
-7 to -5	1

(Highest 9; lowest -7)

TEST IV

Score	Frequency
8 to 9	1
7 to 8	7
6 to 7	29
5 to 6	53
4 to 5	57
3 to 4	29
2 to 3	17

(Highest $8\frac{1}{2}$; lowest 2)

TEST V

Score	Frequency
9 to 10	6
8 to 9	43
7 to 8	52
6 to 7	53
5 to 6	30
4 to 5	8
0 to 1	1

(Highest $9\frac{1}{2}$; lowest 0)

TEST VI

Score	Frequency
45 to 50	4
35 to 45	29
25 to 35	64
15 to 25	65
5 to 15	29
0 to 5	2

(Highest 50; lowest 1)

TEST VII

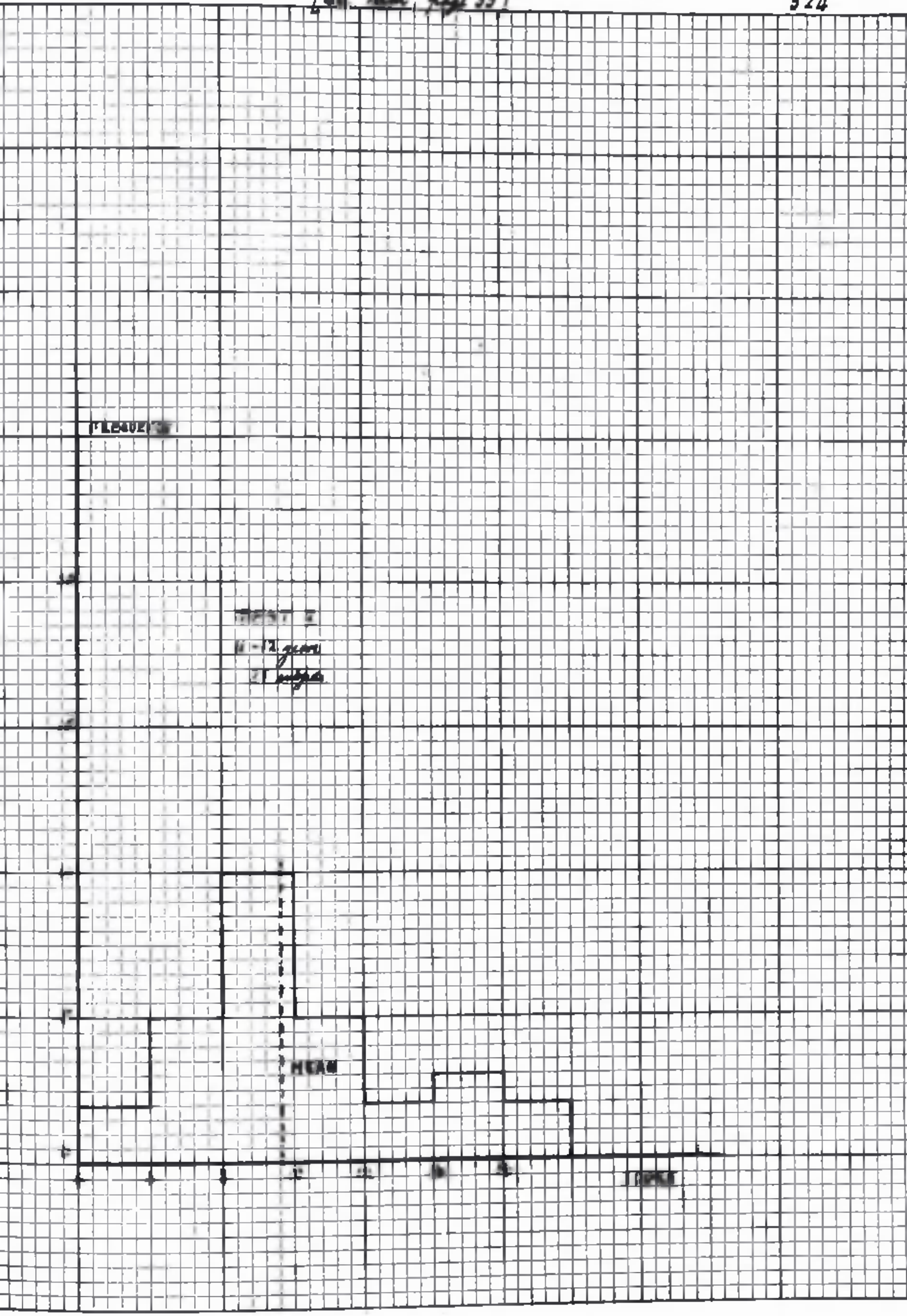
Score	Frequency
12 to 17	3
7 to 12	32
2 to 7	62
-3 to 2	64
-8 to -3	26
-13 to -18	4

(Highest $14\frac{1}{2}$; lowest $-12\frac{1}{2}$)

TEST VIII

Score	Frequency
6 to 8	11
4 to 6	36
2 to 4	74
0 to 2	49
-2 to 0	16
-4 to -2	7

(Highest $7\frac{1}{2}$; lowest $-3\frac{1}{2}$)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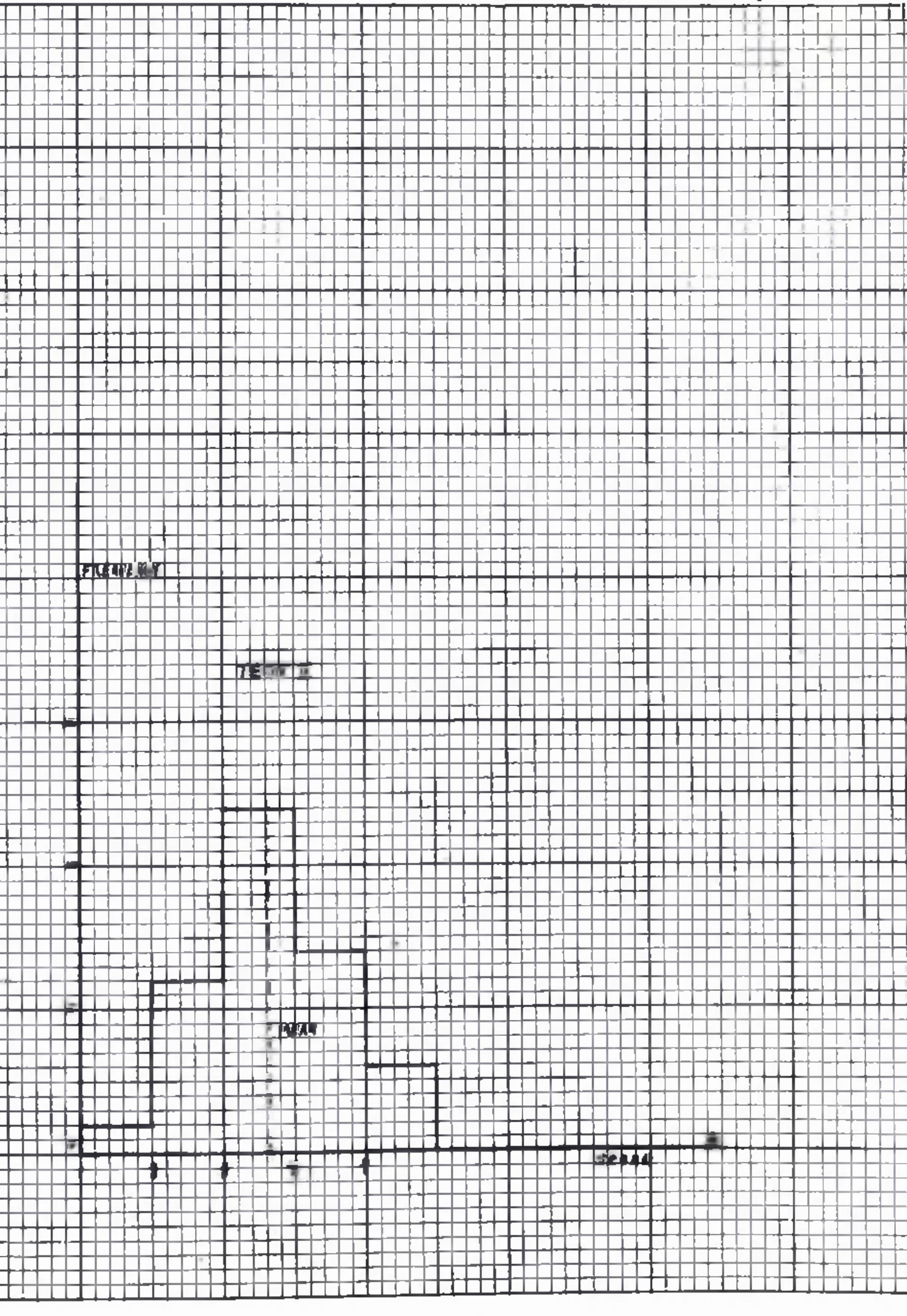

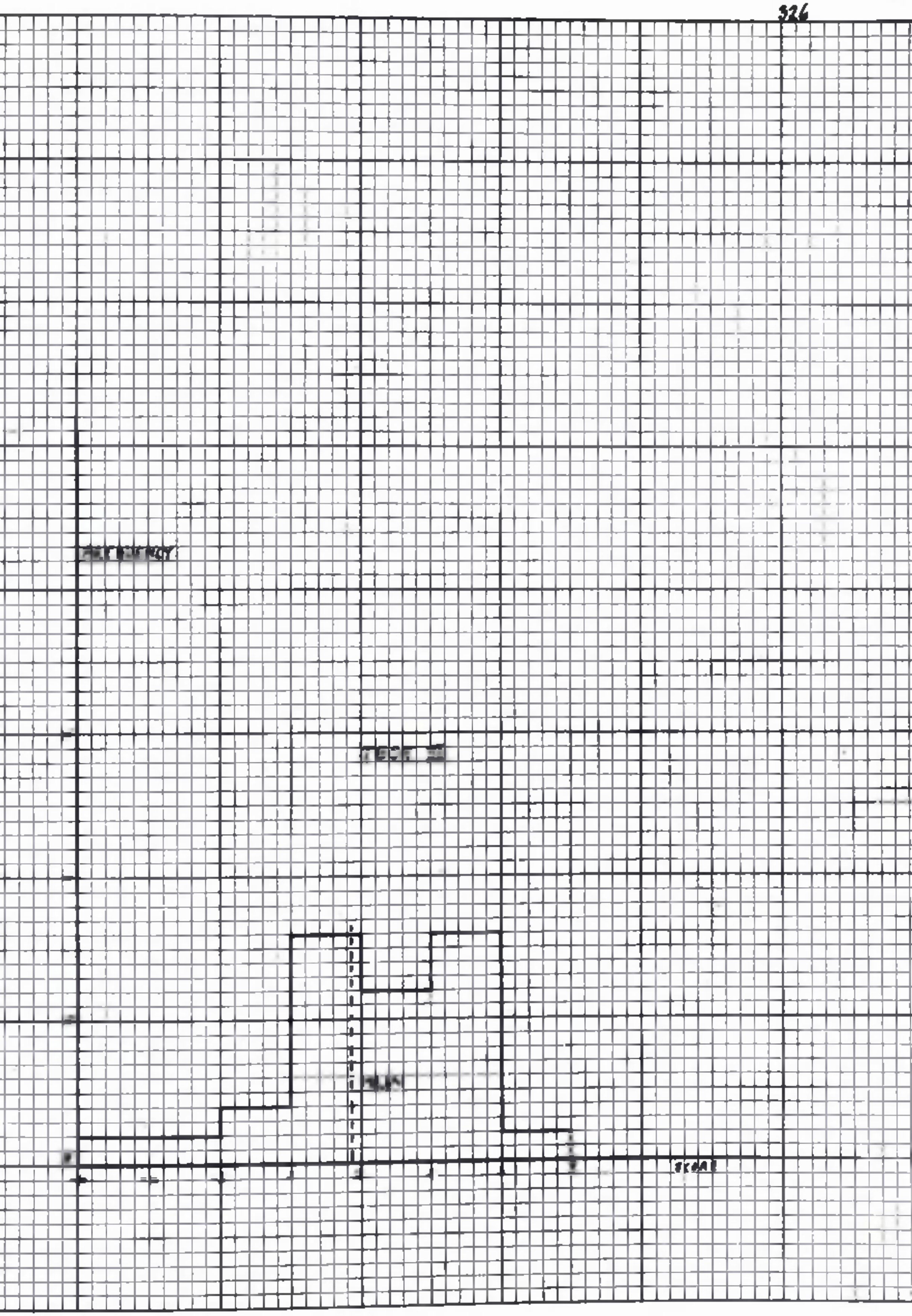

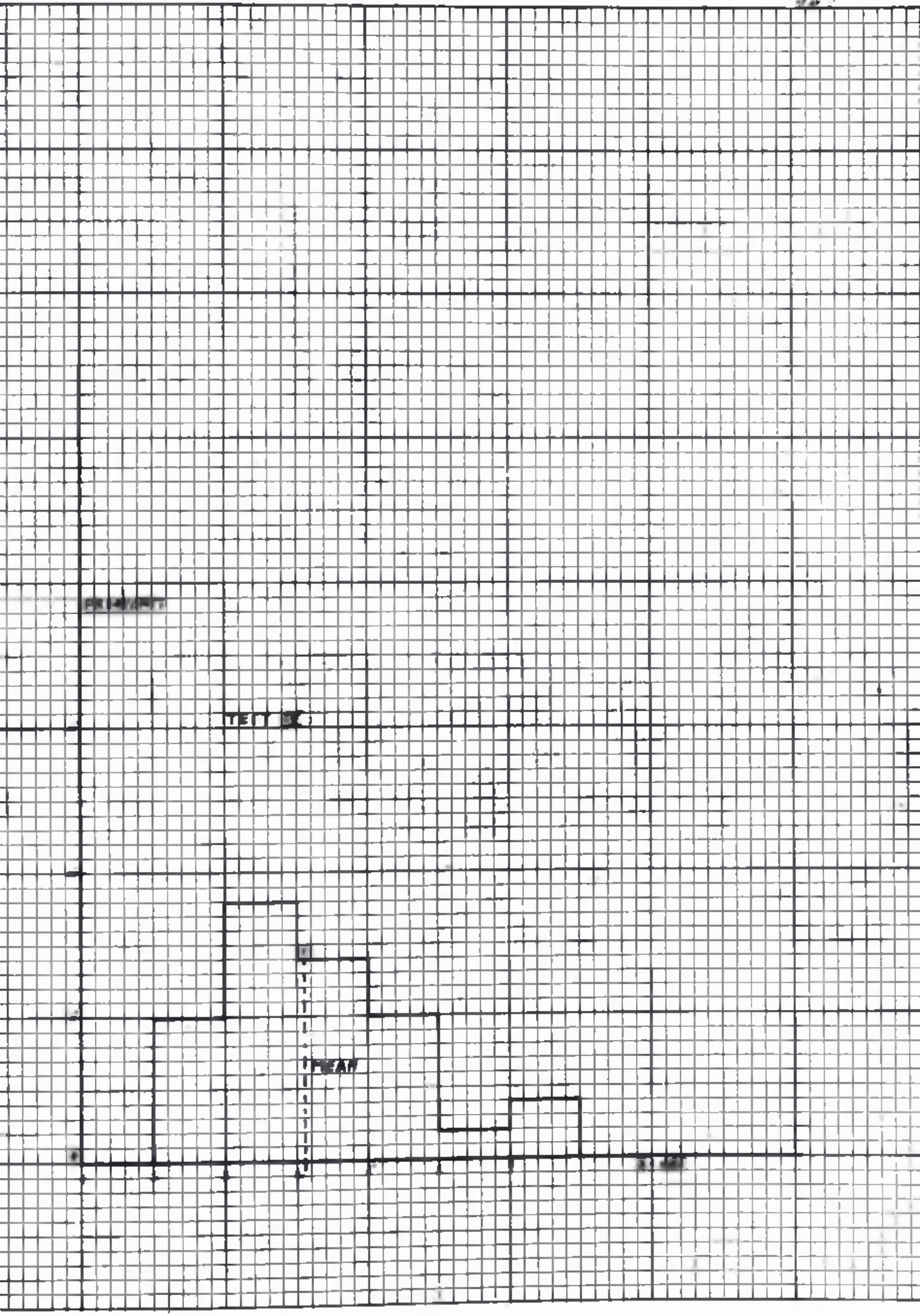
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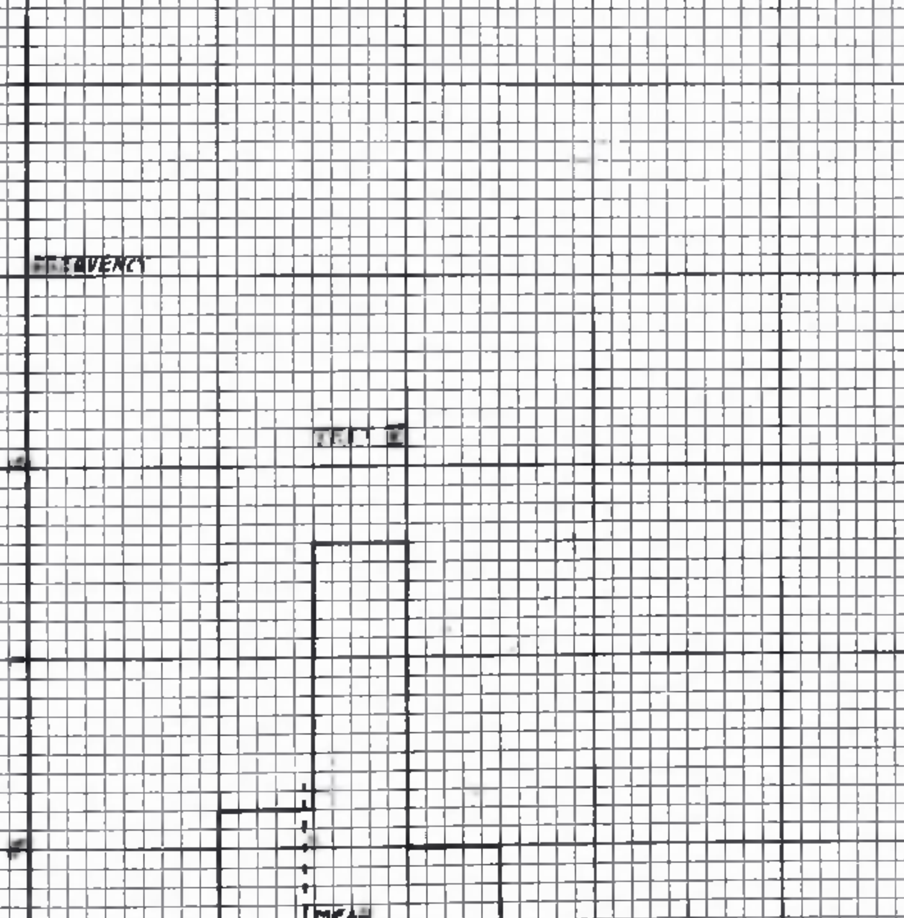
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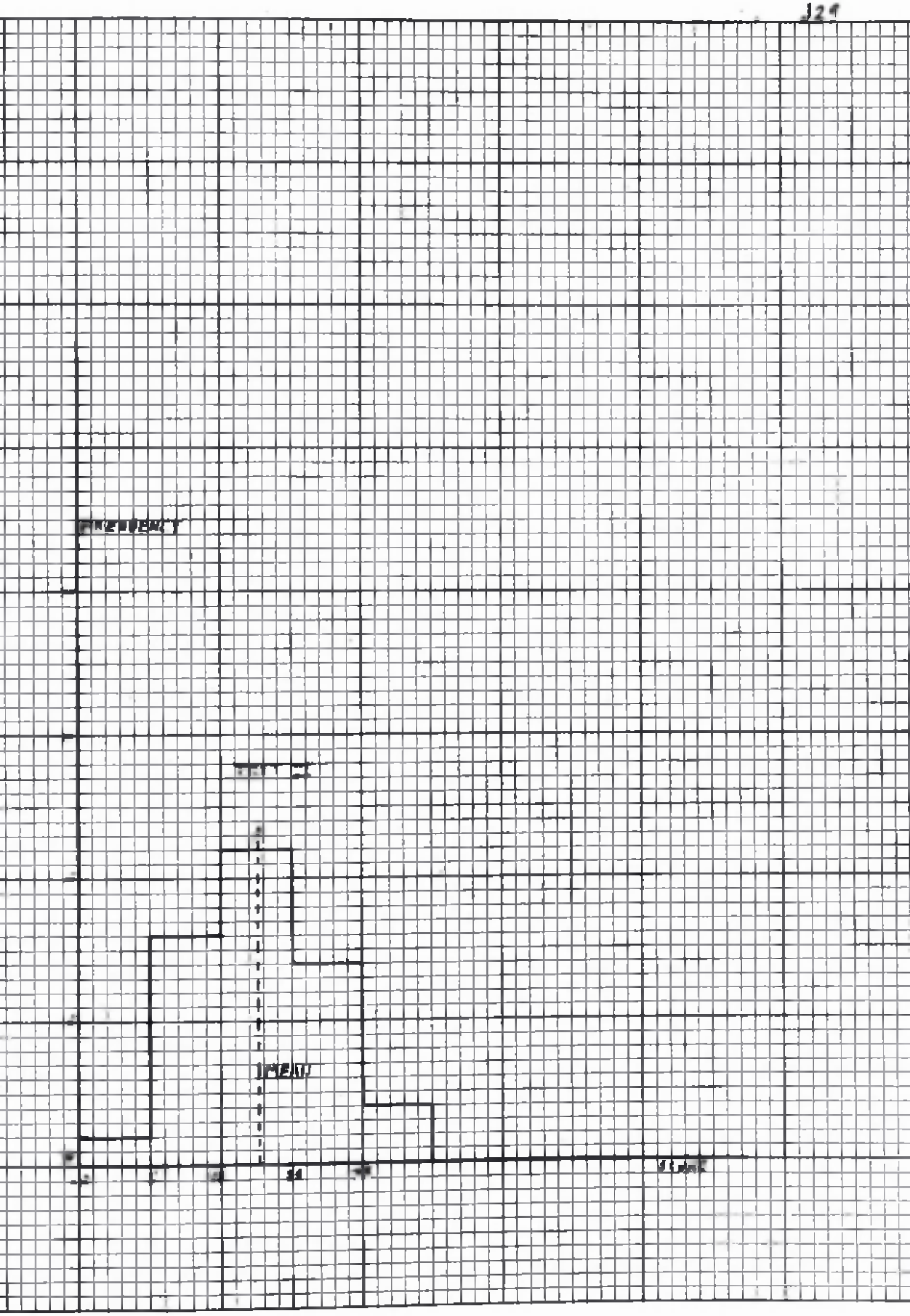
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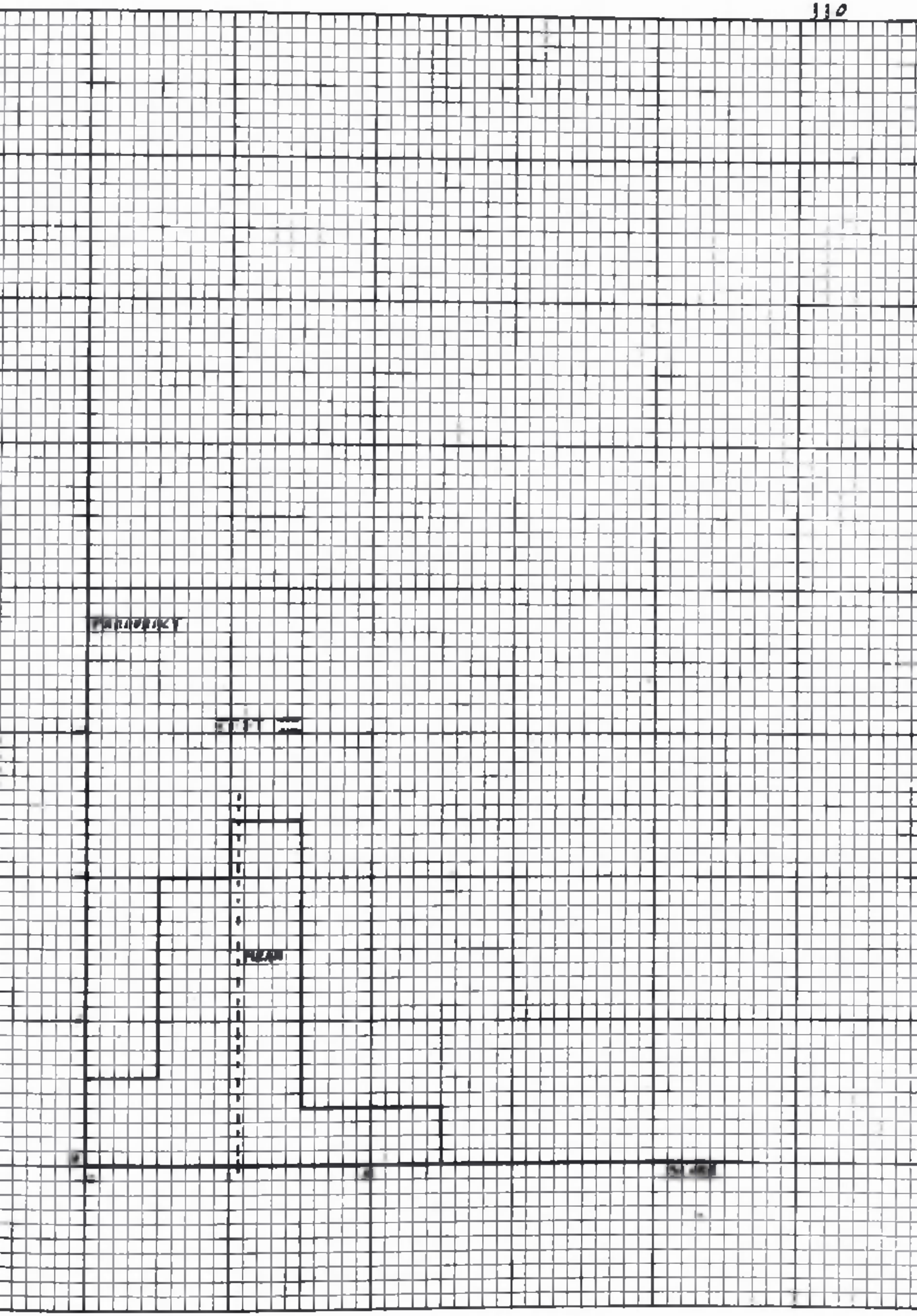

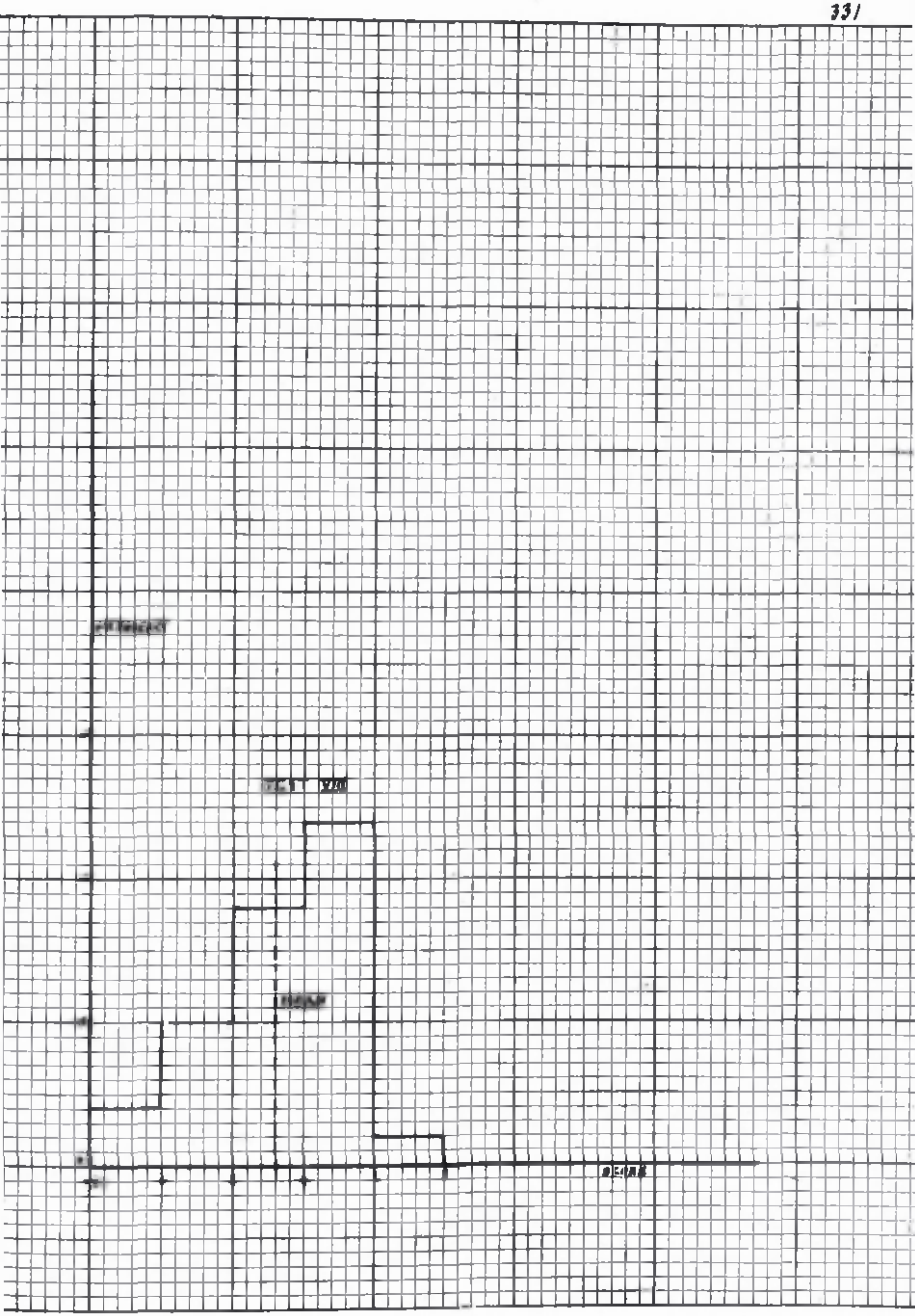

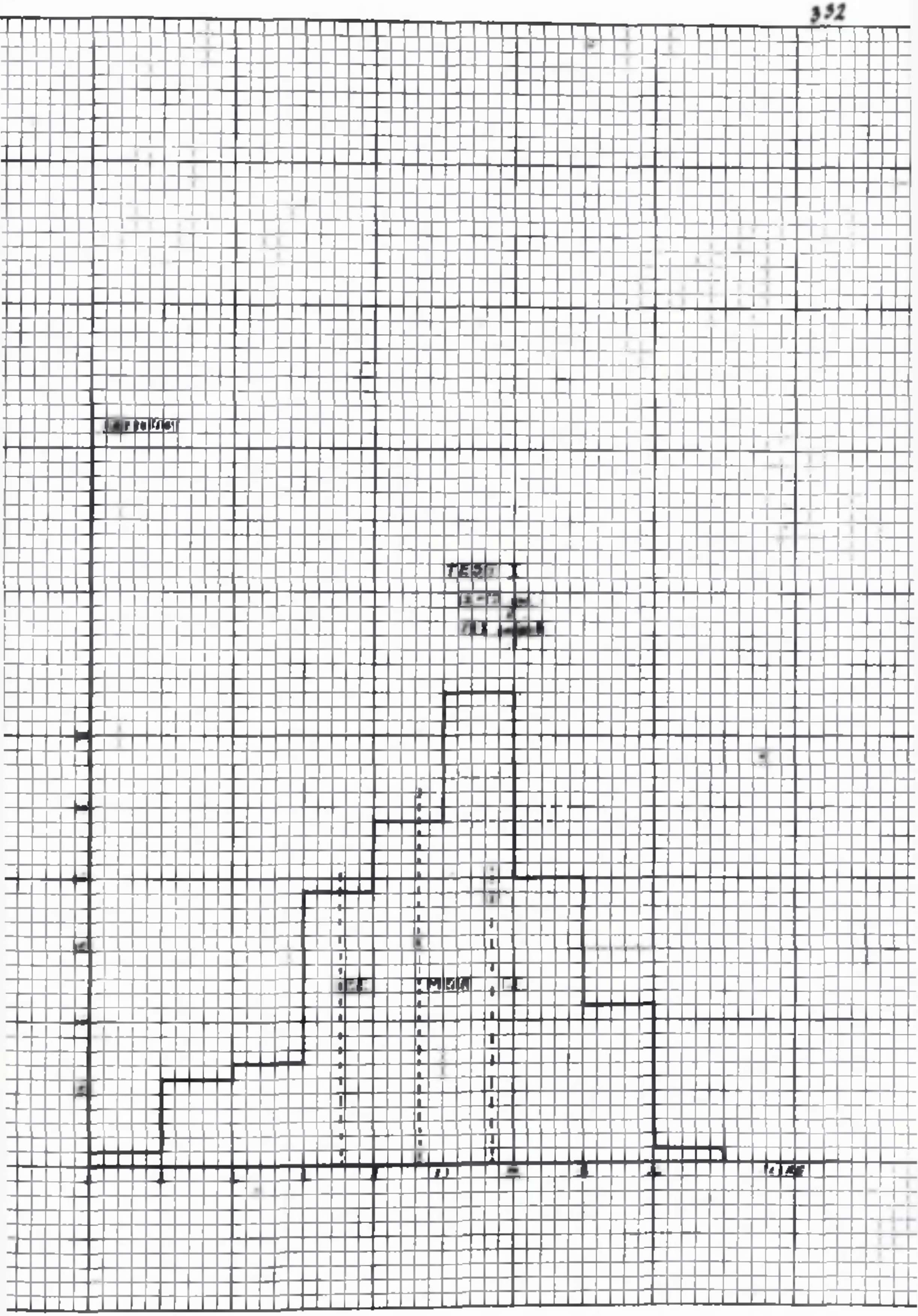

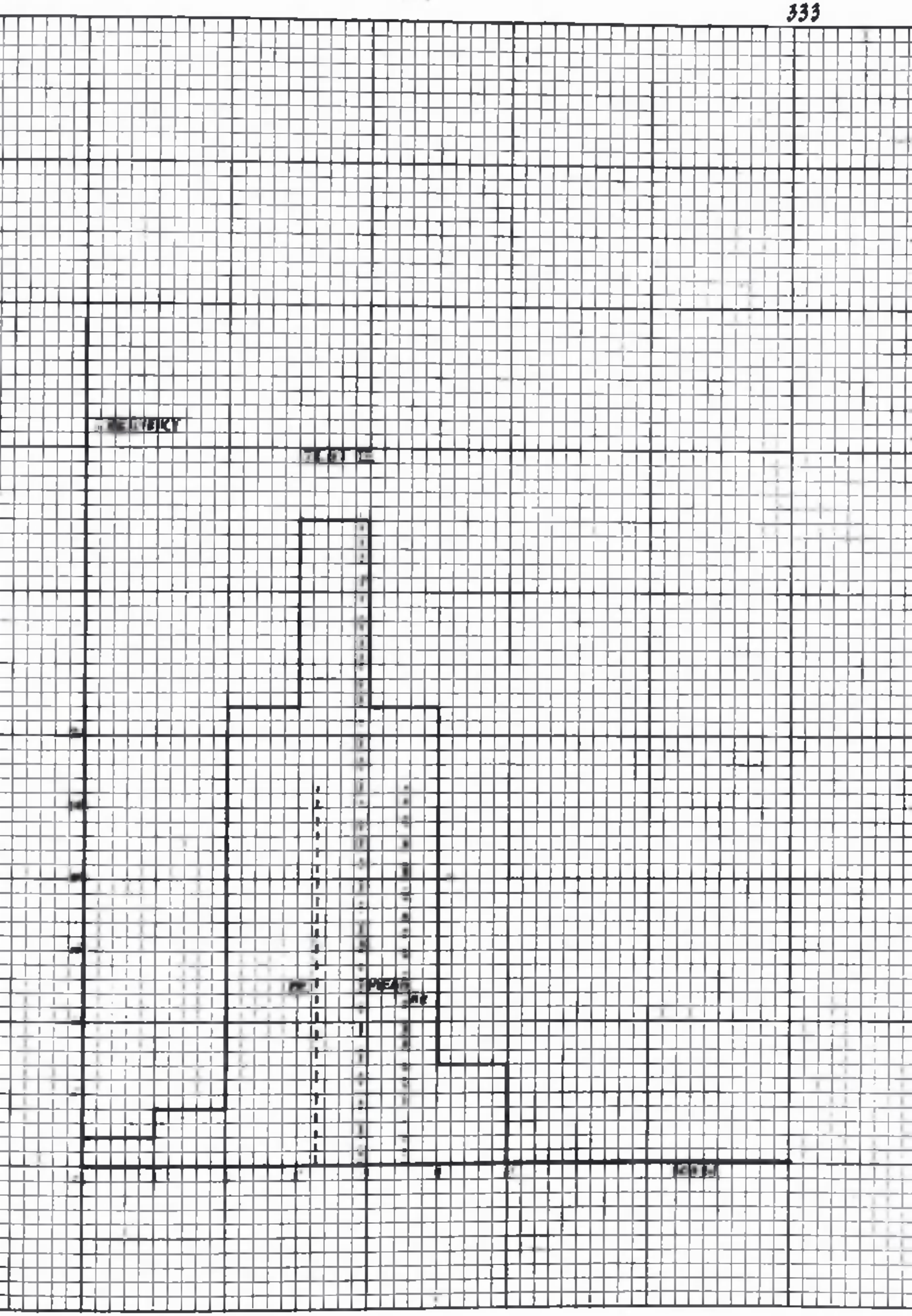

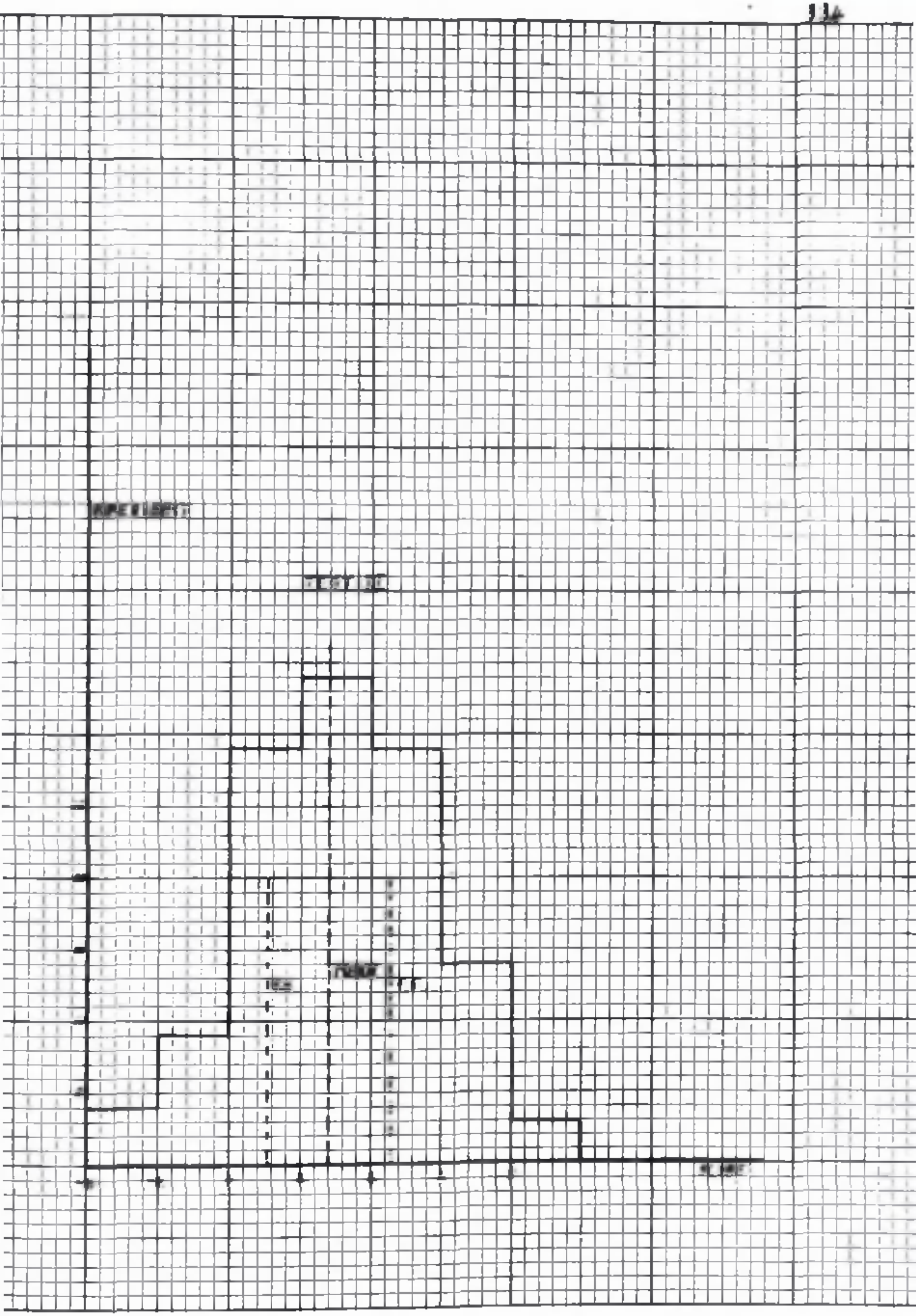

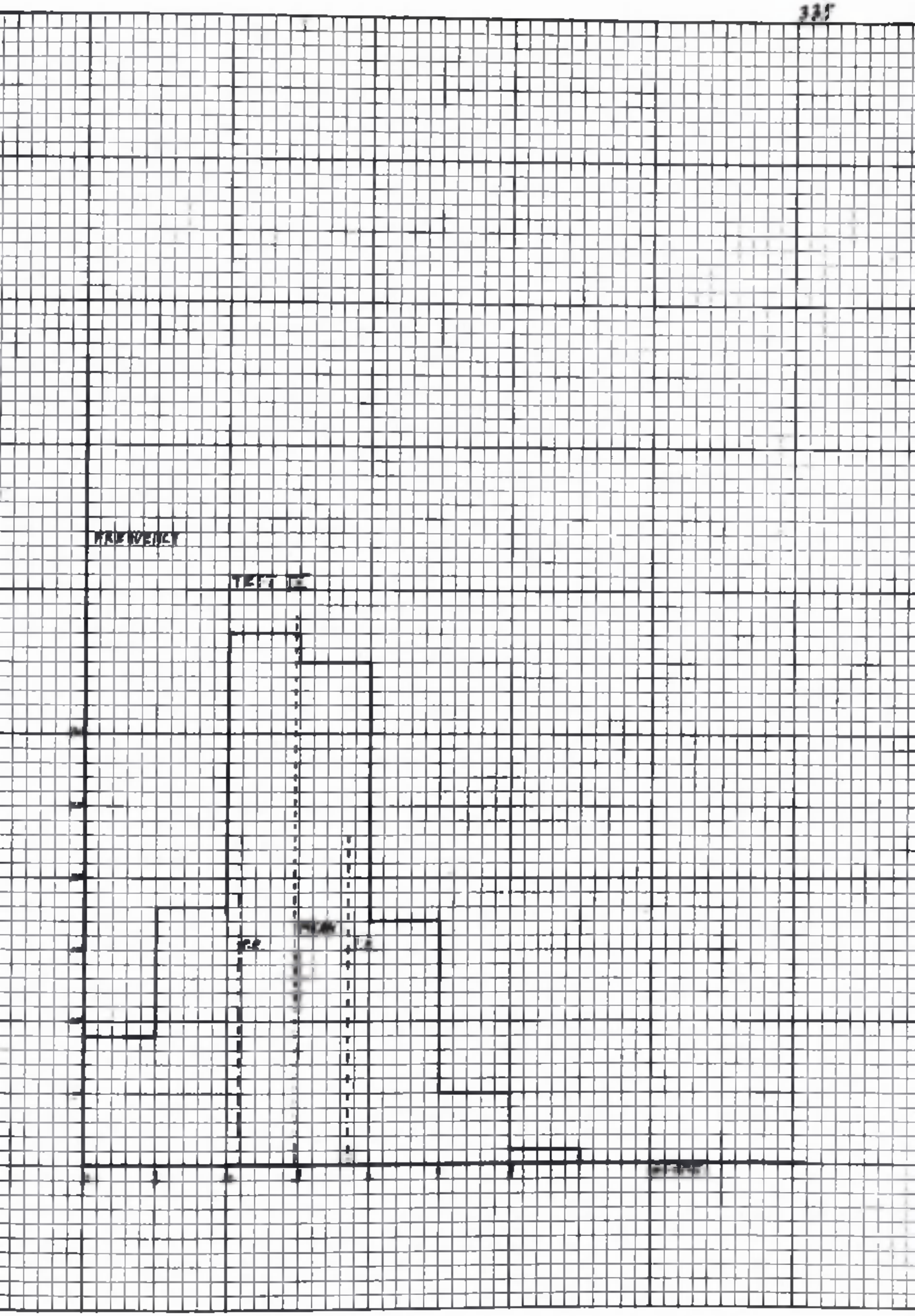
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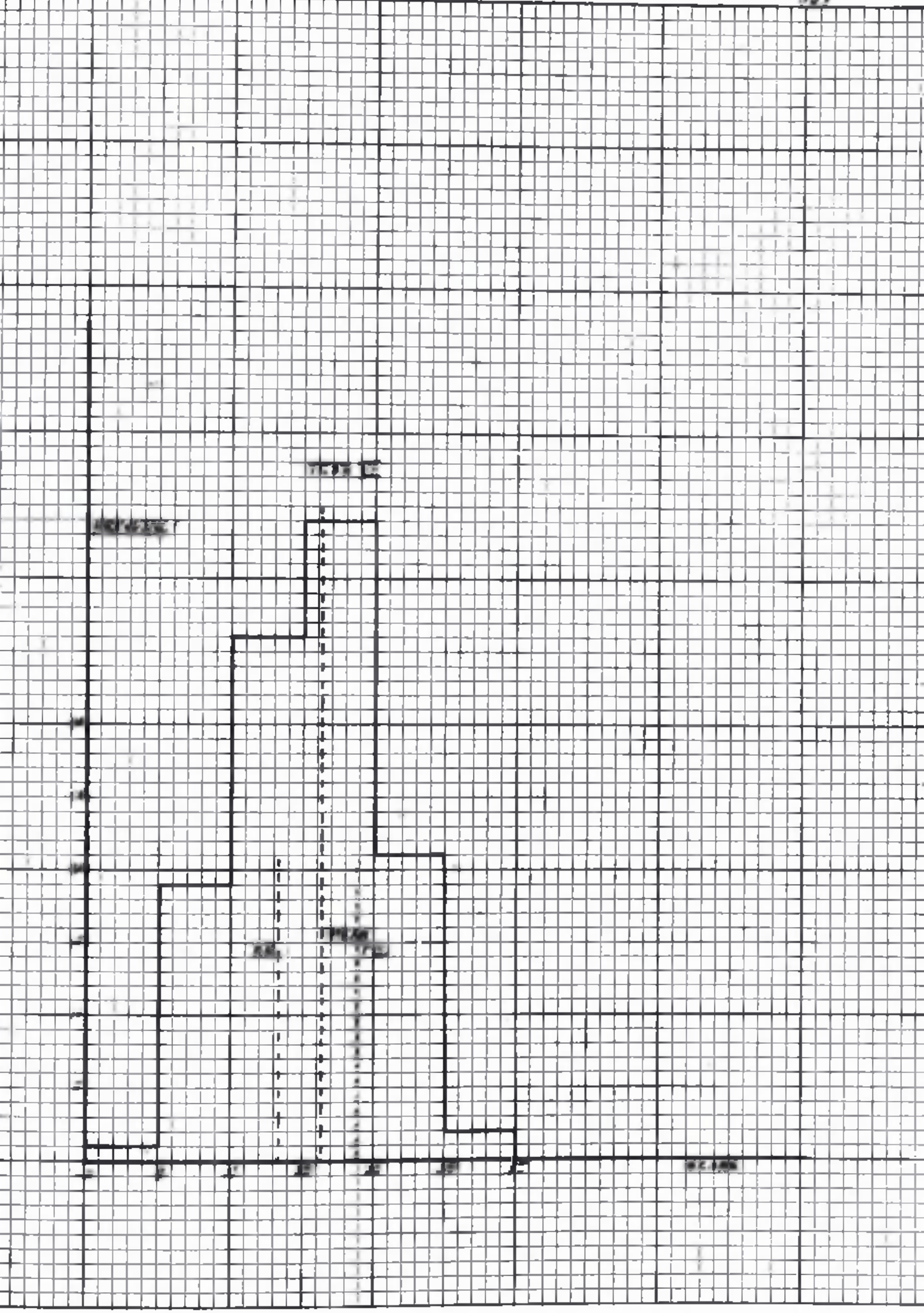

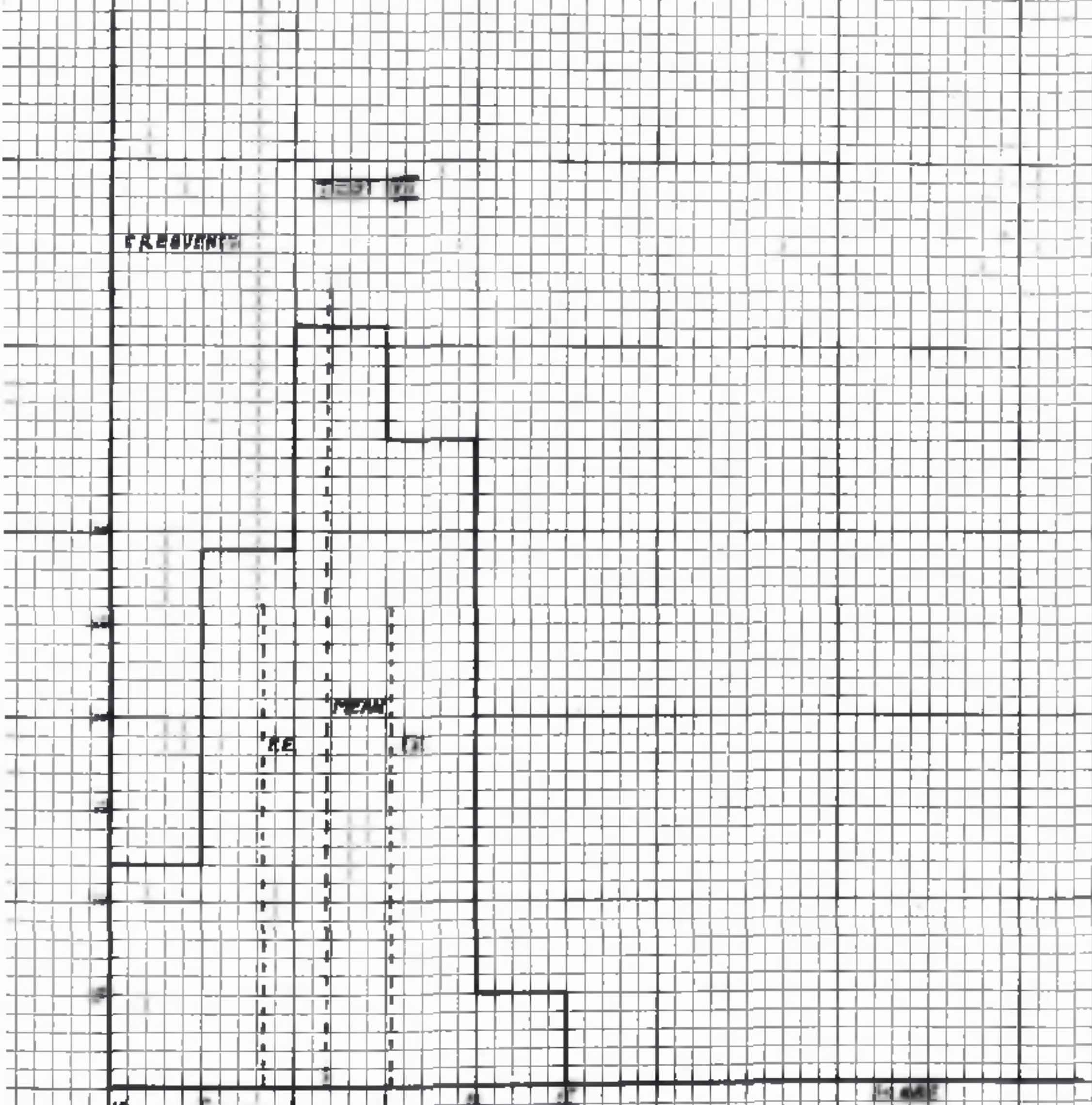
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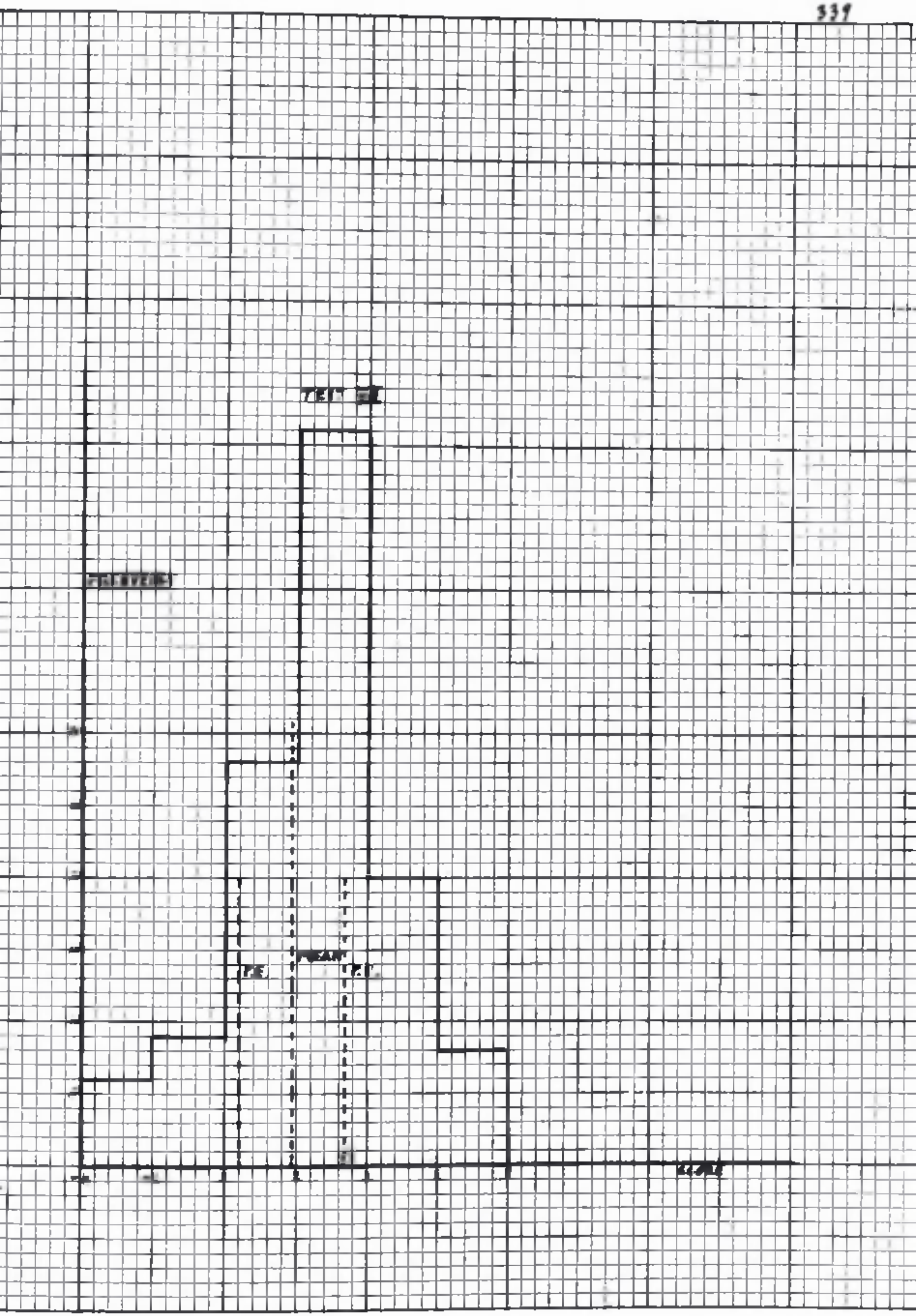

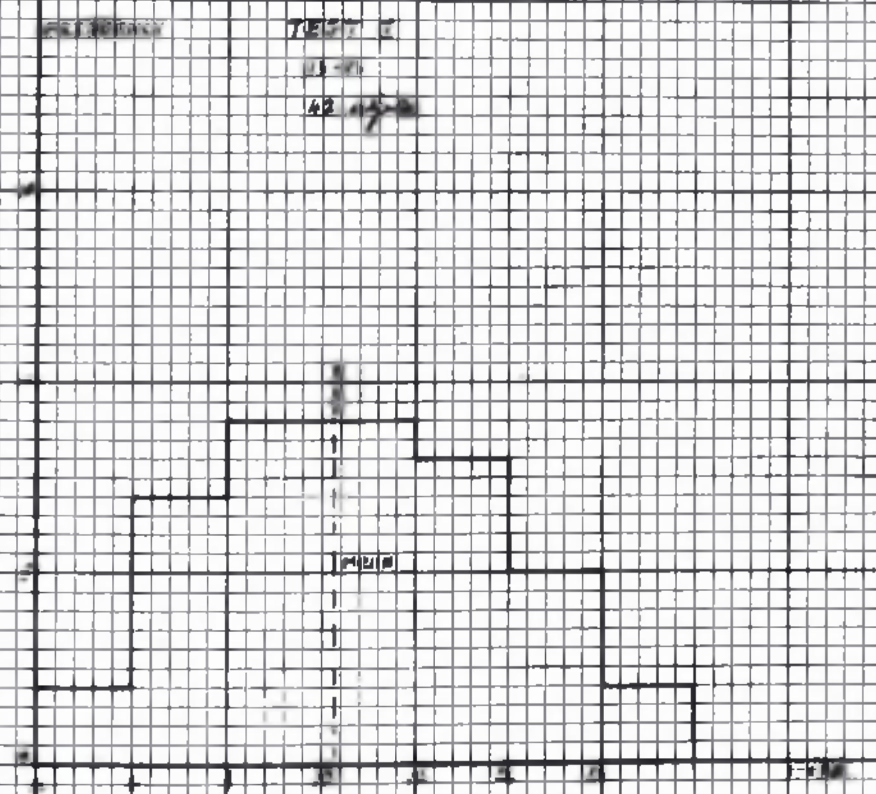
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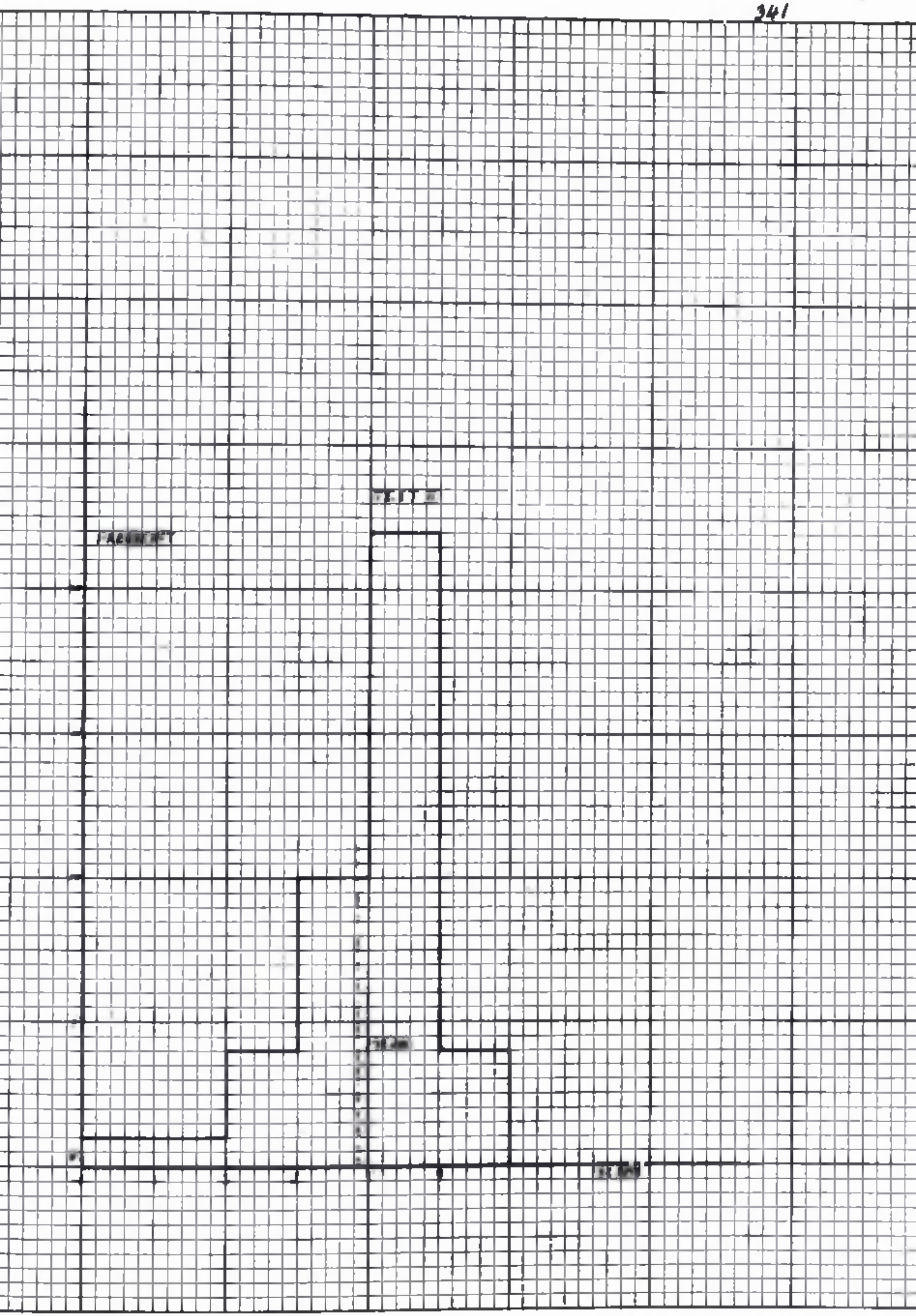

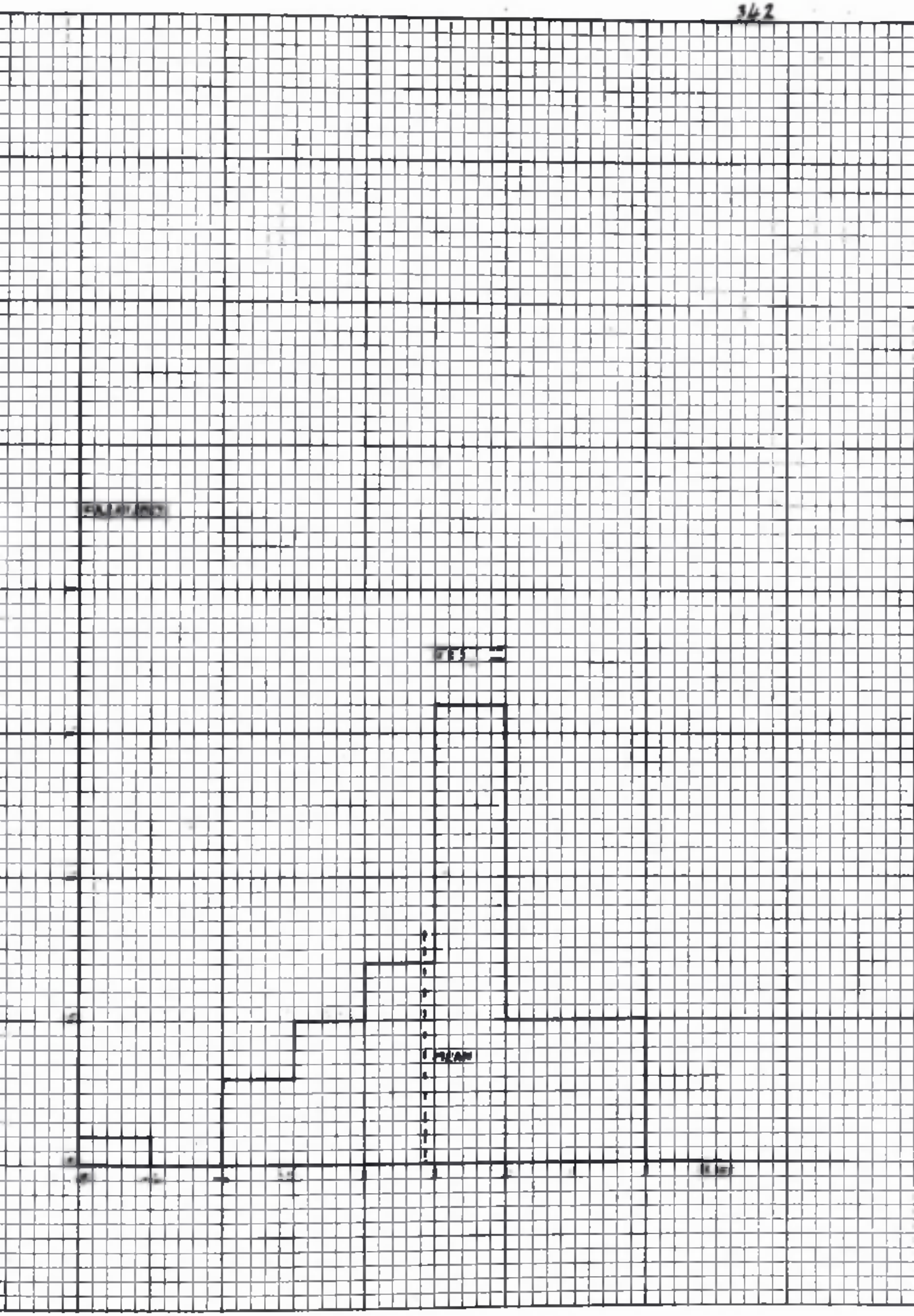
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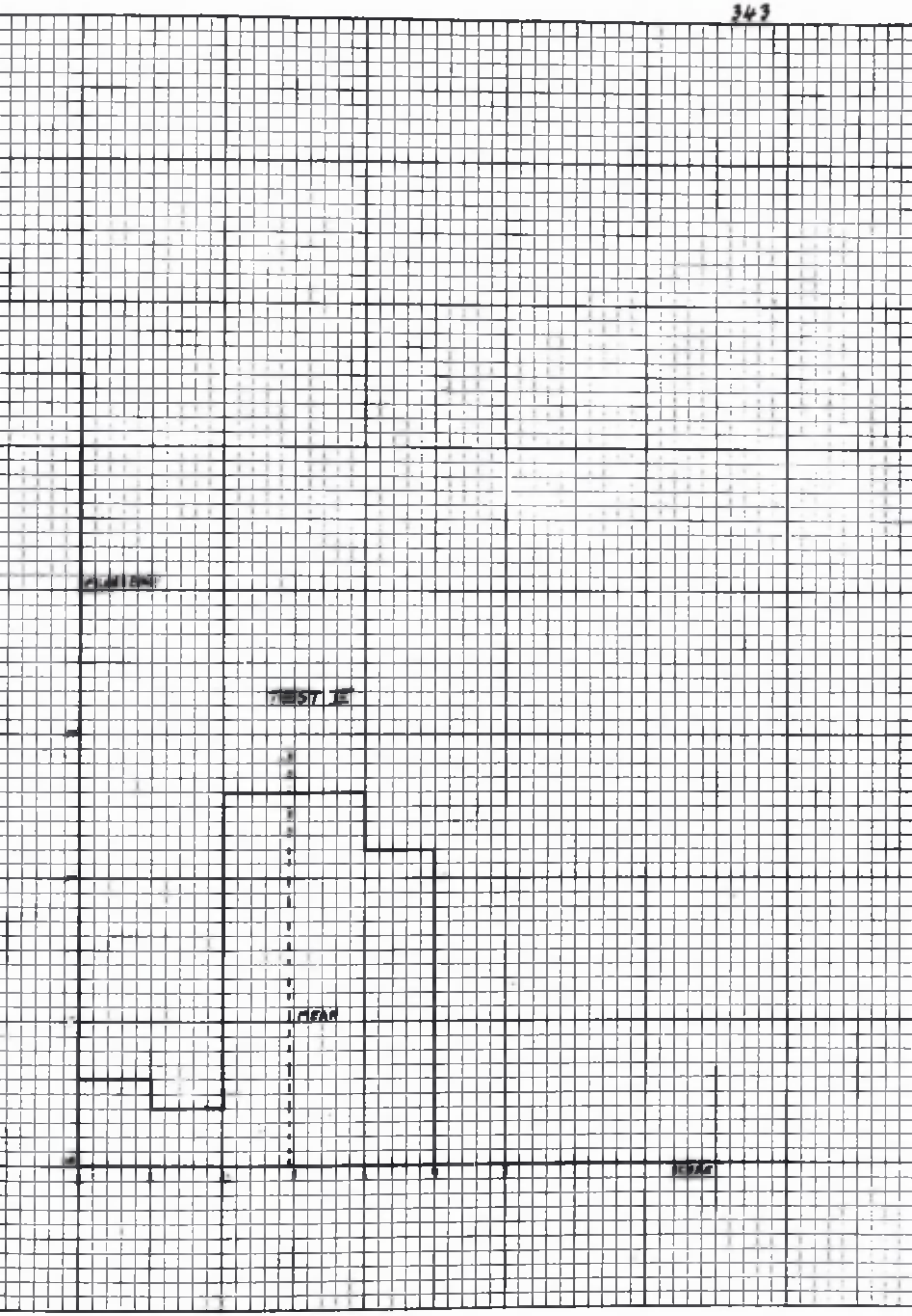
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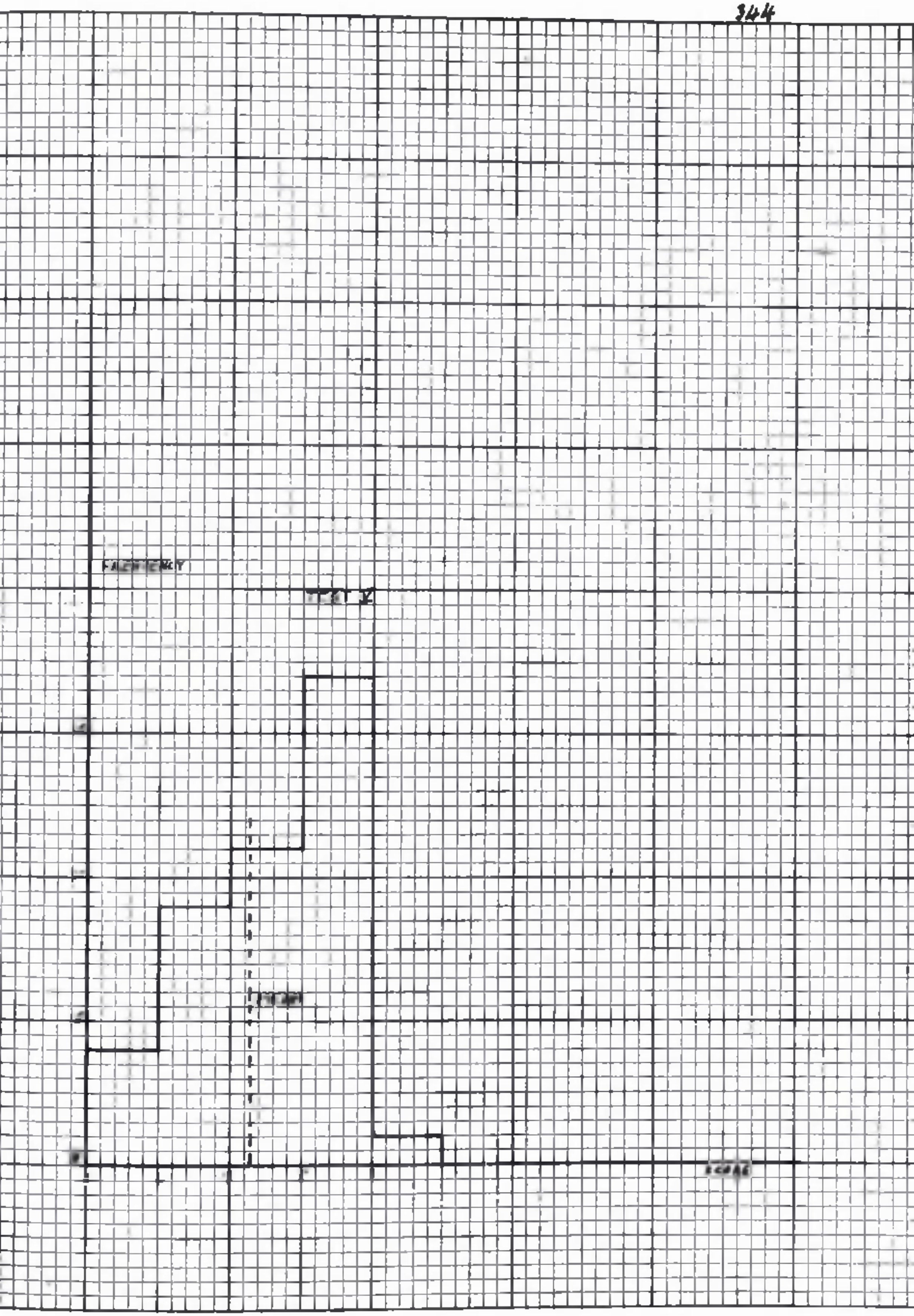

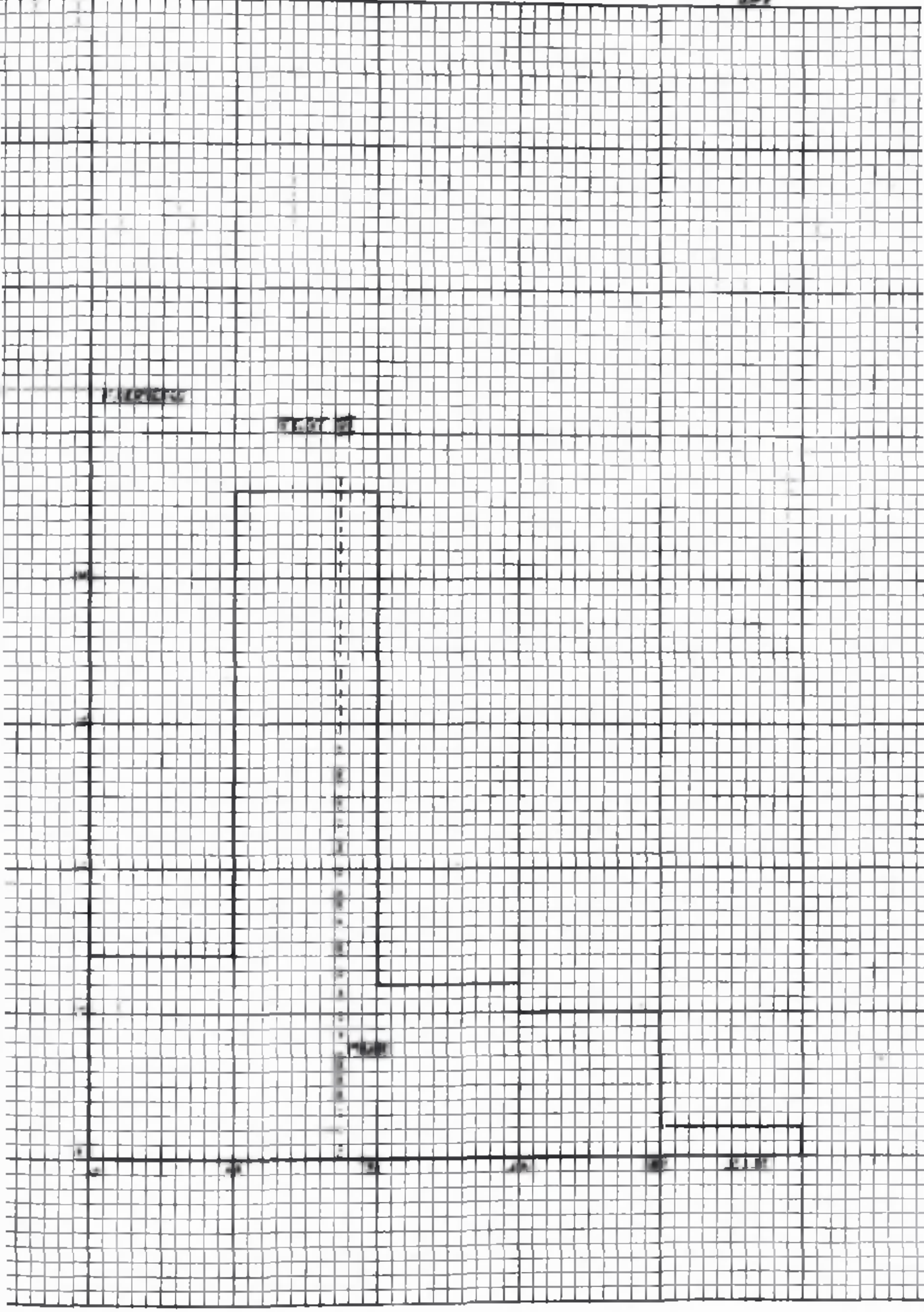

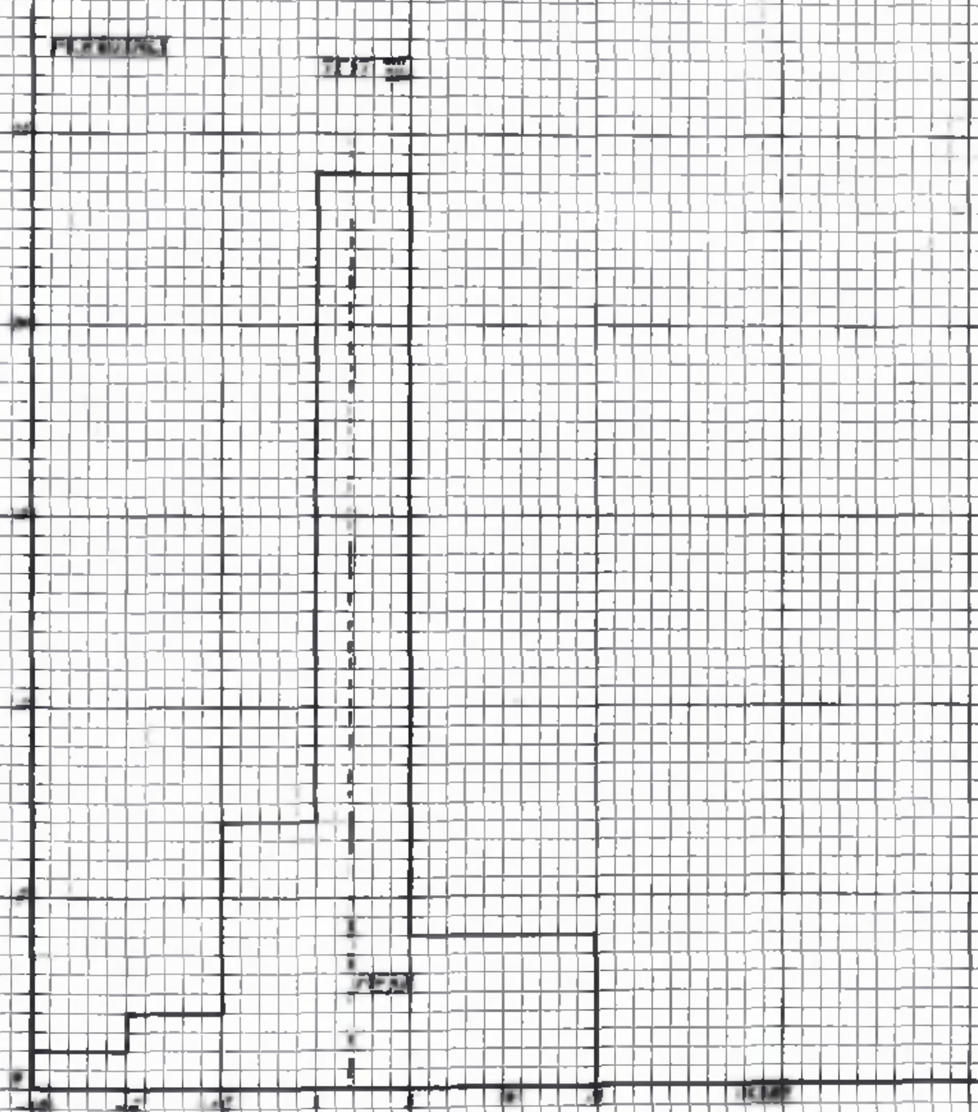

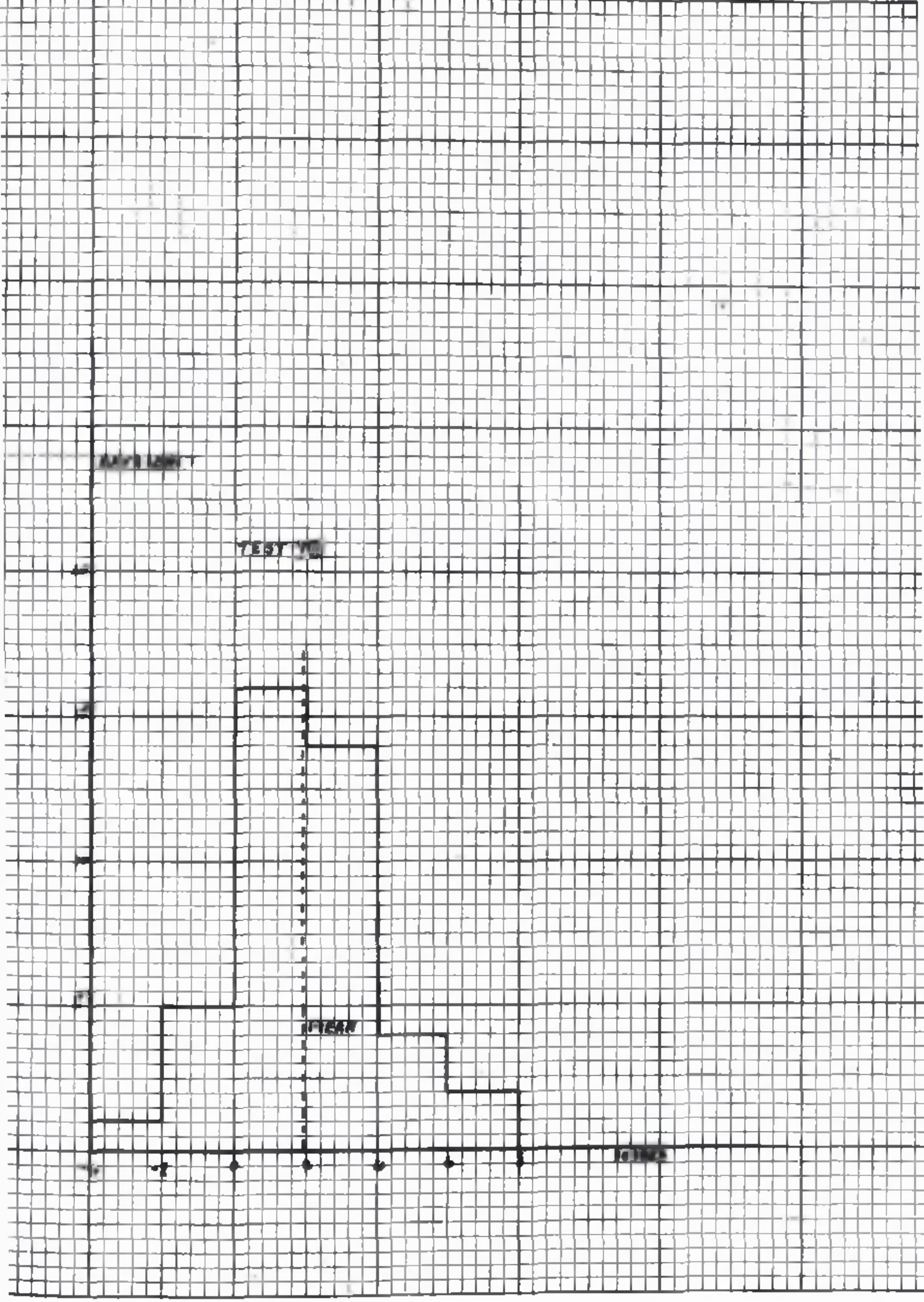
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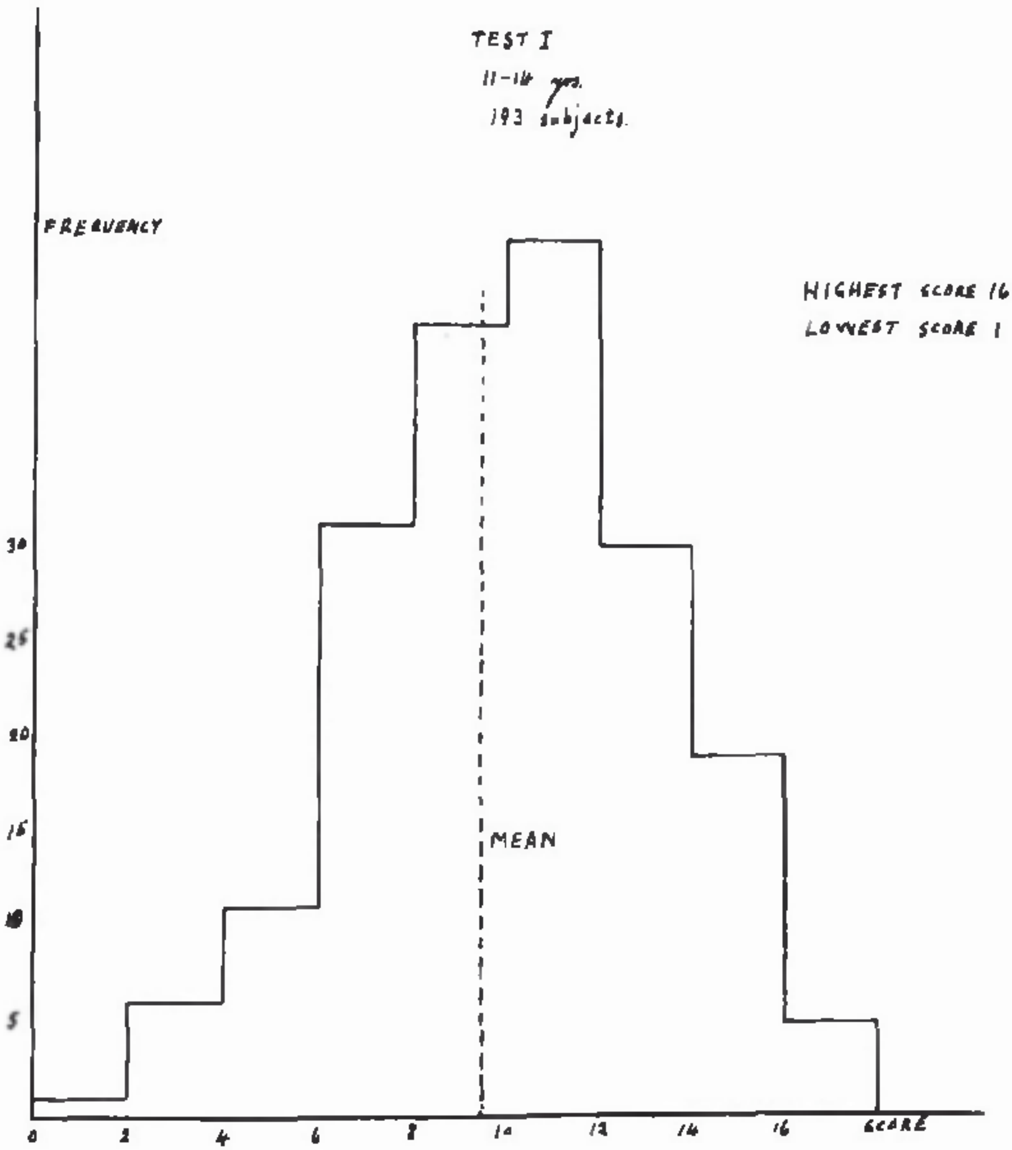
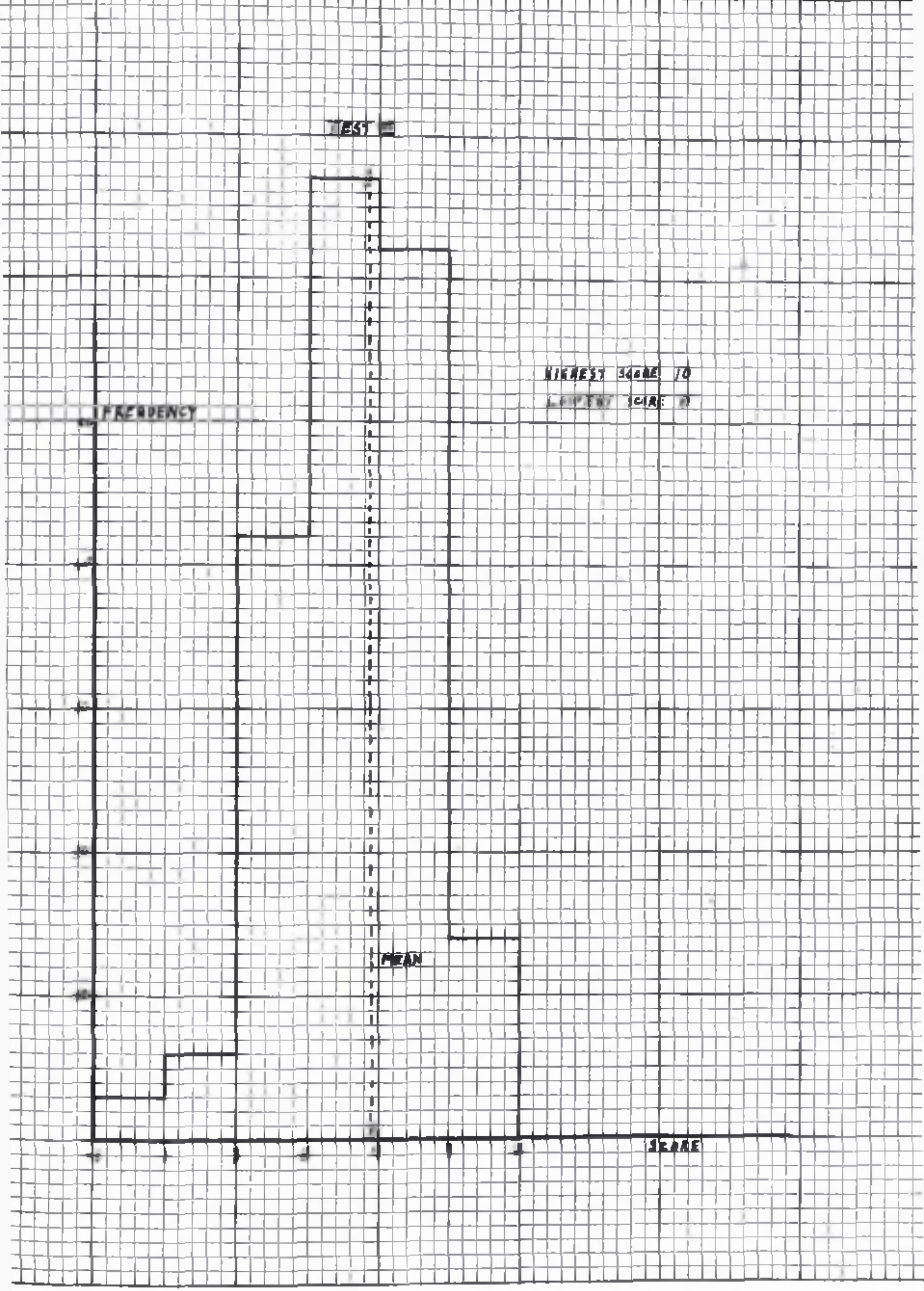
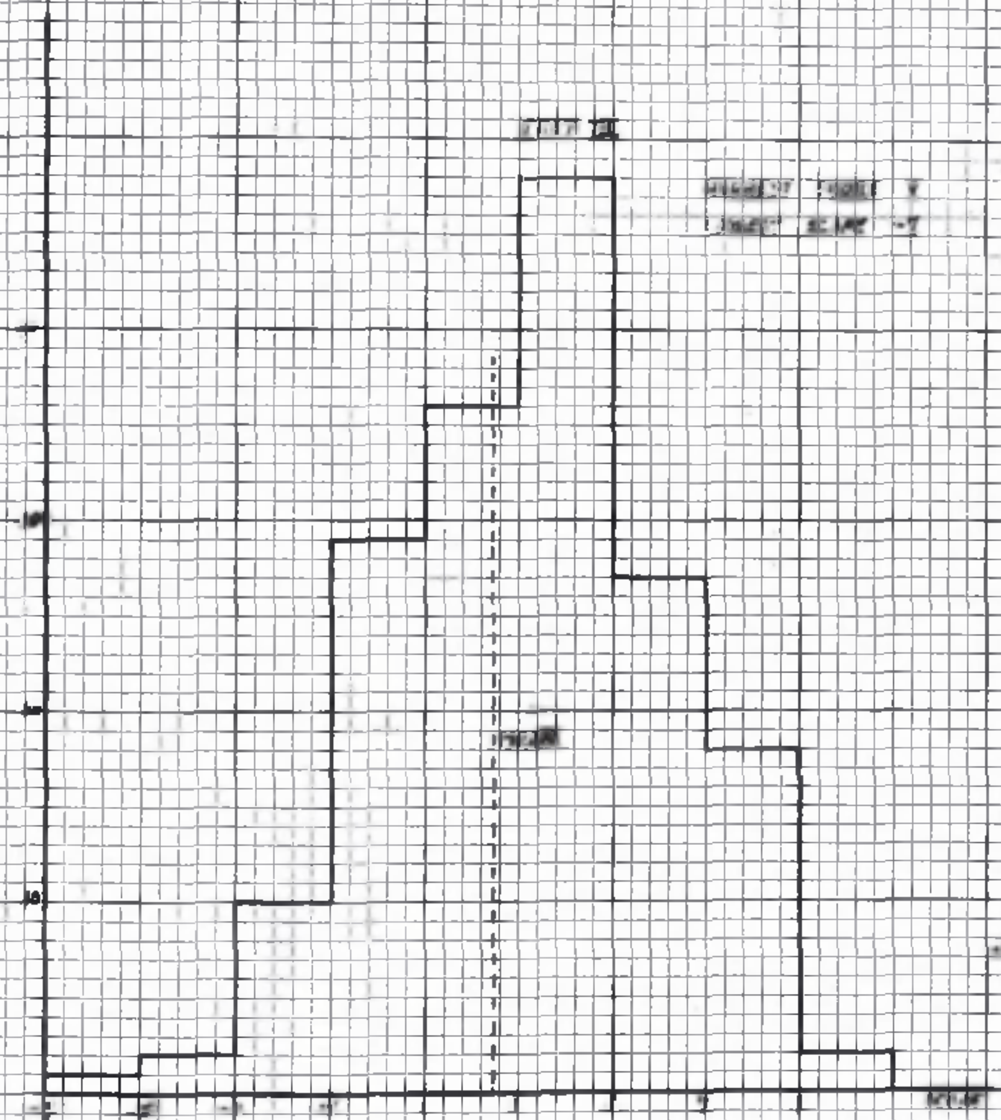
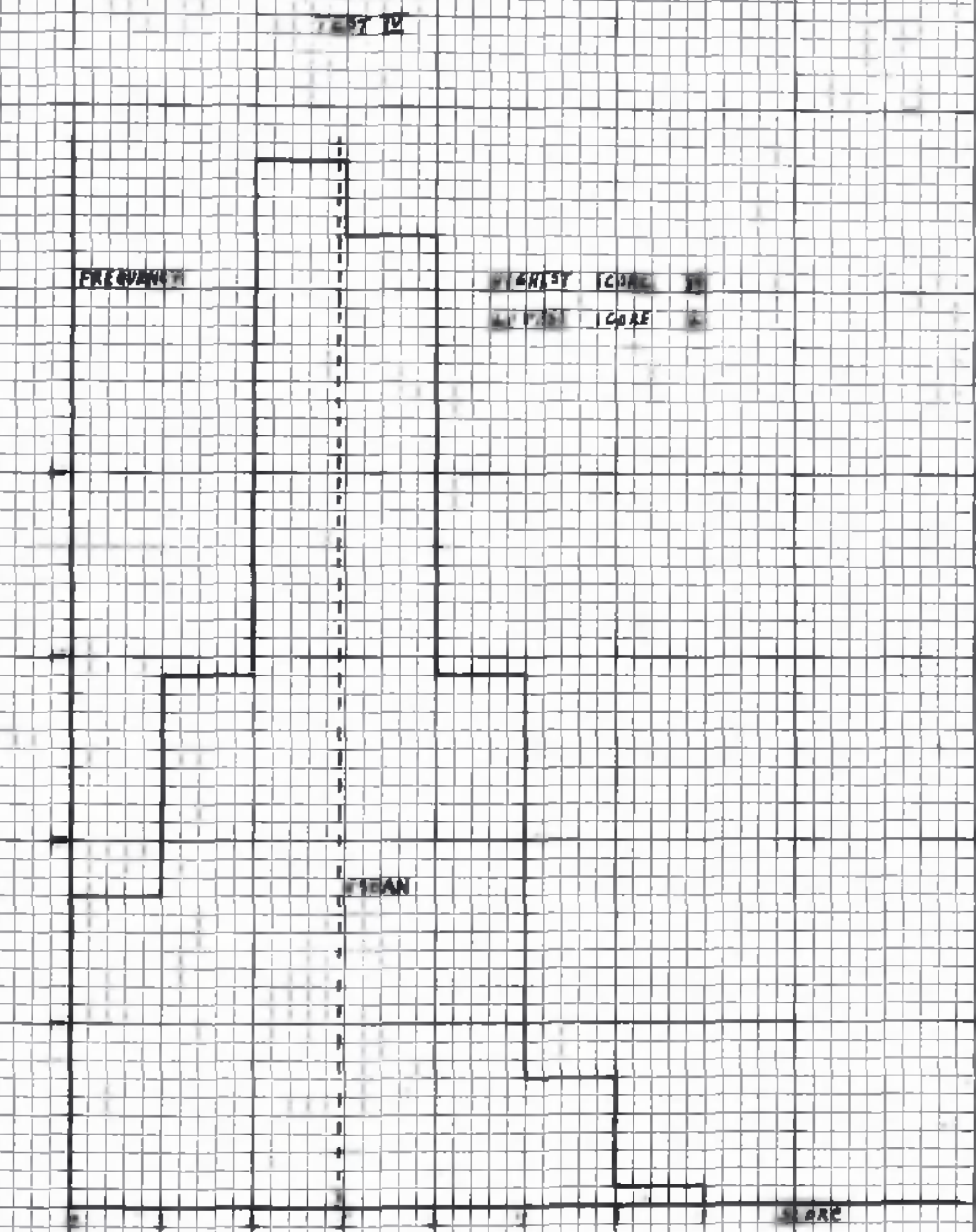
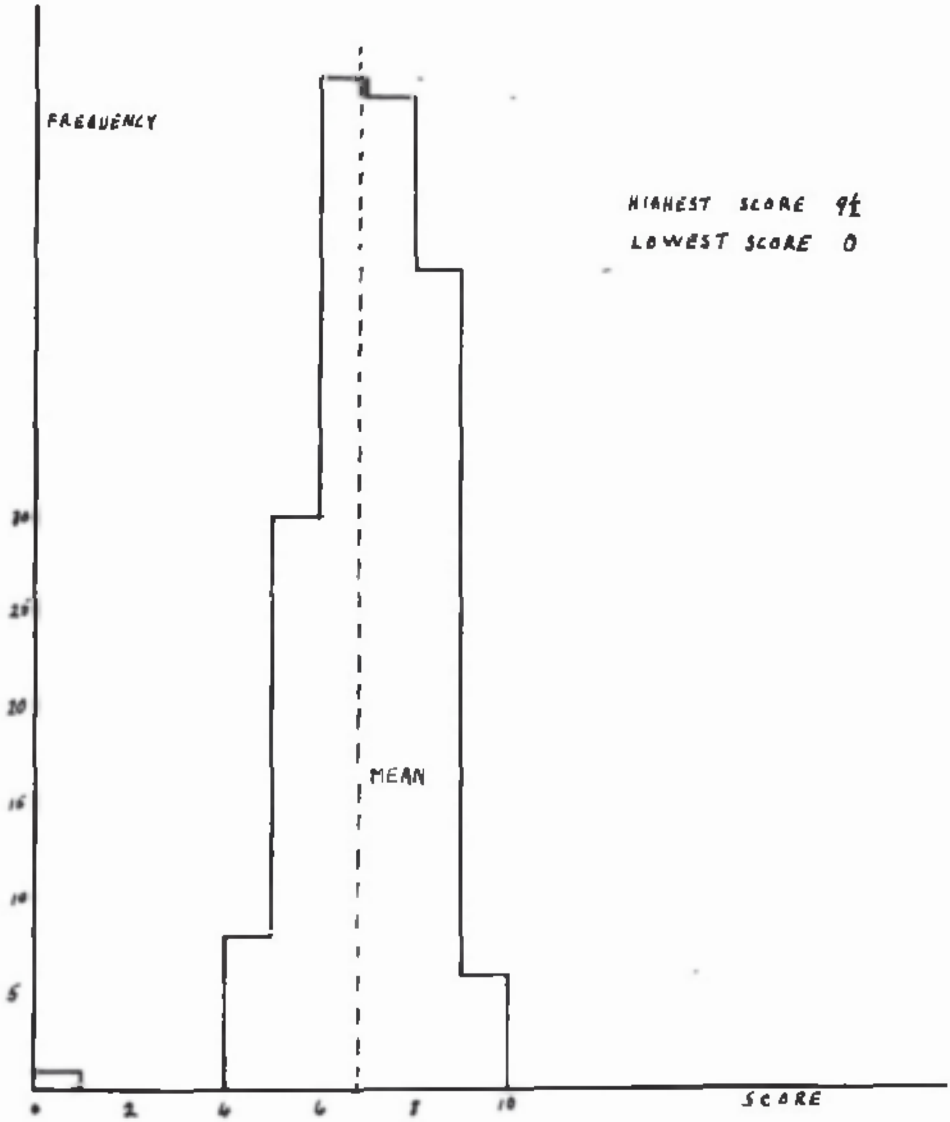

TEST I
11-14 yrs.
193 subjects.
FREQUENCY
HIGHEST SCORE 16
LOWEST SCORE 1
MEAN
30
25
20
15
10
5
0
2
4
6
8
10
12
14
16
SCORE


TEST
HIGHEST SCORE 10
FREQUENCY
MEAN
SCORE




TEST IV
FREQUENCY
MEAN
SCORE

TEST V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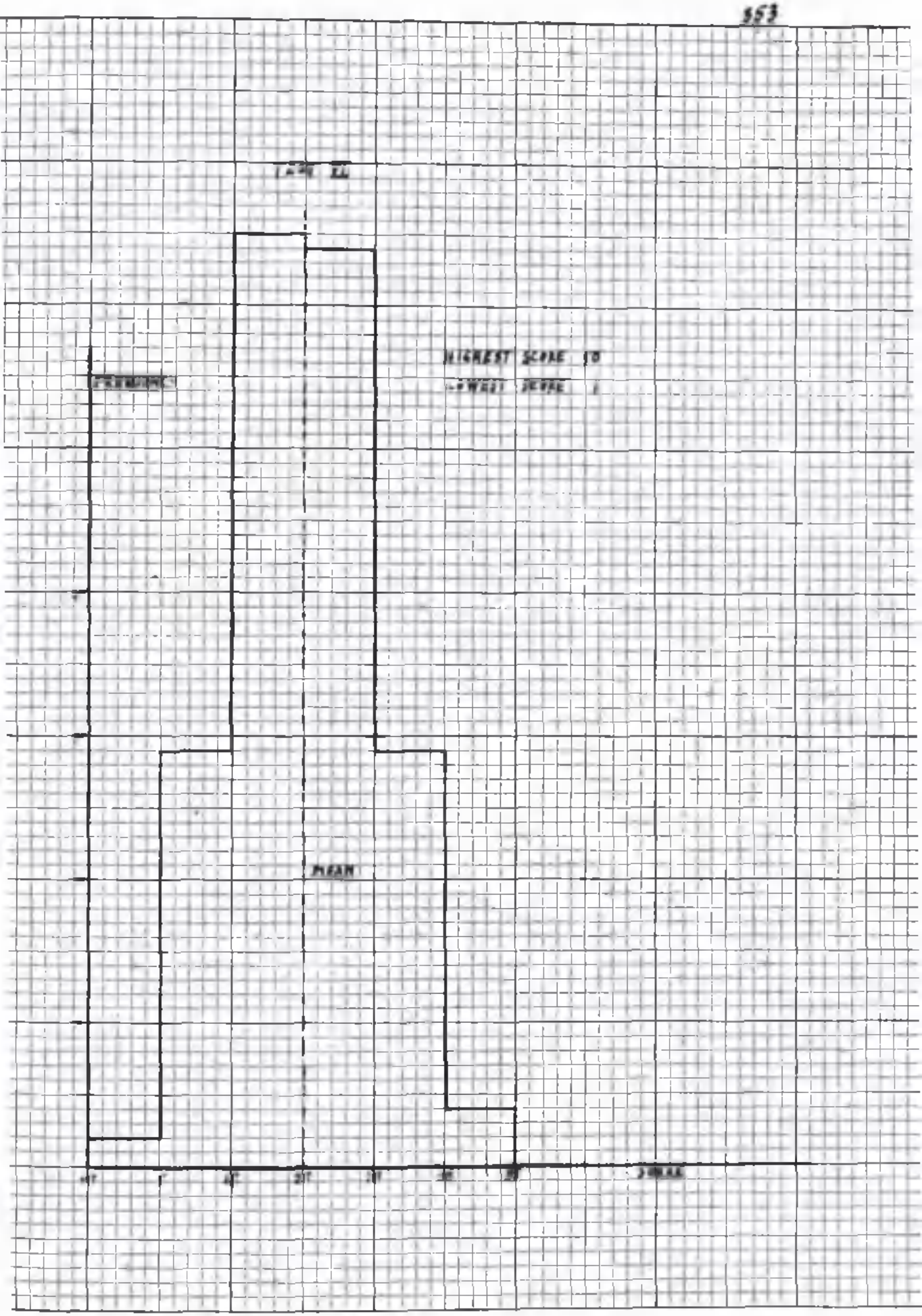
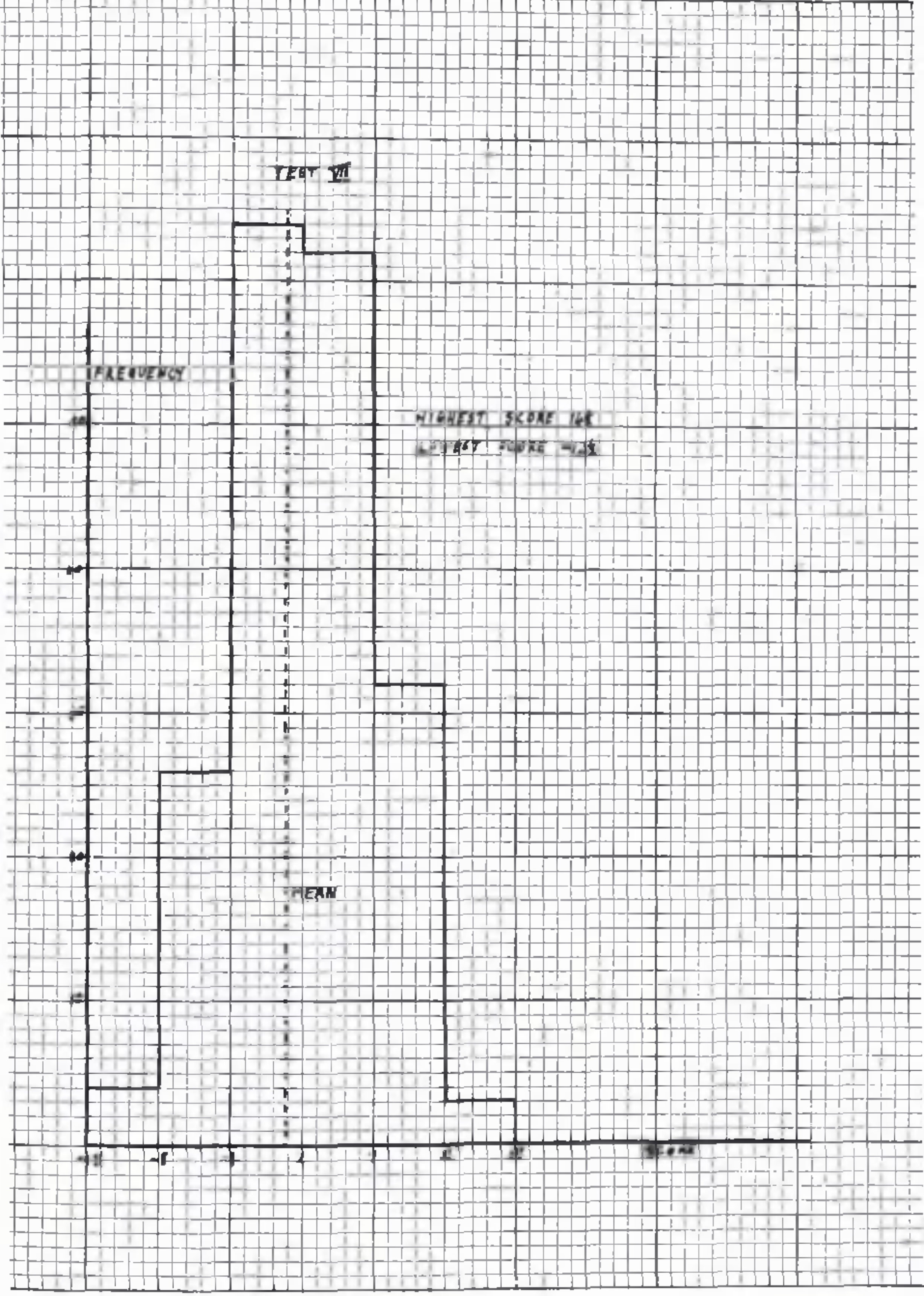
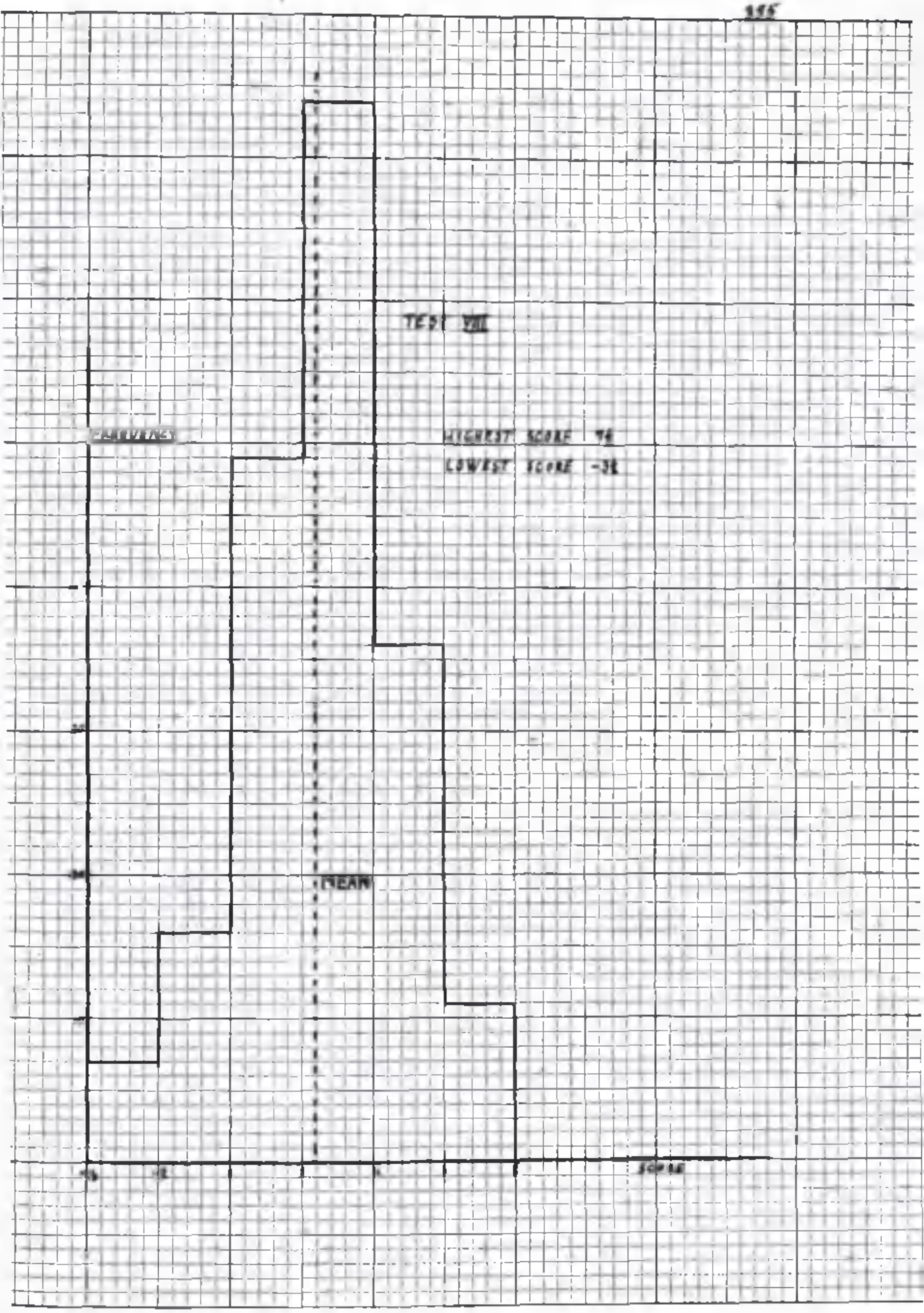
HIGHEST SCORE 9½
LOWEST SCORE 0
30
25
20
15
10
5
MEAN
0
2
4
6
8
10
SCORE


HIGHEST SCORE 10
MEAN


TEST VII
FREQUENCY
HIGHEST SKORE
MEAN


TEST VIII
HIGHEST SCORE
LOWEST SCORE
MEAN
SCORE

THE CORRELATION OF EACH TEST WITH THE POOLED RESULT.

GROUP A (11-12)

TEST	Value of r
VIII	·58 ± ·08 (s)
V	·50 ± ·09 (s)
IV	·50 ± ·09 (s)
III	·44 ± ·10 (s)
VI	·38 ± ·11 (s)
I	·35 ± ·11 (s)
II	·24 ± ·11
VII	·07 ± ·12

GROUP B (12-13)

TEST	Value of r
I	·53 ± ·04 (s)
V	·49 ± ·05 (s)
VIII	·46 ± ·05 (s)
VI	·45 ± ·05 (s)
IV	·45 ± ·05 (s)
II	·39 ± ·05 (s)
VII	·21 ± ·06 (s)
III	·19 ± ·06 (S)

GROUP C

TEST	Value of r
I	·50 ± ·08 (s)
VIII	·47 ± ·08 (s)
VI	·43 ± ·08 (s)
IV	·38 ± ·09 (s)
V	·32 ± ·09 (s)
VII	·25 ± ·10
II	·23 ± ·10
III	·17 ± ·10

[Correlation coefficients marked 's' are significant]

[See text, page 53]

THE ORDER OF DIFFICULTY OF THE TESTS.

(This order can be found from the percentage of the group correct in the various items.)

(Dummy items are marked 'd'.)

Test I

			Group			
			A	B	C	Whole group
1.	From Highest Heaven	d	55%	65	81	67
2.	The Harp that once		100	92	88	92
3.	Heraclitus	d	72	72	93	77
4.	The Ash Grove		97	80	81	82
5.	O Leave your Sheep	d	79	76	74	76
6.	Puer nobis	d	24	53	67	51
7.	So early in the morning.		100	91	100	94
8.	The Marseillaise		97	92	100	94
9.	The Rio Grande		24	20	29	22
10.	Onward Christian Soldiers.		14	-21	-50	-26
11.	All through the night		-24	1	-7	-5
12.	The chorale of 'The Kings'	d	65	66	69	67
13.	Come lasses and lads		28	13	12	15
14.	The three Traitors	d	52	48	60	51
15.	The Citizens of Châtres	d	59	9	60	27
16.	The Vicar of Bray		31	39	5	30
17.	Peace be with you	d	62	68	81	70
18.	Heavenly gifts	d	65	62	67	64

Test II

		A	B	C	Whole group
1.	The Wild Horseman	100	96	95	96
2.	At Church	100	91	98	94
3.	Gypsy Dance	93	82	93	86
4.	Dance of the Elves	100	81	86	85
5.	Cavalier	97	99	98	98
6.	Song of the Sea	-10	9	33	11
7.	Sea Surge	59	62	69	63
8.	Cradle Song	79	53	62	59
9.	Wedding March	21	34	67	39
10.	The Organ Grinder	14	-23	-24	-22

Test III

	Group A	B	C	Whole group
1.	86	93	79	89
2.	62	73	74	72
3.	28	55	50	47
4.	21	35	41	37
5.	17	28	12	15
6.	14	16	-7	12
7.	-4	6	-10	1
8.	-7	-9	-17	-4
9.	-38	-14	-24	-18

Test IV

	A	B	C	Whole group
1. March in D	55	56	81	61
2. Ecossaise (Dance)	86	79	78	80
3. Waltz	45	43	38	43
4. Strutting out (Dance.)	38	50	64	51
5. March (Bach)	4	34	14	25
6. Praise to the Holiest (Hymn)	78	68	82	72
7. Song 'My Secret'	35	53	51	50
8. March Militaire	14	36	38	33
9. The Butterfly (Song)	59	53	48	53

Test V.

	A	B	C	Whole group
1. Sanctus (Joyful)	86	53	93	67
2. Academic Festival (Joyful)	67	51	57	55
3. Gossip Joan (Cheerful)	48	48	52	49
4. Scherzo (Joyful)	83	91	93	90
5. Blessed art Thou (Peaceful)	83	66	77	71
6. Ecossaise (Cheerful)	67	81	83	79
7. Variation (Peaceful)	58	56	62	58
8. Sinfonia (Sad)	64	71	79	72
9. Chorale (Gloomy)	57	64	51	60
10. Tyrolese Folk Song (Cheerful)	79	74	79	76

Test VI

		Group A	B	C	Whole group
1.	A-hunting we will go.	100	100	95	99
2.	The Lessons of Nature d	76	78	82	79
3.	The First Nowell	100	88	94	91
4.	Leaves of Grass d	31	53	67	54
5.	The Cloister and the Hearth d	9	47	42	40
6.	Ye banks and braes	98	96	100	97
7.	A hundred pipers	91	84	99	89
8.	O dear what can the matter be	97	79	89	84
9.	The old folks at home	78	73	89	78
10.	The world of ice d	29	64	44	54
11.	The last rose of summer	91	95	95	95
12.	The spirit of the age d	29	57	58	53
13.	Ode to evening d	24	48	47	44
14.	The cold harbour d	16	54	42	46
15.	Thoughts in a garden d	21	50	27	41
16.	The minstrel boy	88	81	96	86
17.	Ungava d	-4	39	20	28
18.	Wae's for Prince Charlie	72	63	67	65
19.	The Ash Grove	53	48	60	52
20.	Scots wha ha'e	93	79	88	83
21.	Rubaiyat d	5	44	14	32
22.	Mystery at Geneva d	24	45	42	41
23.	Ho-ro my nut brown maiden	57	41	55	46
24.	The Grettir Saga d	16	43	27	36
25.	The Death of Jason d	2	47	35	38
26.	The Diamonds d	24	47	49	44
27.	It was a lover and his lass	81	56	91	67
28.	Drink to me only with thine eyes	33	39	56	42
29.	Shenandoah	28	10	47	21
30.	Lavengro d	0	32	13	23
31.	Oft in the stilly night	45	44	79	52
32.	'Tis folly to be wise d	36	41	43	40
33.	The Crown of Wild Olive d	-31	34	31	24
34.	The Rift in the Lute d	2	27	38	25
35.	A man's a man for a' that	26	28	48	32
36.	Since first I saw your face	47	17	35	25
37.	On wings of song	26	9	32	16
38.	Unto this last d	-4	34	26	26
39.	The flowers o' the forest	83	62	71	67
40.	The Bohemian Girl	45	9	20	17
41.	Lochnagar	43	32	57	39

Test VI (Cont.)

			Group			
			A	B	C	Whole group
42.	Where the bee sucks		33	-1	36	12
43.	Shakuntula	d	-5	51	0	31
44.	The Mirror of Perfection	d	14	52	42	44
45.	The Mill on the Floss	d	7	26	26	23
46.	The Return of the Native	d	-9	32	25	25
47.	Good King Wenceslas		72	44	70	54
48.	All people that on earth do dwell		22	8	-6	7
49.	The Bay of Biscay		67	53	49	54
50.	The Wild Duck	d	5	33	18	24
51.	The Rio Grande		53	27	62	38
52.	Runnymede	d	7	32	25	27
53.	Ashenden	d	-7	39	25	29
54.	Turn ye to me		38	-12	30	4
55.	The lass with the delicate air		14	-15	8	-6
56.	Orlando Furioso	d	5	40	17	30
57.	The Maiden's Prayer		4	-11	31	0
58.	The Marble Faun	d	2	23	-1	14
59.	Ravenshaw	d	-21	13	5	6
60.	The Kingdom of Christ	d	-24	-7	-33	-15

Test VII

			A	B	C	Whole group
1.	Sullivan		88	54	69	62
2.	Devereux	d	-5	9	-5	4
3.	Verstegan	d	-16	26	6	15
4.	Reinartz	d	-14	14	2	7
5.	Elgar		45	43	23	39
6.	Quarles	d	-31	22	0	9
7.	Kohler	d	-4	14	-4	7
8.	Pavlov	d	-33	-1	-6	-7
9.	Rossini		31	28	23	28
10.	Stanford		59	43	49	47
11.	Schubert		57	14	4	18
12.	Koffka	d	-22	20	18	13
13.	Tamurlane	d	-2	18	-10	9
14.	Masuma	d	-4	29	26	24
15.	Montessori	d	-28	20	-7	7
16.	Cibber	d	-29	-8	-10	-12
17.	Wyatt	d	-50	-23	-30	-29
18.	Witter	d	-24	-23	-11	-21

Test VII (Cont.)

		A	B	C	Whole group
19. Steiner	d	-24	-21	-20	-21
20. Schumann		28	-11	0	-3
21. Dryden	d	53	-15	-12	-20
22. Verdi		40	4	17	12
23. Beethoven		76	37	26	40
24. Arne		35	-3	14	6
25. Barbauld	d	-43	17	8	6
26. Tschaikowsky		21	-21	7	-8
27. Crashaw	d	-16	-13	-24	-16
28. Dekker	d	-50	-10	-29	-20
29. Humboldt	d	-4	1	-8	6
30. Sylvester	d	-43	-20	-16	-22
31. Haydn		50	13	1	16
32. Mozart		4	17	26	17
33. Seidlitz	d	-22	6	-2	0
34. Sedley	d	-50	-25	-35	-31
35. Couperin		12	-4	10	2
36. Donne	d	-35	-11	-7	-14
37. Wagner		21	-2	21	7
38. Handel		31	29	13	21
39. Wootton	d	-26	5	12	2
40. Sousa		16	-9	-5	-4
41. Liszt		-2	-5	-11	-6
42. Purcell		26	-5	12	7
43. Bach		53	-12	7	2
44. Cowley	d	-64	-27	-44	-37
45. Gluck		-4	-5	2	-3
46. Chopin		4	6	14	8
47. Mendelssohn		22	-5	19	4
48. Rachmanninoff		-22	-29	2	-21
49. Strauss		24	-10	10	-1
50. Brahms		29	3	27	12

Test VIII

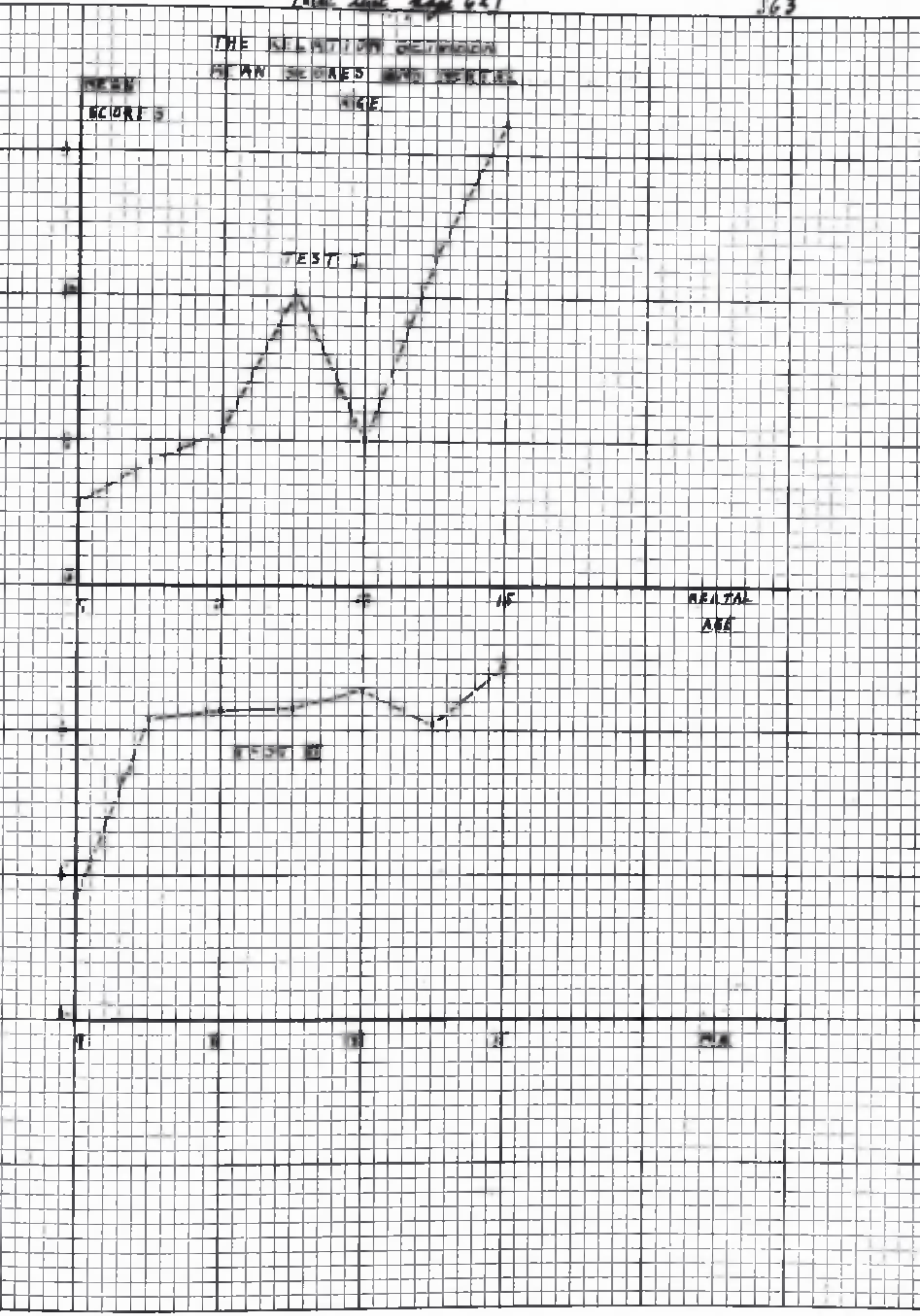
	A	B	C	Whole group
1. Evening hymn	100	86	100	91
2. Bagatelle	76	-2	38	19
3. Arkansas Traveller (Violin)	-4	-7	-14	-8
4. Coronation March	-14	-6	-19	-10
5. La Cimquantaine	48	27	10	26
6. In Praise of Tears	7	19	-19	9
7. Hymn	0	-18	-29	-18
8. Hymn	79	70	48	66
9. Rock of Ages	-62	-26	-43	-35

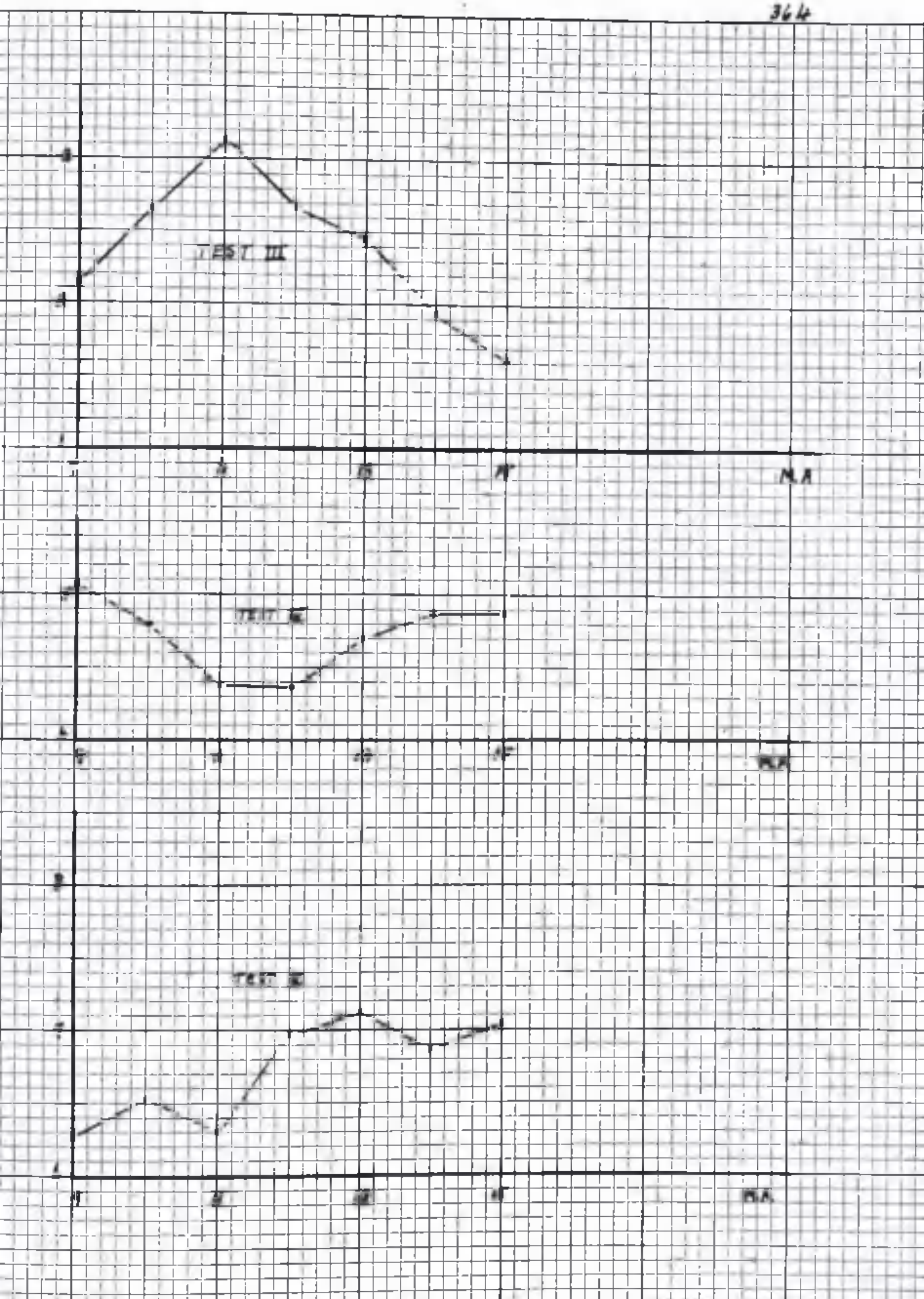
[See text, page 62]

RESULTS BASED ON MENTAL AGE CLASSIFICATION. (same subjects as before; some extreme M.A.'s omitted.)

		I	II	III	IV	V	VI	VII	VIII
M.A. 9–10 n = 7	M	8·57	4·86	2·14	5·07	6·29	16·93	2·5	2·64
	σ	2·56	1·93	2·85	1·15	·70	8·58	4·23	2·22
	$P.E._M$	·65	·44	·73	·29	·18	2·19	1·08	·56
M.A. 10–11 n = 23	M	8·87	6·09	2·65	4·80	6·54	21·63	2·87	2·89
	σ	3·49	1·72	2·30	1·09	1·01	7·66	4·87	1·86
	$P.E._M$	·49	·24	·32	·15	·14	1·08	·68	·26
M.A. 11–12 n = 32	M	9·09	6·13	3·13	4·39	6·31	24·16	1·30	1·52
	σ	3·15	2·63	3·00	1·16	1·61	9·27	4·94	2·41
	$P.E._M$	·38	·31	·36	·14	·19	1·10	·59	·29
M.A. 12–13 n = 38	M	10·03	6·16	2·66	4·38	6·99	25·63	–·36	2·28
	σ	2·65	1·99	2·53	1·25	1·27	10·96	5·11	2·53
	$P.E._M$	·29	·22	·28	·14	·14	1·20	·56	·28
13–14 n = 41	M	9	6·29	2·46	4·71	7·12	26·33	2·22	2·5
	σ	3·16	1·92	2·41	1·41	1·31	8·77	5·46	2·53
	$P.E._M$	·33	·20	·25	·15	·14	·92	·58	·27
14–15 n = 31	M	10·29	6·03	1·94	4·89	6·87	27·16	2·98	2·84
	σ	3·10	1·91	2·94	1·16	1·09	8·23	4·51	2·21
	$P.E._M$	·38	·23	·36	·14	·13	1·00	·55	·27
15–16 n = 13	M	11·23	6·46	1·62	4·88	7·04	29·92	1·88	2·15
	σ	3·14	2·17	3·90	·92	·92	6·03	5·61	1·93
	$P.E._M$	·59	·41	·73	·17	·17	1·13	1·05	·36

[also text page 627

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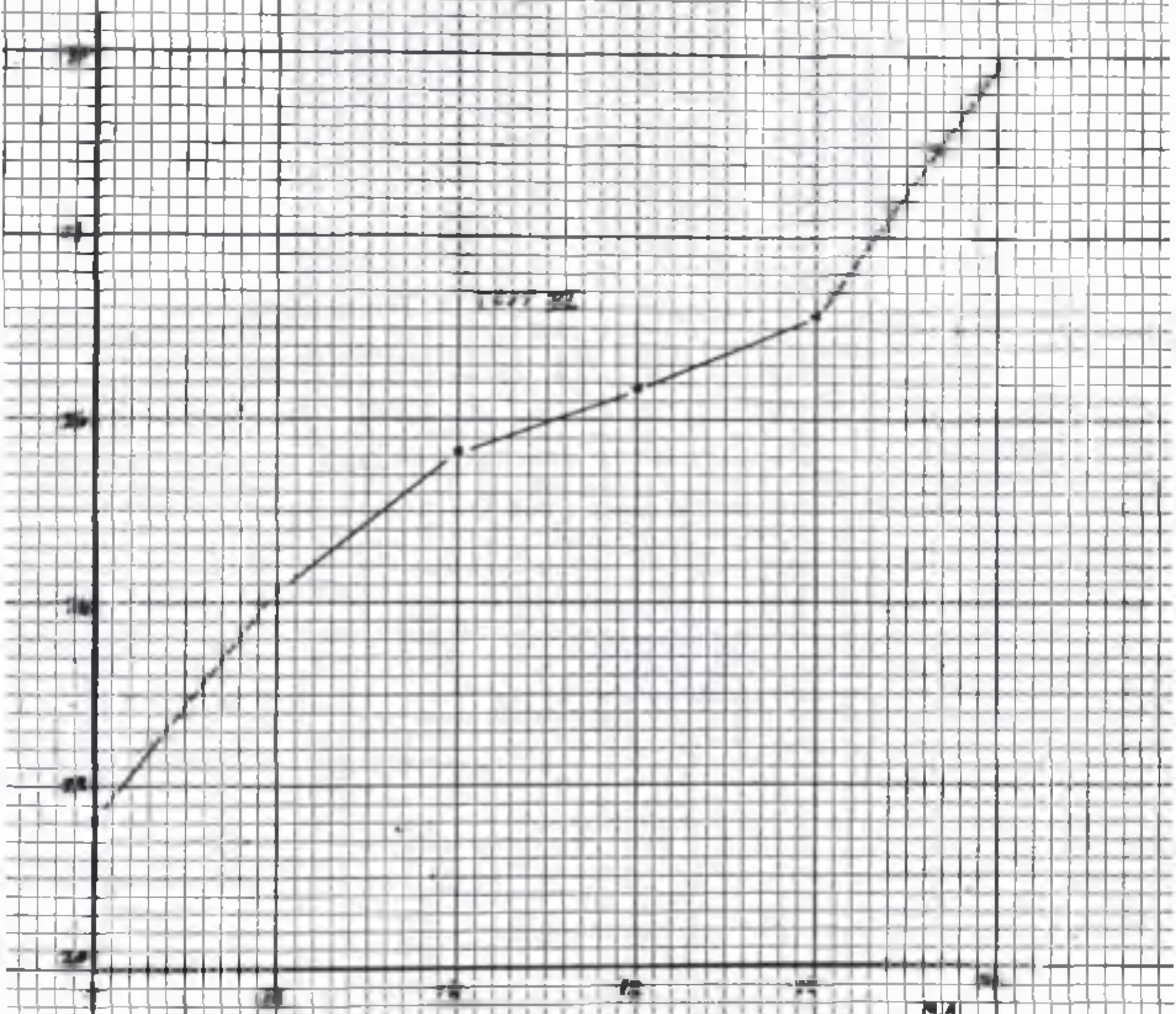
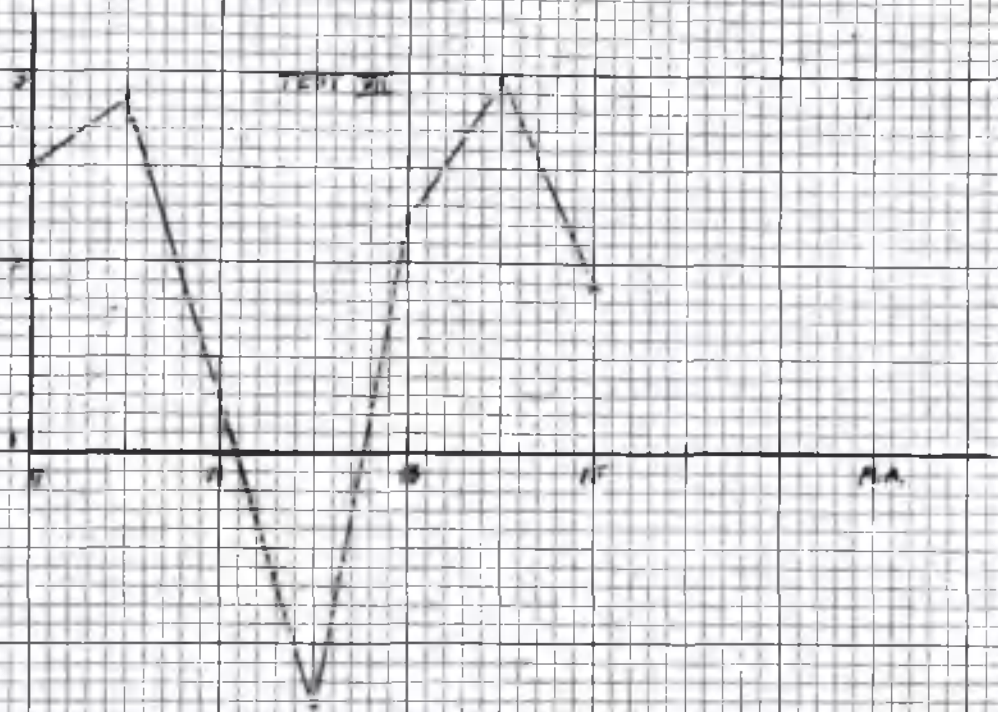
M.A
M.A
M.A

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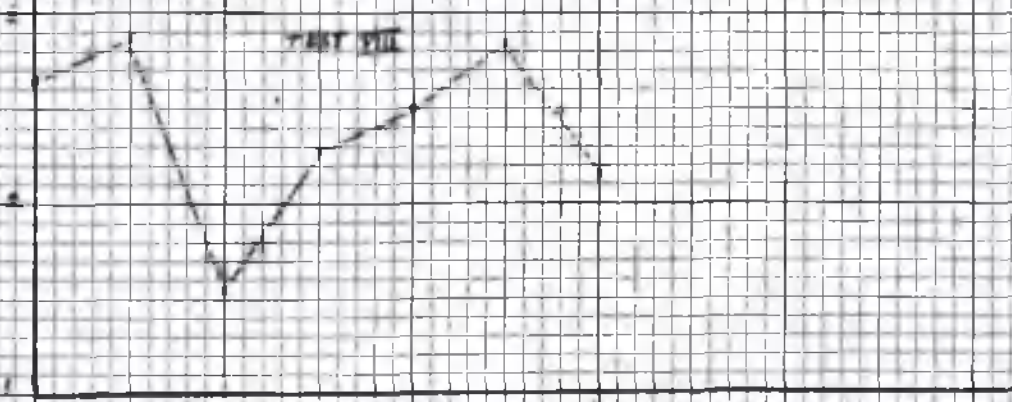
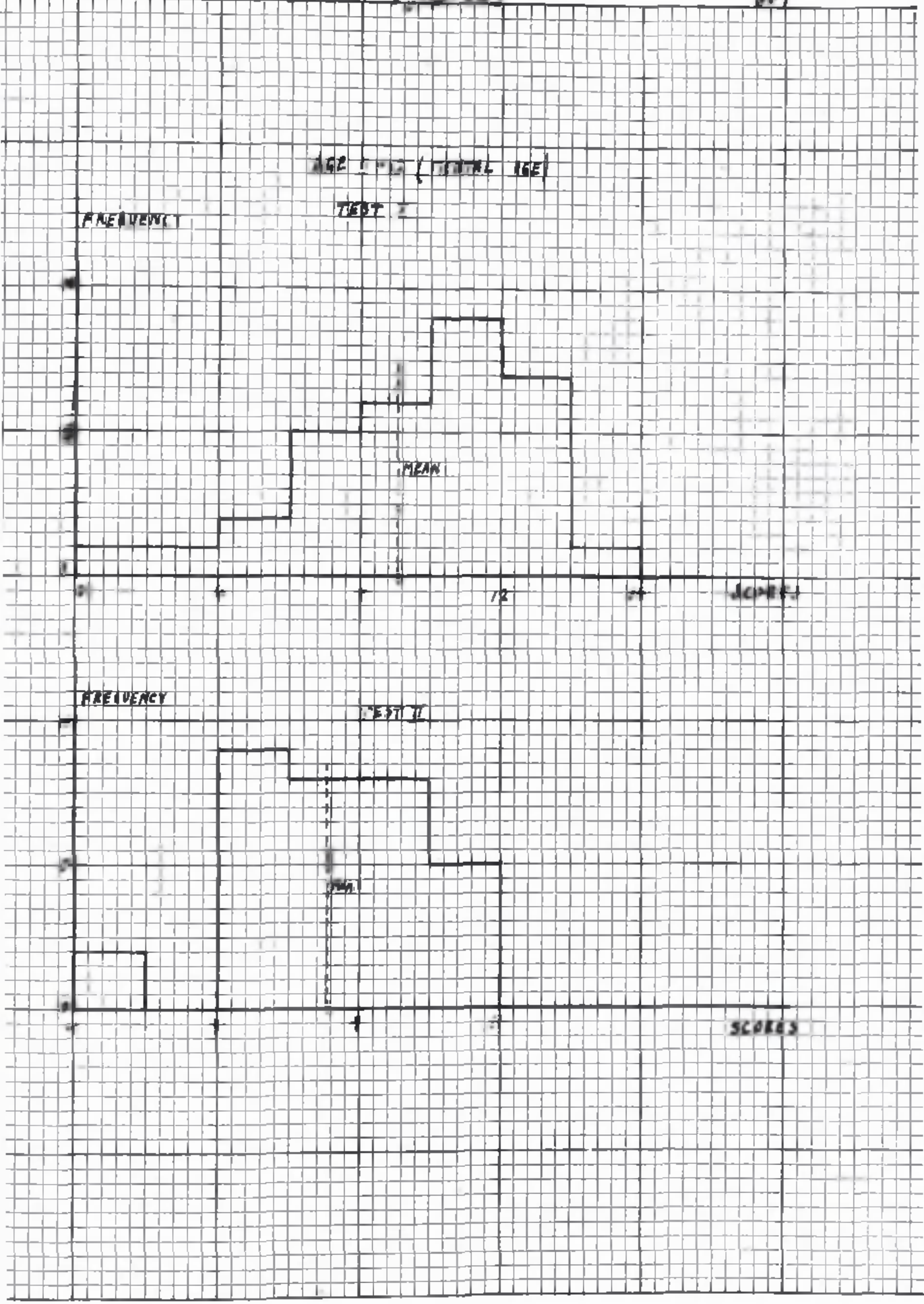
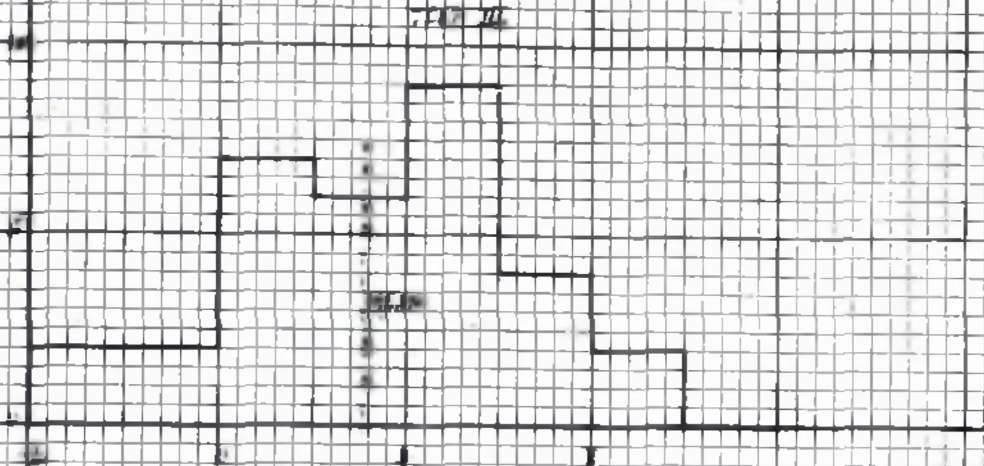
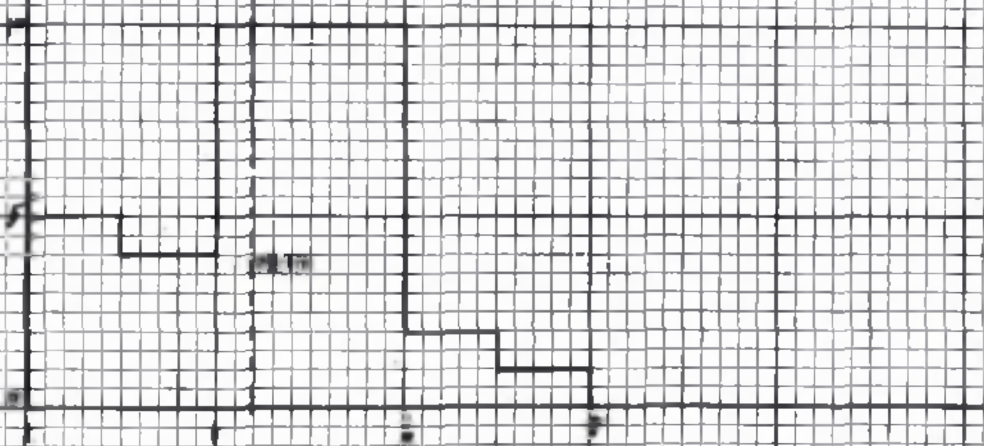
M.A.

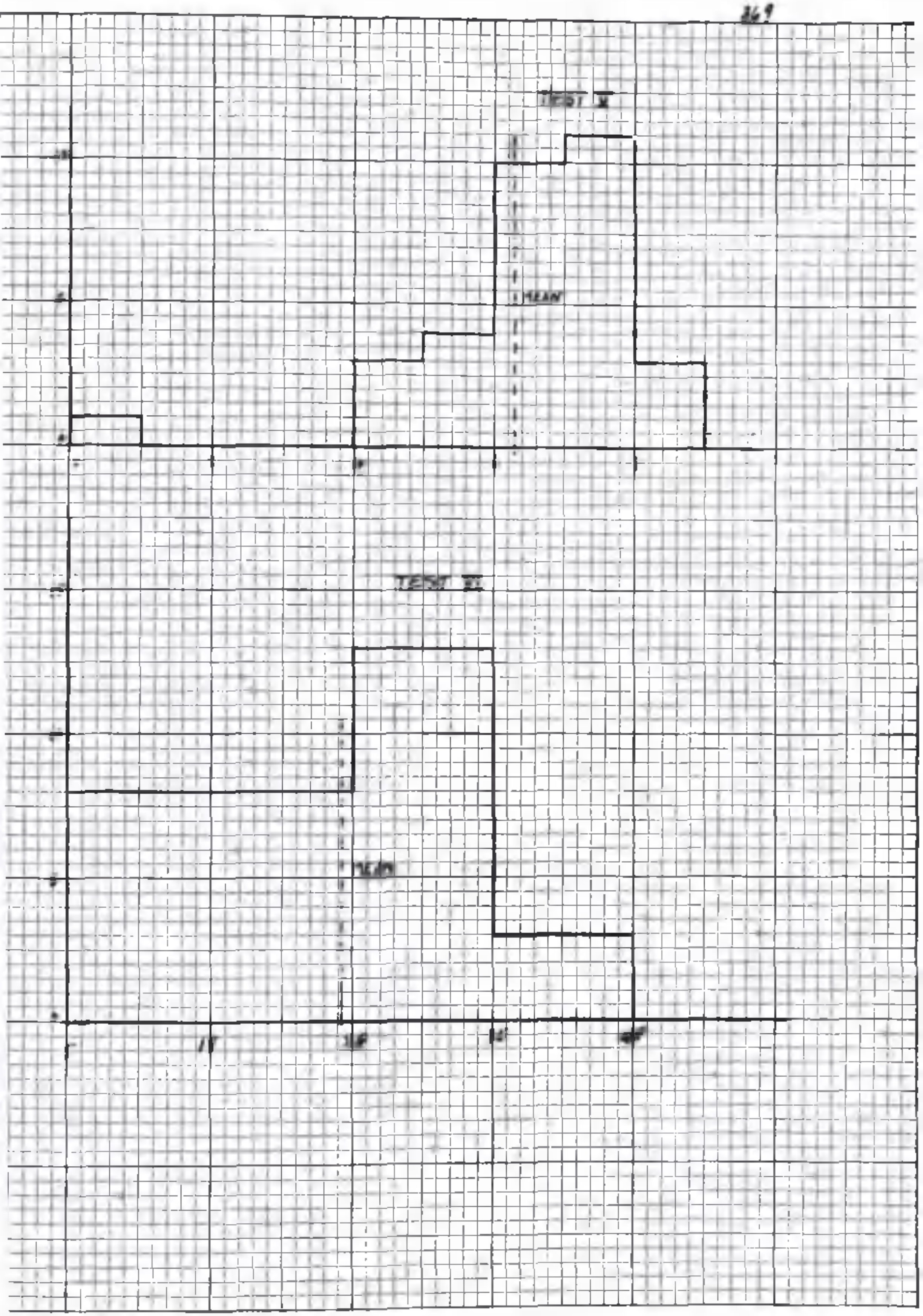

TEST VIII
M.A.

[See text page 62]

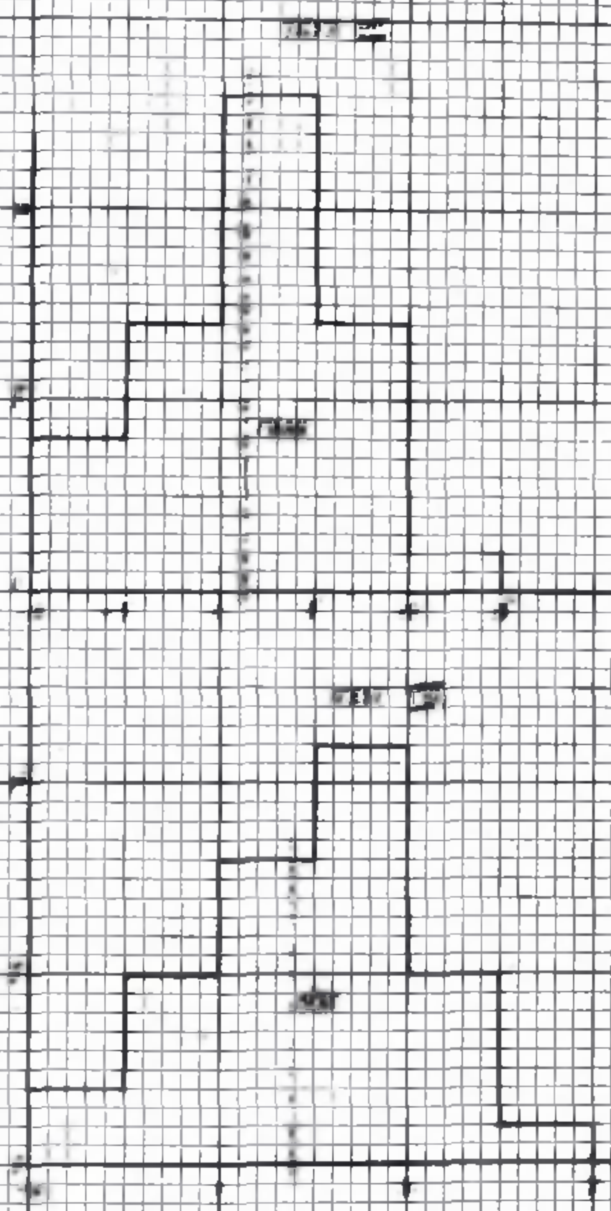


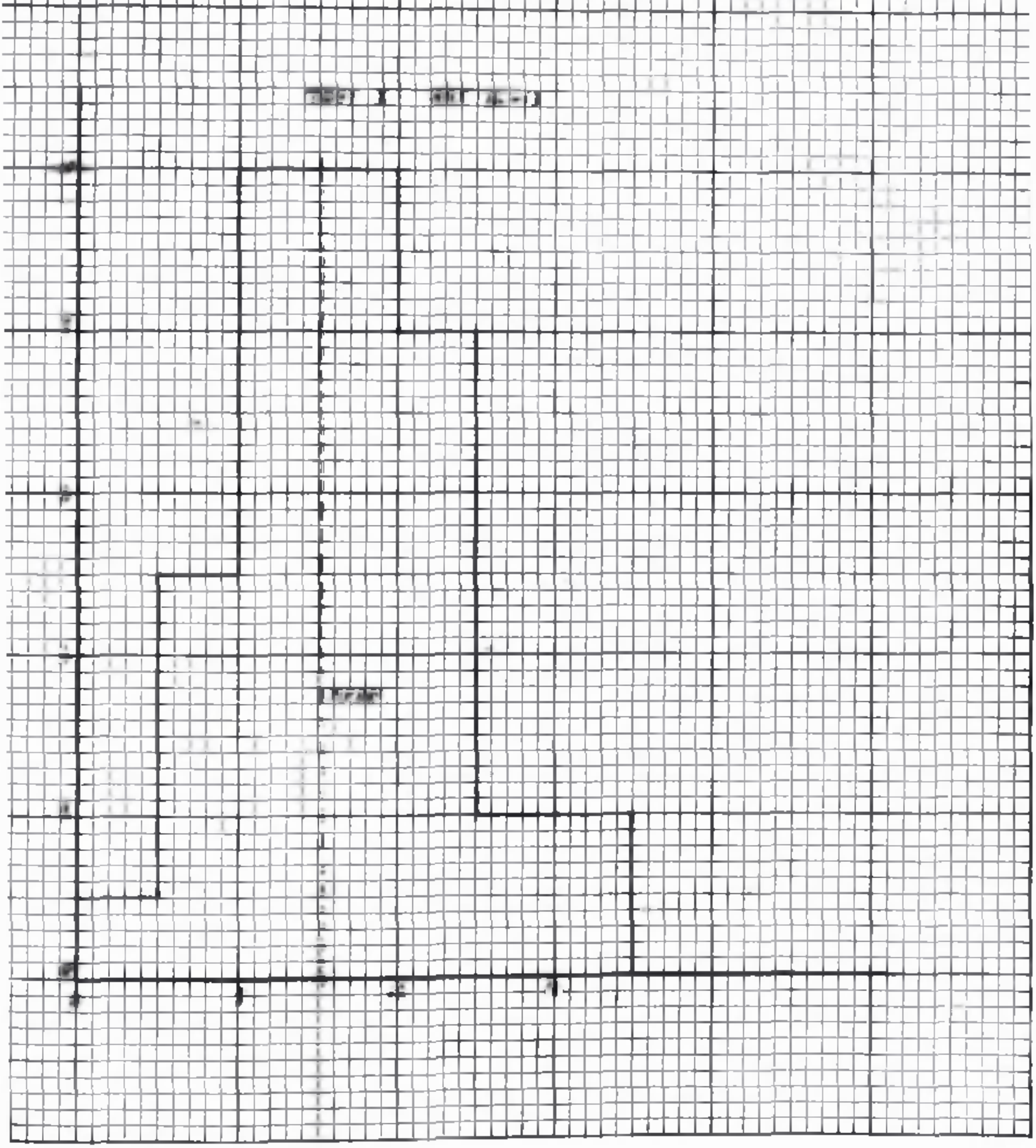


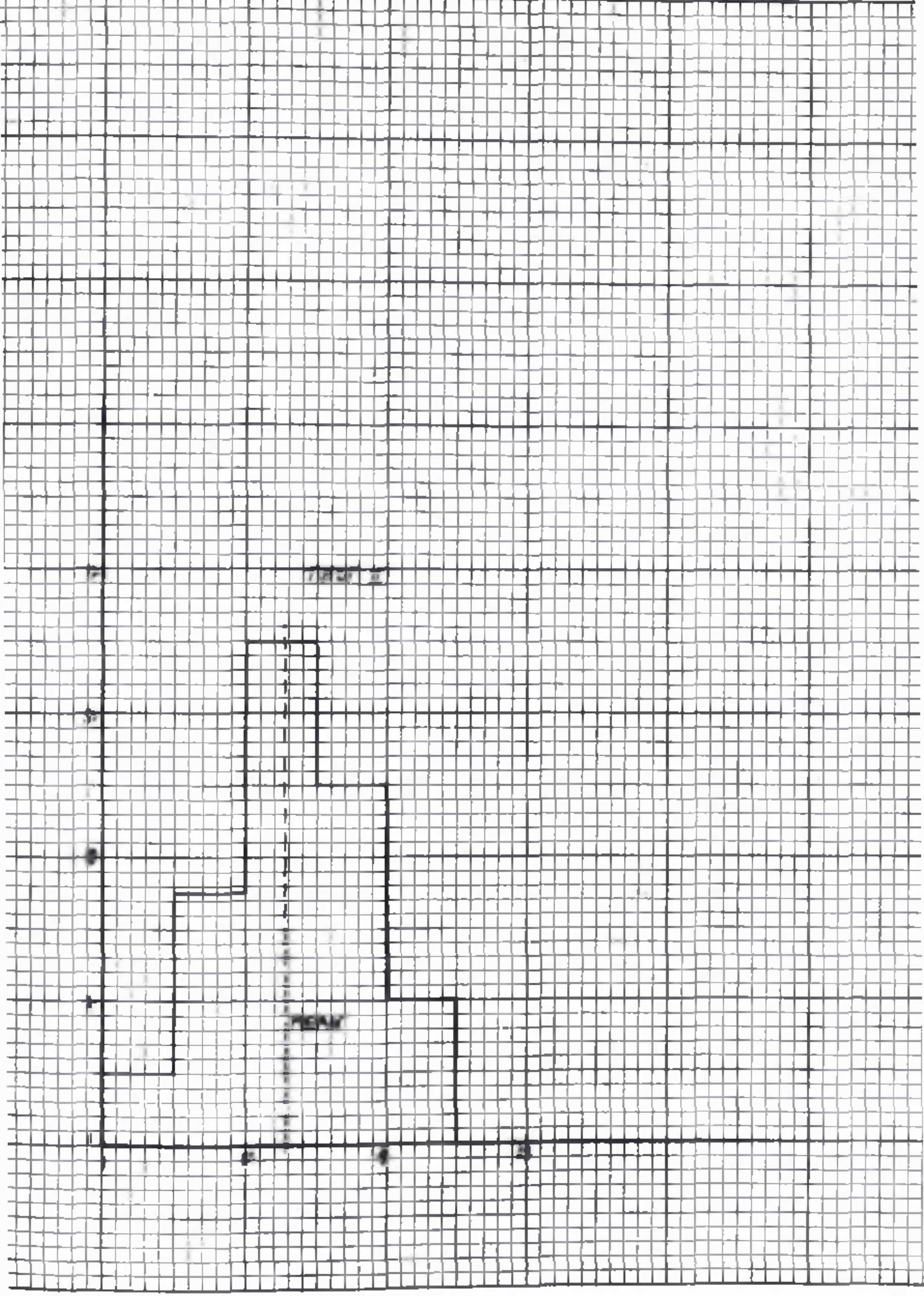


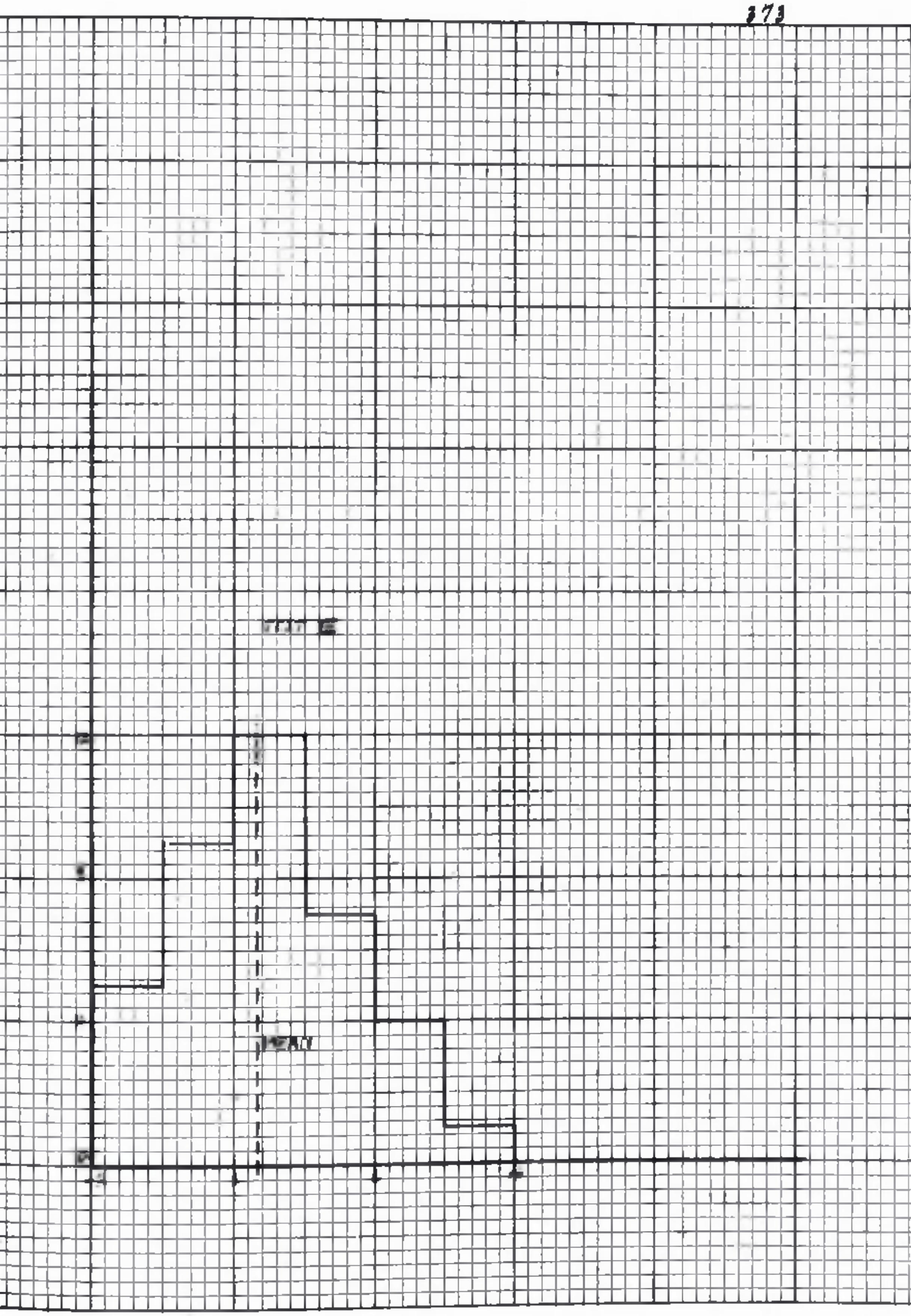


TEST X
MEAN
TEST XI
MEAN

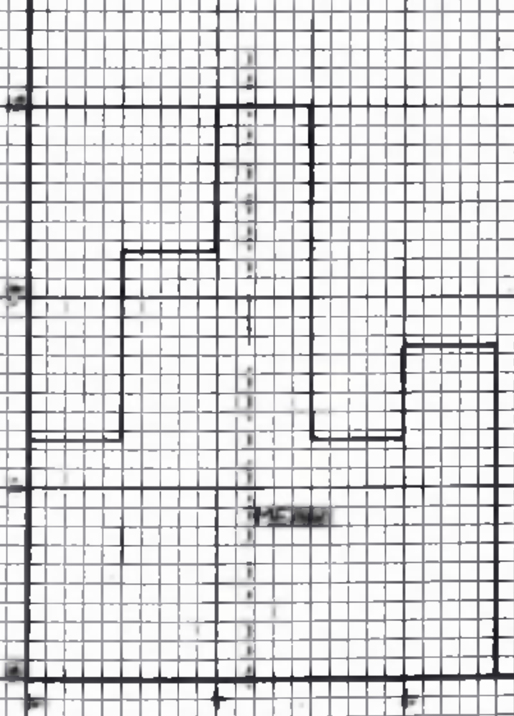


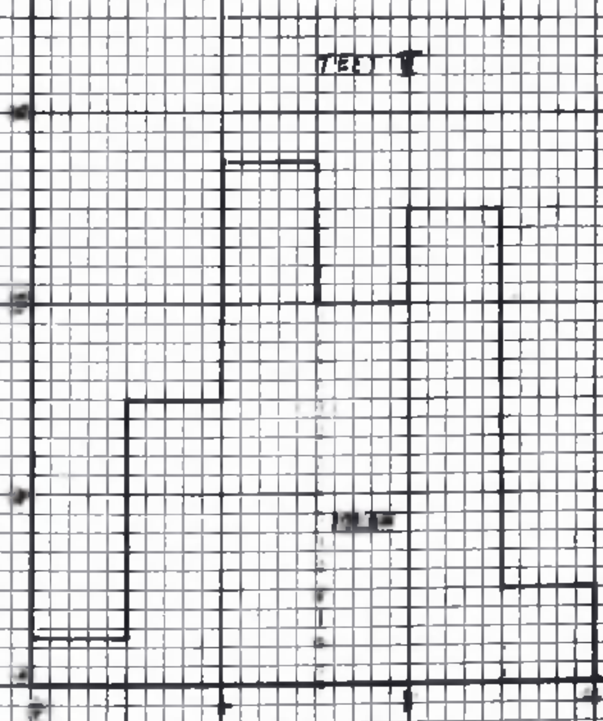


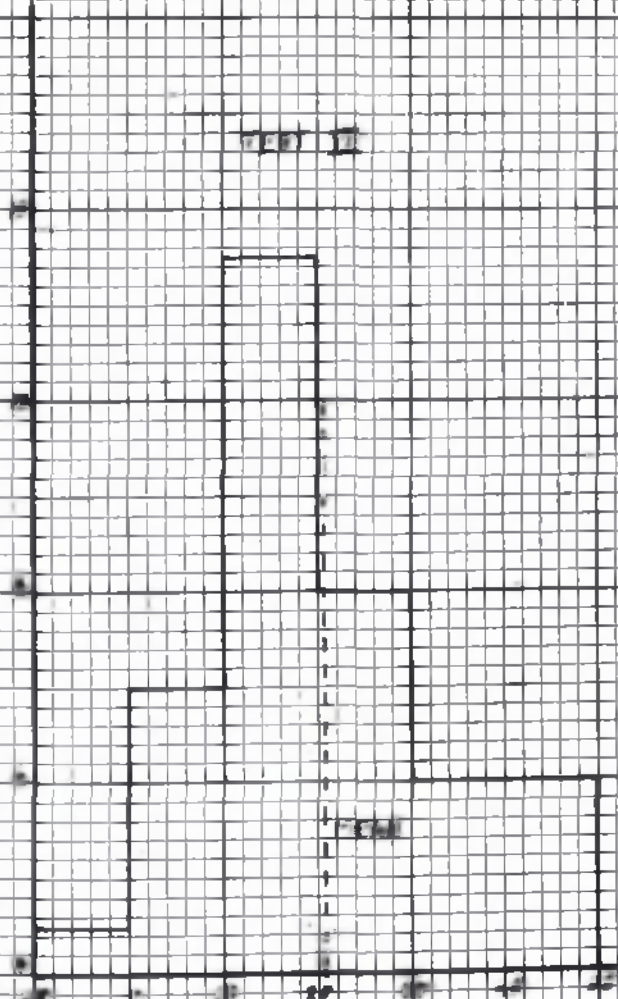


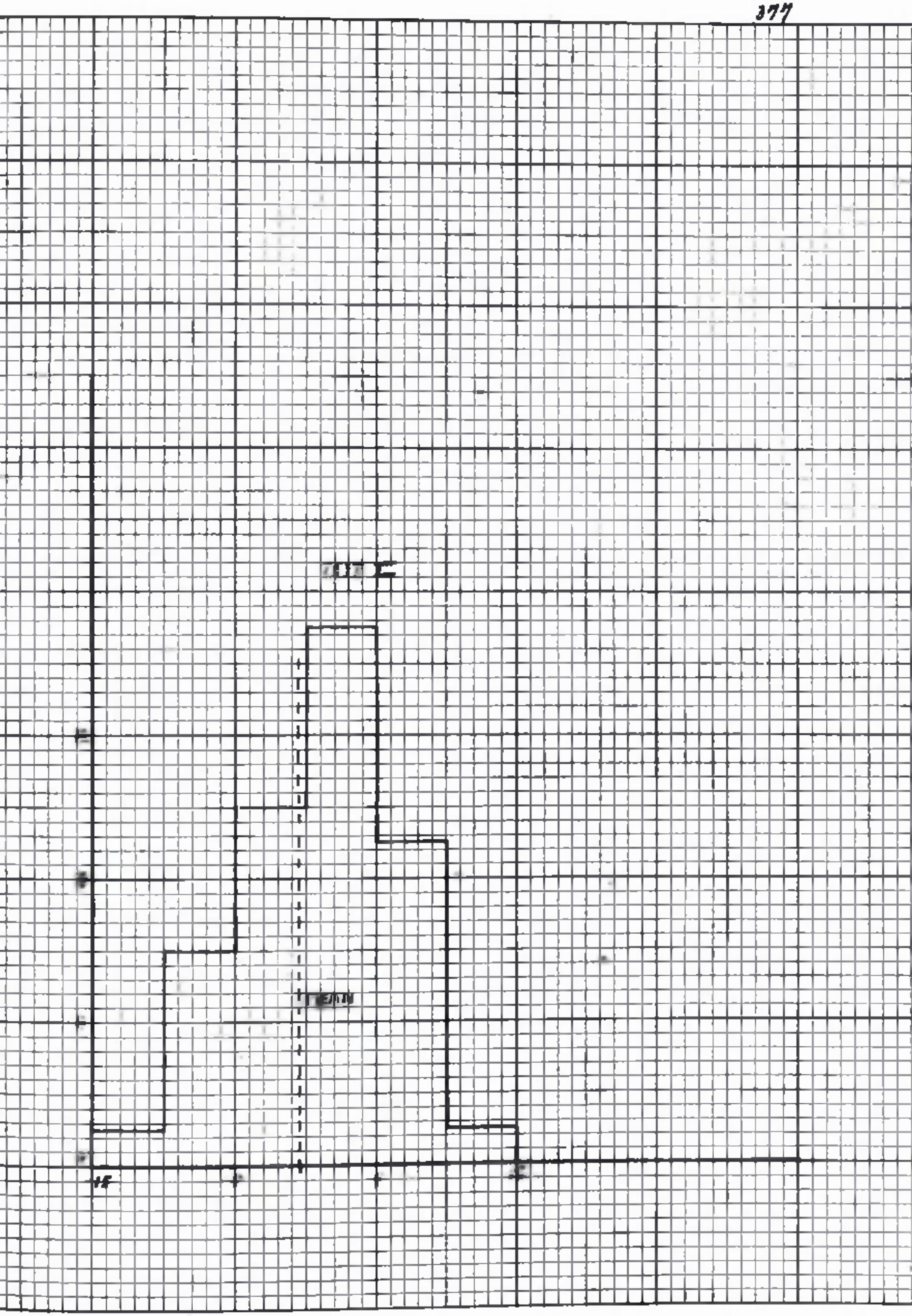

MEAN

TEST II









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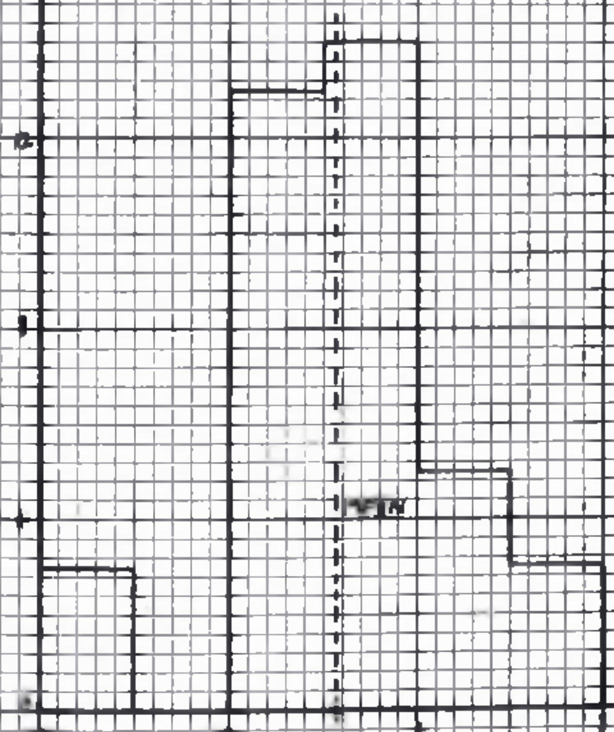
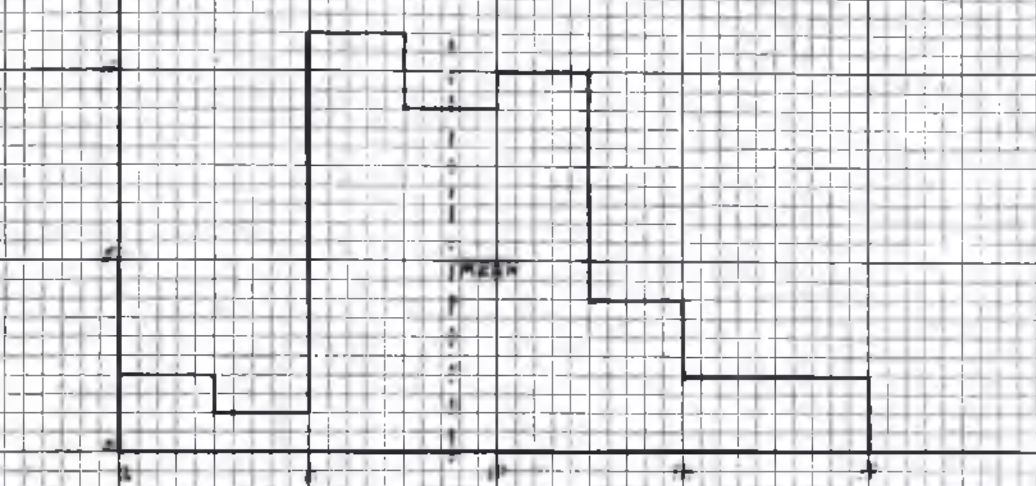
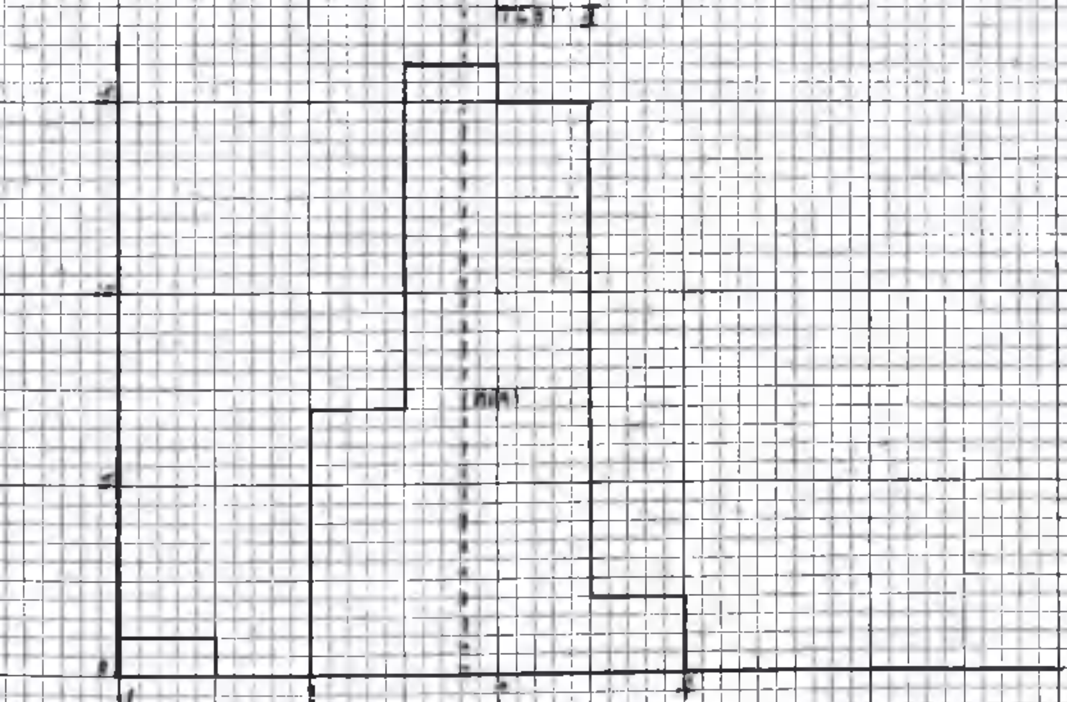
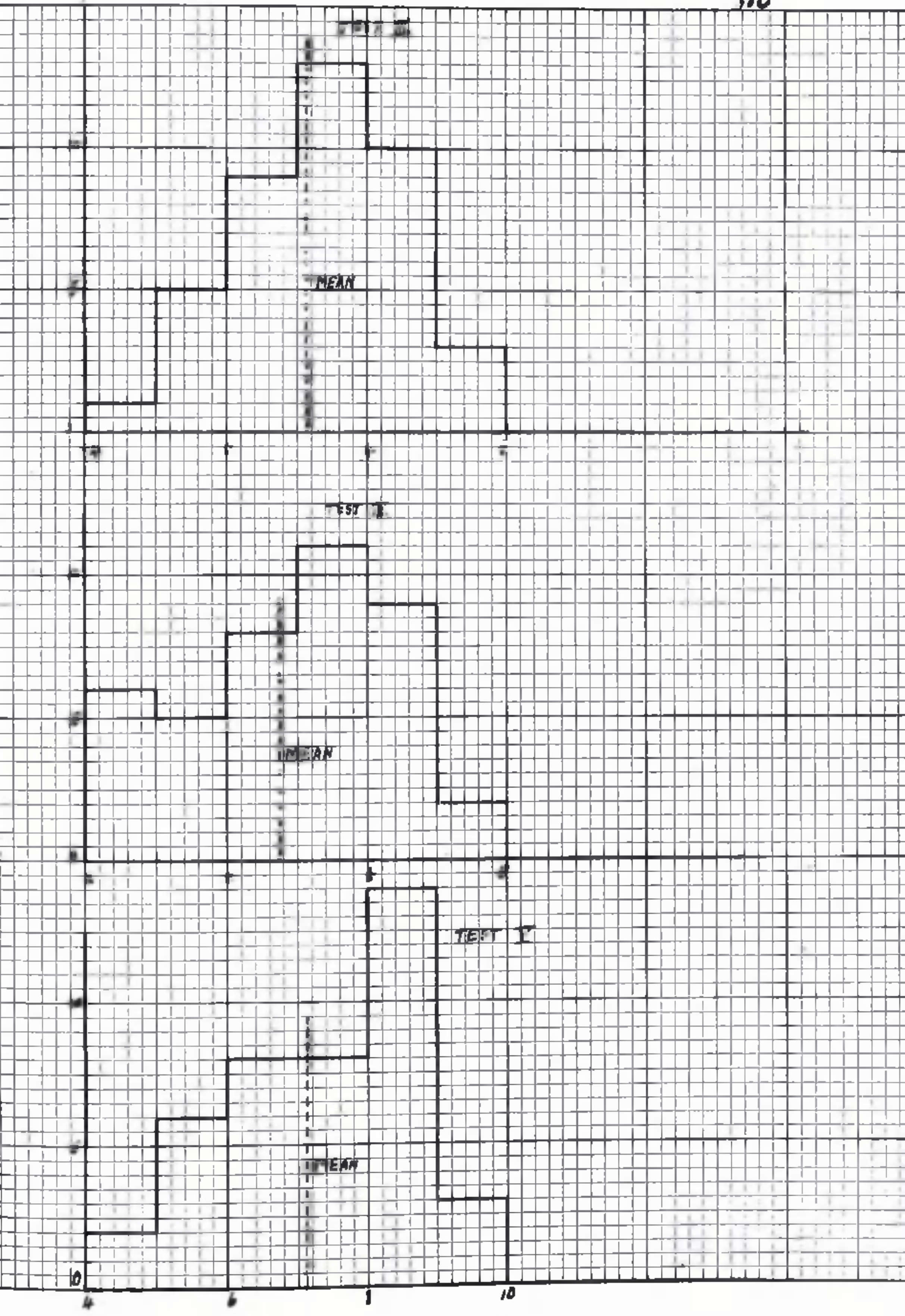
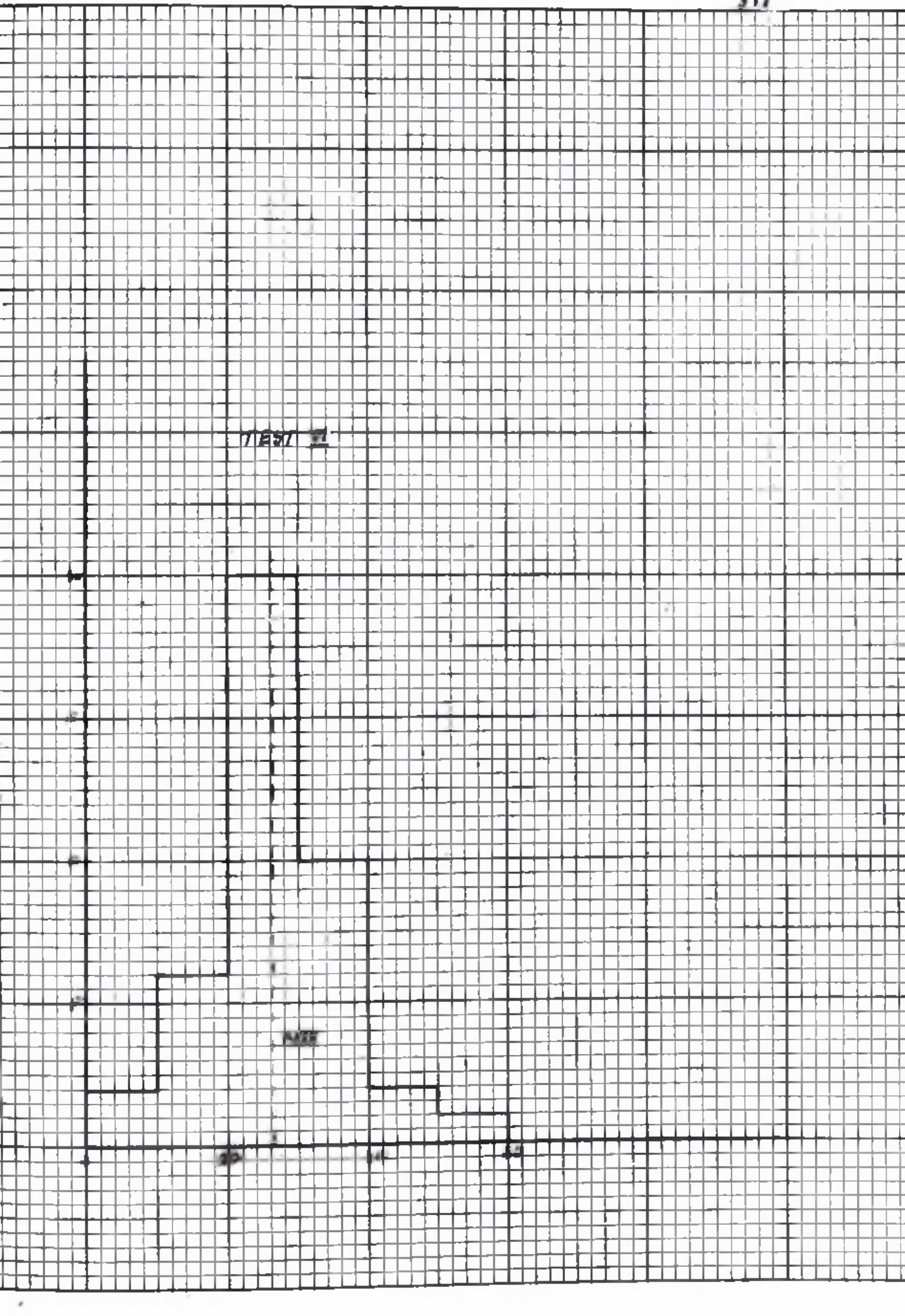
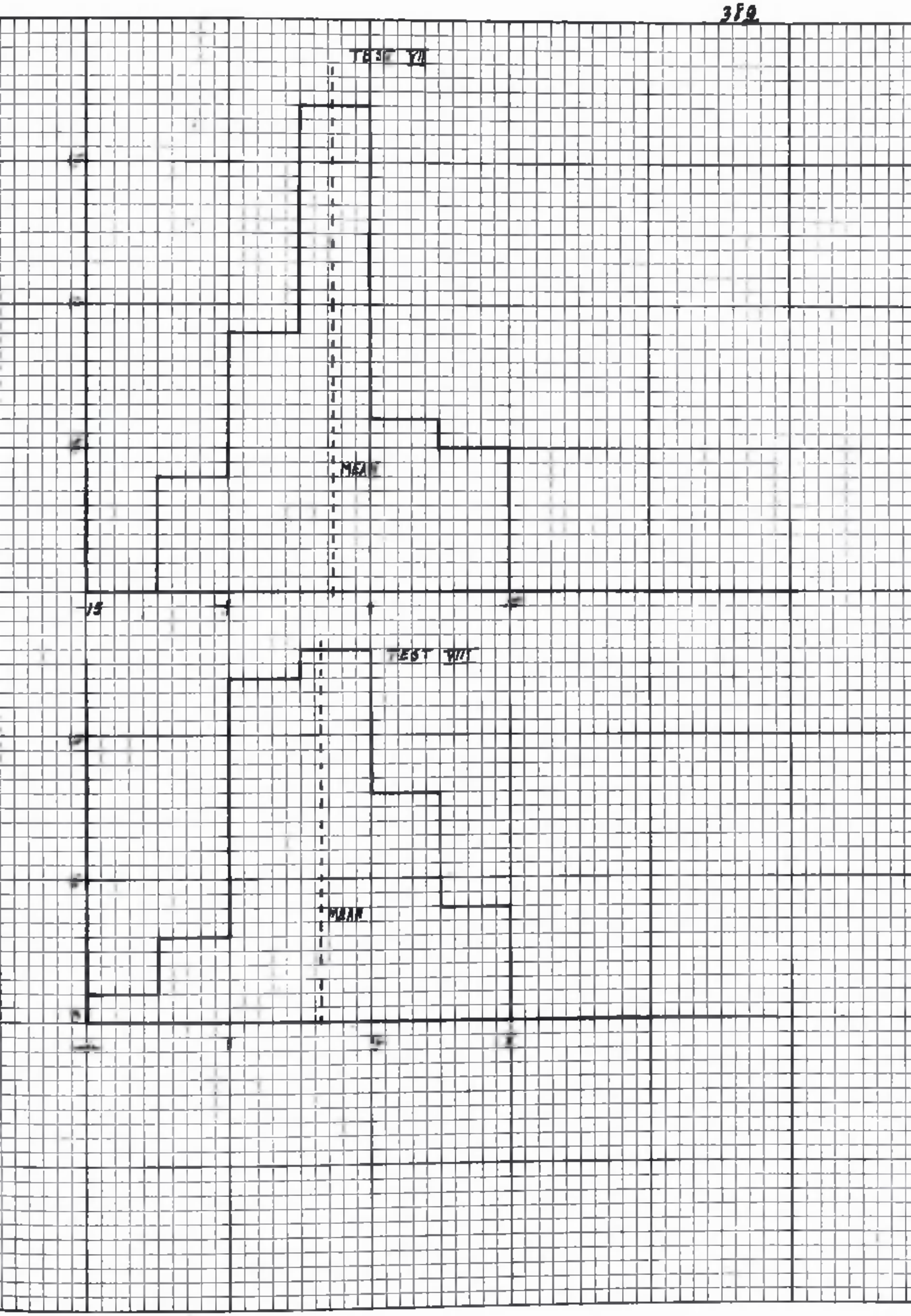



MEAN




MEAN
MEAN
TEST I
MEAN
10
4
6
10


TEST


TEST VII
MEAN
15
TEST VIII
MEAN

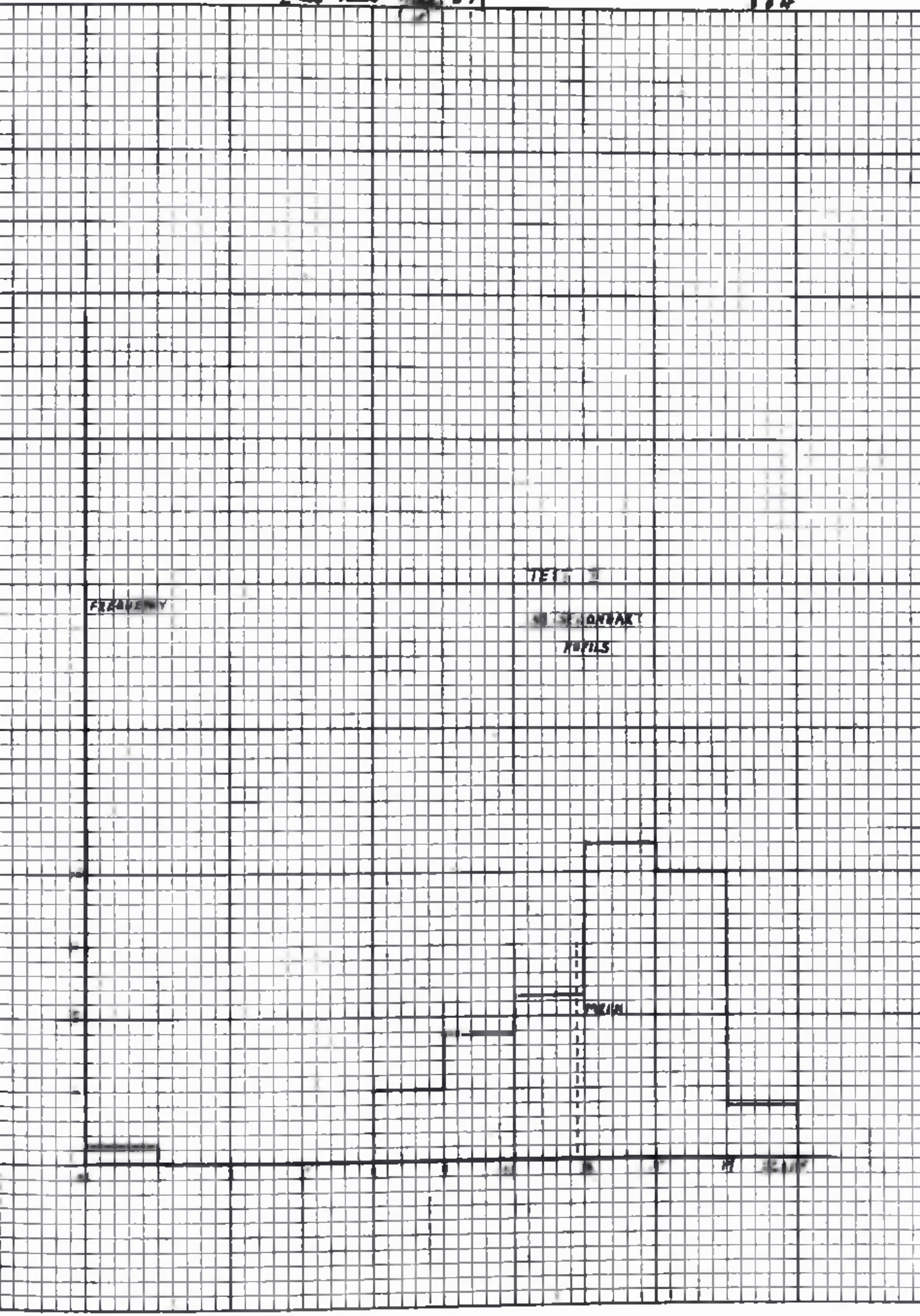
[See text, page 63]

INTERCORRELATIONS

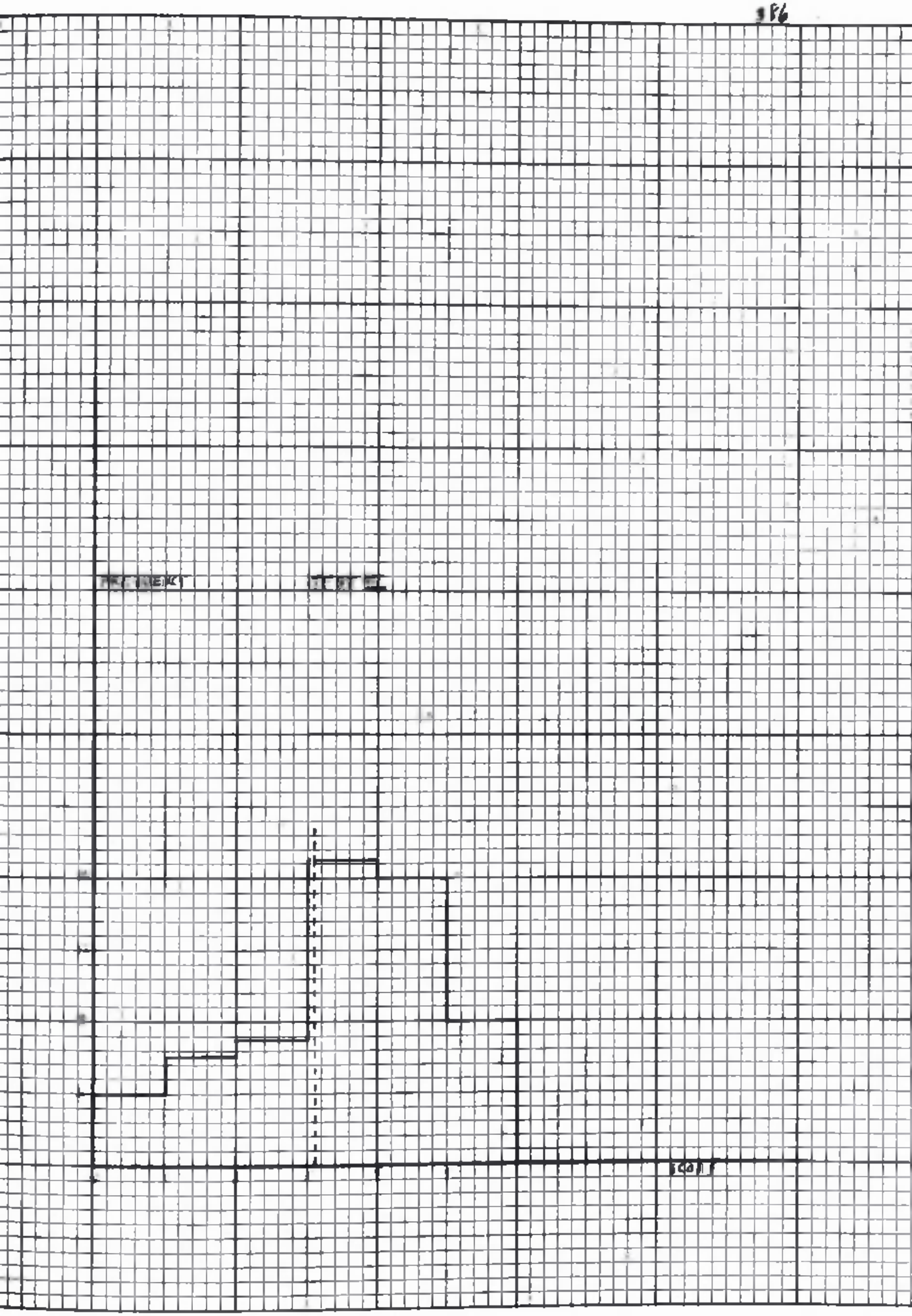
(M.A. classification)

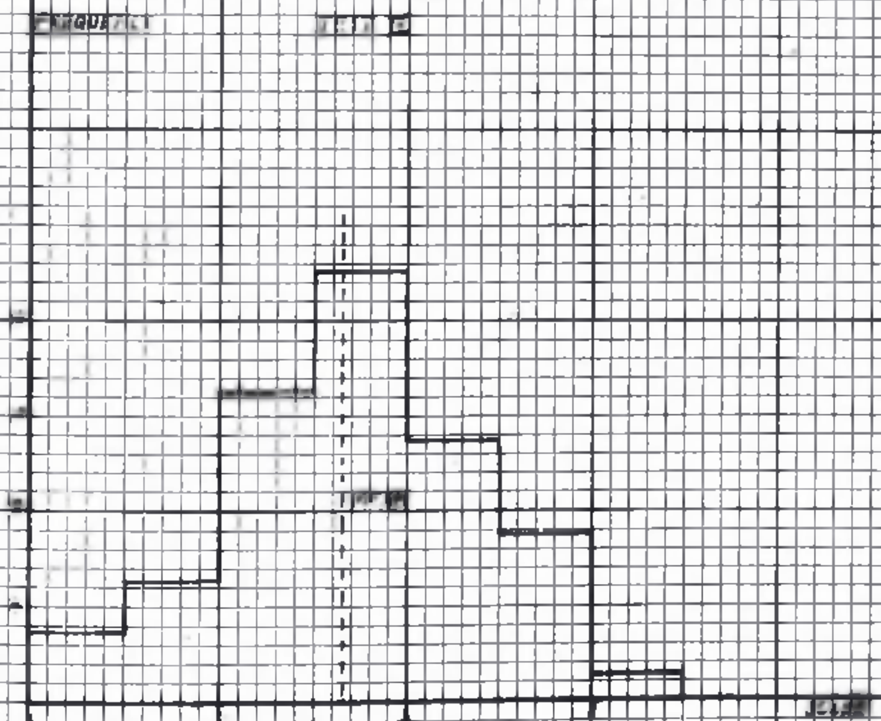
	I	II	III	IV	V	VI	VII	VIII
I	-	·03 ± ·11	(6) ·40 ± ·10	·11 ± ·11	·12 ± ·11 (5)	·04 ± ·11	·11 ± ·11	−·04 ± ·11
II		-	·14 ± ·11	·08 ± ·11	·30 ± ·10	−·20 ± ·11	−·18 ± ·11	·19 ± ·11
III			-	−·02 ± ·11	−·04 ± ·10	−·04 ± ·11	·11 ± ·11	·16 ± ·11
IV				-	·15 ± ·11	·07 ± ·11	·15 ± ·11	−·01 ± ·11
V					-	·16 ± ·11	·14 ± ·11	·23 ± ·10
VI						-	−·12 ± ·11	·12 ± ·11
VII							-	·08 ± ·11
VIII								-

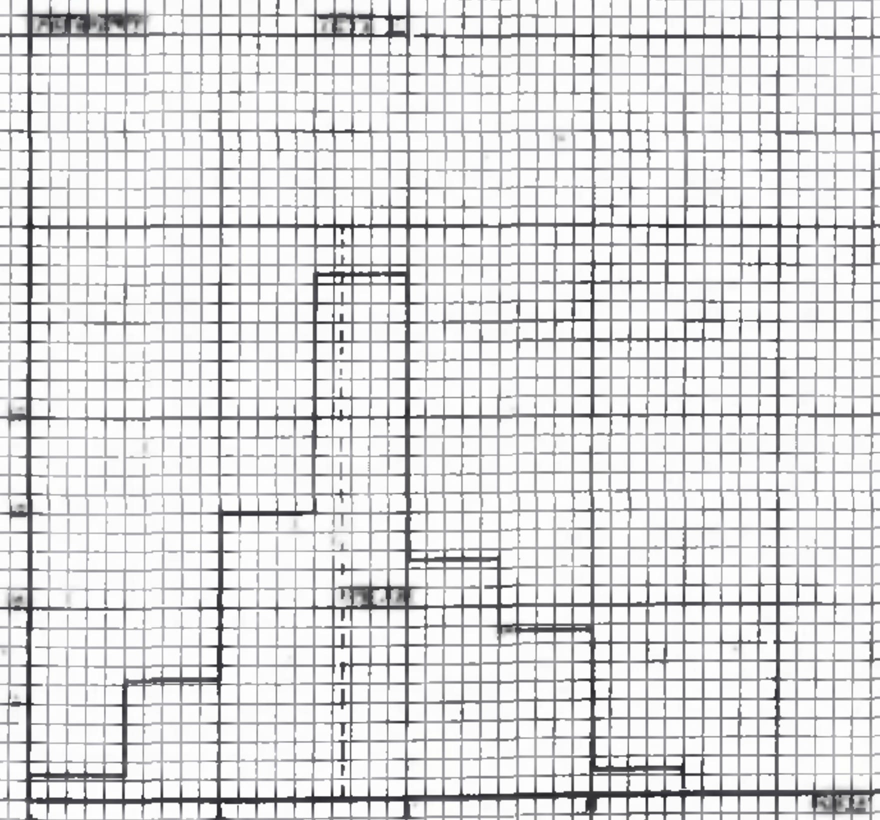
[See text page 67]

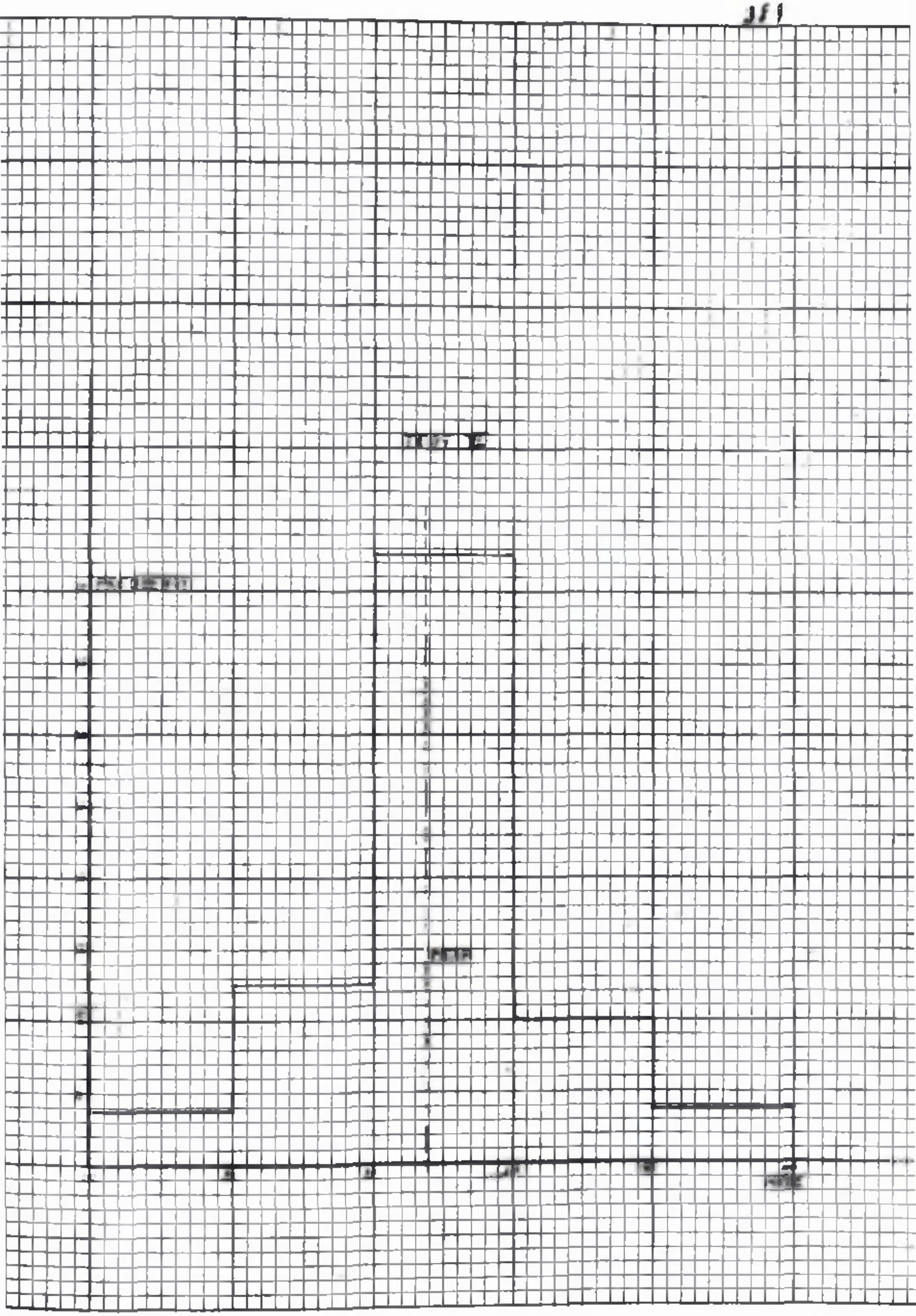


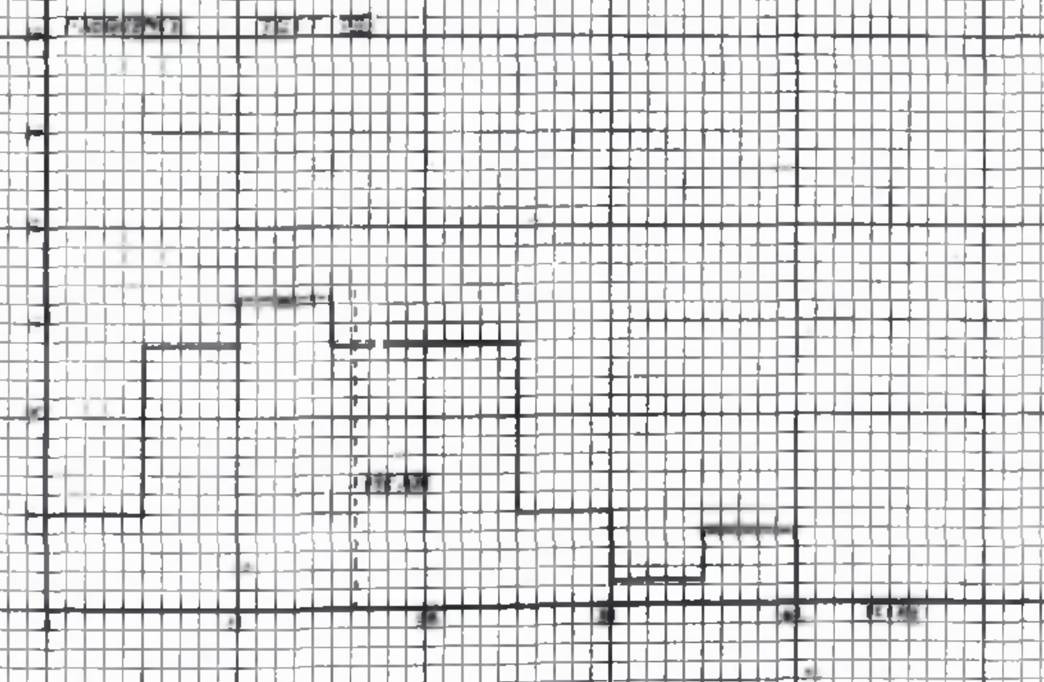

FREQUENCY
TEST II
16
12
8
4
MEAN
2
6
10
SCORE

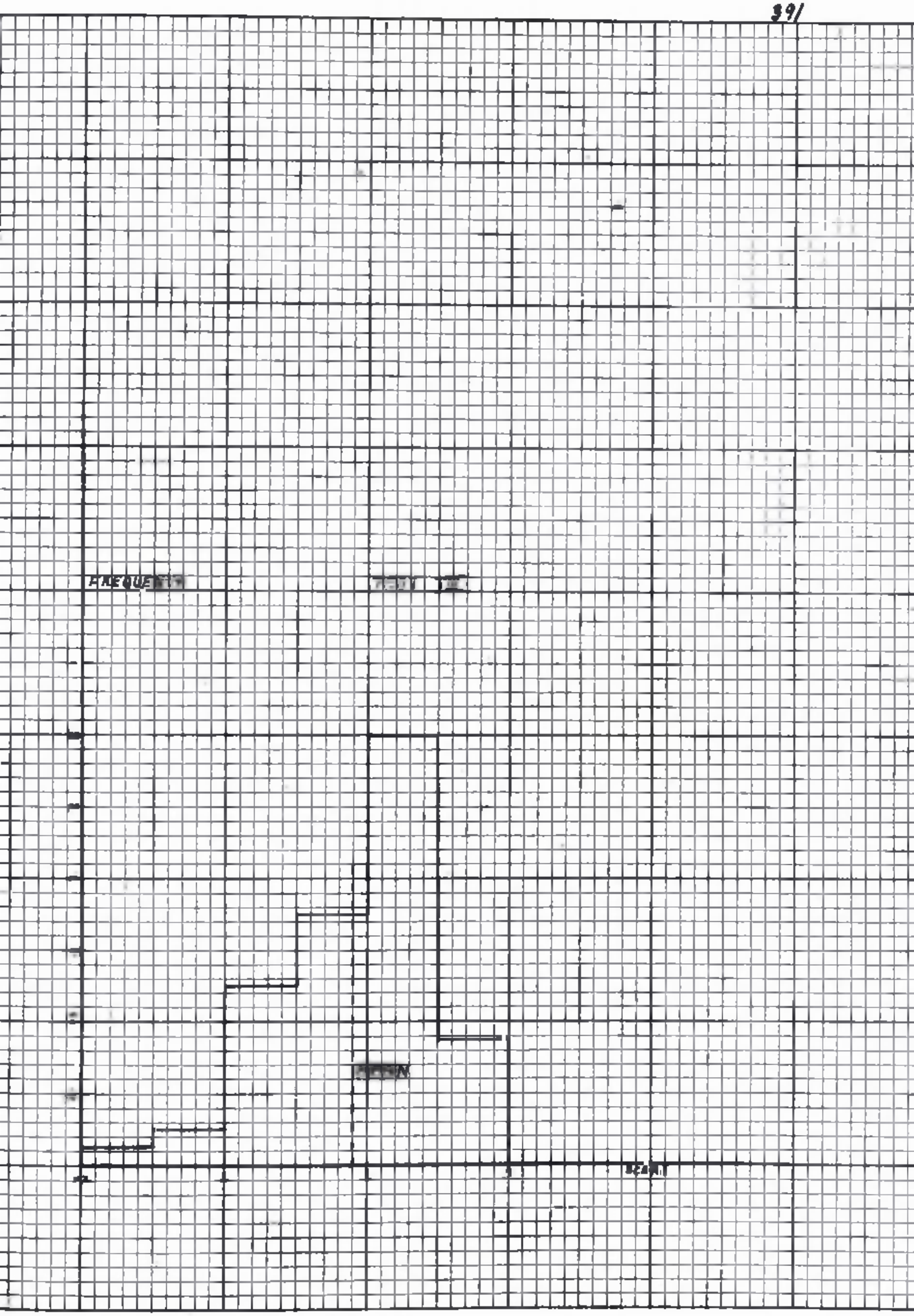












[See text, page 71]

TENTATIVE NORMS BASED ON THE RESULTS OF THE TEST AND ITS REPETITION. *

	AVERAGE SCORES							
PERCENTILE	I	II	III	IV	V	VI	VII	VIII
90	16	10	8	$6\frac{1}{2}$	$8\frac{3}{4}$	$44\frac{1}{4}$	$25\frac{3}{4}$	8
80	15	9	7	$6\frac{1}{4}$	$8\frac{1}{2}$	41	$21\frac{3}{4}$	$7\frac{1}{4}$
70	$14\frac{1}{2}$	$8\frac{1}{2}$	7	6	8	$38\frac{1}{2}$	$18\frac{1}{2}$	$6\frac{1}{2}$
60	$13\frac{1}{2}$	8	$6\frac{1}{2}$	$5\frac{1}{2}$	$7\frac{3}{4}$	$36\frac{1}{2}$	$15\frac{3}{4}$	$6\frac{1}{4}$
50	$12\frac{1}{2}$	8	6	5	$7\frac{1}{2}$	$34\frac{1}{2}$	$14\frac{1}{2}$	6
40	12	8	5	5	7	$33\frac{1}{4}$	$12\frac{3}{4}$	$5\frac{1}{4}$
30	11	7	4	$4\frac{3}{4}$	$6\frac{3}{4}$	32	12	$4\frac{3}{4}$
20	$9\frac{1}{2}$	7	3	$4\frac{1}{2}$	$6\frac{1}{2}$	28	$8\frac{3}{4}$	4
10	8	5	$2\frac{1}{2}$	$4\frac{1}{4}$	$6\frac{1}{4}$	$22\frac{3}{4}$	$7\frac{1}{4}$	$3\frac{1}{4}$

[See text, page 78]

ADDITIONAL RESULTS FOR TESTS VI AND VII

SCORES

PERCENTILE VALUE	1st. YEAR VI	1st. YEAR VII	2nd YEAR VI	2nd YEAR VII	3rd. YEAR VI	3rd. YEAR VII	4th. and 5th YEAR VI	4th. and 5th YEAR VII
90	39	21½	42½	24	47	30½	55½	41½
80	35½	16½	39	20½	43½	25½	47½	35
70	33	13½	37	18½	39½	23	44	31
60	30	11½	34	15½	37	20½	40	29½
50	27½	9	31½	13	34½	17	37	26
40	25½	7	28½	10½	32½	15	35½	24½
30	23½	5½	26½	8½	30½	12½	34	23
20	19½	4	23	6	28½	9½	32	18
10	15	2	18½	3½	22	7½	22	10½

[See text, page 86]

RESULTS FOR PREFERENCE TESTS (VARYING CONDITIONS OF TEMPO, ETC.)

TEST	AGE 10			AGE 11			AGE 12			AGE 13			AGE 14		
	1	D	2	1	D	2	1	D	2	1	D	2	1	D	2
1	33	15	42	30	14	20	9	5	20	11	9	32	5	6	21
2	26	13	51	20	15	29	13	4	17	13	11	28	11	6	15
3	50	7	33	33	7	24	16	9	9	23	15	14	12	8	12
4	41	13	36	30	12	22	12	9	13	18	9	25	11	6	15
5	26	18	46	25	12	27	12	7	15	20	16	16	14	12	6
6	34	15	41	23	13	28	13	5	16	18	14	20	11	6	15
7	34	19	37	29	18	17	16	5	13	22	16	14	15	8	9
8	37	10	43	30	10	24	8	6	20	19	15	18	14	8	10
9	49	12	29	25	10	29	16	7	11	18	16	18	11	11	10
10	32	9	49	20	11	33	12	4	18	20	6	26	12	8	12
11	36	13	45	23	16	25	13	5	14	22	12	18	11	7	14
12	37	16	39	29	8	27	16	1	17	25	5	22	20	3	9
13	25	15	50	25	18	21	12	5	17	15	16	21	12	8	12
14	49	10	31	26	15	23	13	8	13	12	12	18	12	9	11
15	37	9	52	23	12	29	11	9	14	22	11	19	12	6	14
16	44	12	34	31	9	24	16	5	13	20	9	23	16	6	10

RESULTS WITH 'DOUBTFULS' HALVED AND SHARED

TEST	AGE 10			AGE 11			AGE 12			AGE 13			AGE 14		
	1	2	%	1	2	%	1	2	%	1	2	%	1	2	%
1	40½	49½	10	37	27	16	11½	22½	32	15½	(5) 36½	40	8	(6) 24	50
2	32½	(5) 57½	28	27½	36½	14	15	19	12	18½	(5) 33½	29	14	18	13
3	53½	36½	19	36½	27½	14	20½	13½	21	30½	21½	17	16	16	0
4	47½	42½	6	36	28	13	16½	17½	3	22½	29½	13	14	18	13
5	35	(6) 55	22	31	33	3	15½	18½	9	28	24	8	20	12	25
6	41½	48½	8	29½	34½	8	15½	18½	9	25	27	4	14	18	13
7	43½	46½	3	38	26	19	18½	15½	9	30	22	15	19	13	19
8	42	48	7	35	29	9	11	(5) 23	35	26½	25½	2	18	14	13
9	55	(5) 35	22	30	34	6	19½	14½	15	26	26	0	16½	15½	3
10	36½	53½	19	25½	38½	20	14	20	18	23	29	12	16	16	0
11	40½	49½	10	31	33	3	15½	18½	9	28	24	8	14½	17½	9
12	44	46	2	33	31	3	16½	17½	3	27½	24½	6	21½	10½	34
13	32½	(6) 57½	28	34	30	6	14½	19½	15	23	29	12	16	16	0
14	54	36	20	33½	30½	5	17	17	0	28	24	8	16½	15½	3
15	33½	(5) 56½	26	29	35	9	15½	18½	9	27½	24½	6	15	17	6
16	50	40	11	35½	28½	11	18½	15½	9	24½	27½	6	19	13	19

THE PERCENTAGE SHOWN IS THE DIFFERENCE IN THE NUMBERS OF RESPONSES, EXPRESSED AS A PERCENTAGE OF THEIR SUM.

[See text, page 94]

DISTRIBUTION OF RESPONSES (Response and Frequency are shown)

(The percentage shown is the percentage of the group which gave the corresponding response)

TEST	AGE 10			AGE 11			AGE 12			AGE 13			AGE 14		
	Response	Freq.	%	R	F	%	R	F	%	R	F	%	R	F	%
1	1	1		1	2		1	4		1	2		1	0	
	2	14	31	2	9	28	2	1	6	2	11	42	2	10	63
	3	13	29	3	10	31	3	3	18	3	6	23	3	3	19
	4	12	27	4	5	16	4	6	35	4	3	12	4	1	6
	5	0		5	3		5	0		5	0		5	1	
	6	3		6	1		6	0		6	1		6	1	
	10	1		15	1		7	1		12	1				
	13	1		D	1		9	1		21	1				
							14	1		D	1				
2	2	0		2	2		2	2		2	1		2	0	
	3	1		3	0		3	0		3	2		3	3	
	4	4		4	2		4	1		4	1		4	1	
	5	11	24	5	6	19	5	3	18	5	6	18	5	2	13
	6	9	20	6	7	22	6	3	18	6	4	18	6	4	25
	7	8	18	7	6	19	7	0	0	7	3	6	7	1	6
	8	1	2	8	2	6	8	1	6	8	3	6	8	0	0
	9	4		9	2		9	2		9	2		9	2	
	10	1		10	3		13	1		12	2		10	1	
	12	4		16	1		14	1		17	1		12	1	
	14	1		18	1		15	1		19	1		15	1	
	19	1					19	2							

(over)

TEST	AGE 10			AGE 11			AGE 12			AGE 13			AGE 14		
	R	F	%	R	F	%	R	F	%	R	F	%	R	F	%
3	1	0	-	1	0	-	1	1	-	1		-	1		-
	2	1	-	2	0	-	2	1	-	2		-	2		-
	3	1		3	2		3	1		3			3		
	4	5		4	3		4	0		4	1		4	3	
	5	0		5	6		5	0		5	0		5	0	
	6	3		6	5		6	0		6	4		6	0	
	7	7		7	3		7	2		7	3		7	2	
	8	5		8	3		8	4		8	4		8	4	
	9	4		9	2		9	1		9	3		9	1	
	10	7		10	0		10	0		10	4		10	1	
	11	3		11	1		11	2		11	1		11	1	
	12	3		12	5		12	1		12	2		12	0	
	13	0		13	0		13	0		13	1		13	1	
	14	2		14	0		14	0		14	3		14	1	
	15	0		15	0		15	0		15			15	0	
	16	1		16	0		16	0		16			16	0	
	17	2		17	0		17	3		17			17	1	
	18	0		18	1		18	0		18			18	0	
	19	0		19	1		19	0		19			19	0	
	20	1		20			20	0		20			20	0	
							25	1					23	1	

WHOLE GROUP

TEST	RESPONSE	FREQUENCY	%
1	1	9	
	2	45	33
	3	35	26
	4	27	20
	5	4	
	6	6	
	7	1	
	8	0	
	9	1	
	10	1	
	12	1	
	13	1	
	14	1	
	15	1	
	D	2	
	21	1	

← (There are 22 notes in the theme)

WHOLE GROUP

TEST	RESPONSE	FREQUENCY	%
	2	5	
	3	6	4
	4	9	7
	5	28	21
	6	27	20
	7	18	13
	8	7	5
	9	12	9
2	10	5	
	11	0	
	12	7	
	13	1	
	14	2	
	15	2	
	16	1	
	17	1	
	18	1	
	19	4	

WHOLE GROUP

TEST	RESPONSE	FREQUENCY	%
3	1	1	–
	2	2	–
	3	4	
	4	12	
	5	6	
	6	12	
	7	17	
	8	20	
	9	11	
	10	12	
	11	8	
	12	11	
	13	2	
	14	6	
	15	0	
	16	1	
	17	6	
	18	1	
	19	1	
	20	1	
	23	1	
	25	1	

[See text, page 97]

RESULTS EXAMINED FOR SEX DIFFERENCES

BOYS

AGE	TEST	MEAN	σ	P.E.$_M$	n	V $\left(\frac{100\sigma}{M}\right)$
10	1	4·0	2·6	·4	22	70
	2	7·1	3·4	·5		50
	3	9·3	3·8	·5		40
11	1	4·0	3·3	·6	15	80
	2	7·1	3·8	·7		50
	3	8·6	4·6	·8		50
12	1	4·4	3·4	·6	14	80
	2	9·4	5·4	1·0		60
	3	11·0	6·1	1·1		60
13	1	5·0	5·6	1·1	12	110
	2	8·4	5·1	1·0		60
	3	9·6	2·4	·5		30
14	1	2·7	1·0	·2	10	40
	2	6·2	2·8	·6		50
	3	8·5	3·9	·8		50

(Values of V correct to nearest multiple of 10)

GIRLS

AGE	TEST	MEAN	σ	PE_M	n	V $\left(\frac{100\sigma}{MEAN}\right)$
10	1	3·0	1·2	·2	23	40
	2	6·9	2·7	·4		40
	3	8·6	4·0	·6		50
11	1	2·8	·9	·2	17	30
	2	6·9	2·7	·4		40
	3	7·1	3·0	·5		40
12	1	2·7	1·3	·5	3	50
	2	5·3	2·9	1·1		50
	3	5·7	2·6	1·0		50
13	1	2·4	·9	·2	14	40
	2	6·3	1·9	·3		30
	3	8·8	3·0	·5		30
14	1	2·8	1·5	·4	6	50
	2	7·8	3·9	1·1		50
	3	11·7	5·8	1·6		50

COMPARISON PAIRS

1.	Bn_2	Bn_1	20.	Bn_2	B_3
2.	Bn_1	M_1	21.	Bn_2	B_4
3.	Bn_1	M_2	22.	M_1	M_2
4.	Bn_1	S_1	23.	S_1	M_1
5.	Bn_1	S_2	24.	S_2	M_1
6.	Bn_1	S_3	25.	M_1	S_3
7.	Bn_1	S_4	26.	M_1	S_4
8.	B_1	Bn_1	27.	M_1	B_1
9.	B_2	Bn_1	28.	M_1	B_2
10.	B_3	Bn_1	29.	B_3	M_1
11.	Bn_1	B_4	30.	B_4	M_1
12.	Bn_2	M_1	31.	M_2	S_1
13.	M_2	Bn_2	32.	S_2	M_2
14.	Bn_2	S_1	33.	M_2	S_3
15.	S_2	Bn_2	34.	M_2	S_4
16.	S_3	Bn_2	35.	B_1	M_2
17.	Bn_2	S_4	36.	B_2	M_2
18.	B_1	Bn_2	37.	M_2	B_3
19.	B_2	Bn_2	38.	B_4	M_2

[See text, page 109]

PREFERENCE DISTRIBUTIONS

TABLE I. BOYS

AGE	NO. OF CASES	Bn_1	Bn_2	M_1	M_2	S_1	S_2	S_3	S_4	B_1	B_2	B_3	B_4
11-12	27	113	119	121½	177½	72½	47½	59½	63	40½	77	66½	68½
12-13	16	69	88	72½	107½	46½	23½	27	35½	21	40	40	37½
13-14	24	121½	145	90	173½	62½	42½	43	44	31½	50½	51½	56½
TOTAL	67	303½	352	284	458½	181½	113½	129½	142½	93	167½	158	162½

TABLE II. GIRLS

AGE	NO.	Bn_1	Bn_2	M_1	M_2	S_1	S_2	S_3	S_4	B_1	B_2	B_3	B_4
11-12	30	132½	125	75½	211½	98	63	58	59	46½	81	79½	80½
12-13	11	50	48½	36	76	30½	24	15	30½	22	31½	28	26
13-14	15	74½	92	31½	107½	47½	28	18½	36½	23	37½	34½	39
TOTAL	56	257	265½	143	395	176	115	91½	156	91½	150	142	145½

TABLE III BOYS (AVERAGE NO. OF PREFS. PER INDIVIDUAL)

AGE	NO.	Bn_1	Bn_2	M_1	M_2	S_1	S_2	S_3	S_4	B_1	B_2	B_3	B_4
11-12	27	4·19	4·41	4·50	6·57	2·69	1·76	2·20	2·33	1·50	2·85	2·46	2·54
12-13	16	4·31	5·50	4·53	6·72	2·91	1·47	1·69	2·22	1·31	2·50	2·50	2·34
13-14	24	5·06	6·04	3·75	7·23	2·60	1·77	1·79	1·83	1·31	2·10	2·15	2·35
TOTAL	67	4·53	5·25	4·24	6·84	2·71	1·69	1·93	2·13	1·39	2·50	2·36	2·43

TABLE IV. GIRLS (AV. NO. PER INDIVIDUAL)

AGE	NO.	Bn_1	Bn_2	M_1	M_2	S_1	S_2	S_3	S_4	B_1	B_2	B_3	B_4
11-12	30	4·42	4·17	2·52	7·05	3·27	2·10	1·93	2·97	1·55	2·70	2·65	2·68
12-13	11	4·55	4·41	3·27	6·91	2·77	2·18	1·36	2·77	2·00	2·86	2·55	2·36
13-14	15	4·97	6·13	2·10	7·17	3·17	1·87	1·23	2·43	1·53	2·50	2·30	2·60
TOTAL	56	4·59	4·74	2·55	7·05	3·14	2·05	1·63	2·79	1·63	2·68	2·54	2·60

(over)

PERCENTAGES. TABLE V. BOYS.

AGE	Bn_1	Bn_2	M_1	M_2	S_1	S_2	S_3	S_4	B_1	B_2	B_3	B_4
11-12	76·1	80·1	81·8	119·5	136·3	88·0	110·2	116·7	95·0	142·6	123·2	126·9
12-13	98·4	100·0	82·4	122·2	145·3	73·5	86·4	111·0	65·7	125·0	125·0	119·2
13-14	92·1	109·9	68·2	131·4	130·2	88·6	89·6	91·7	65·7	105·2	107·3	117·7
TOTAL	82·4	95·5	77·1	124·6	135·5	84·7	96·7	106·4	69·4	128·0	117·9	121·3

PERCENTAGES. TABLE VI. GIRLS.

AGE	Bn_1	Bn_2	M_1	M_2	S_1	S_2	S_3	S_4	B_1	B_2	B_3	B_4
11-12	80·3	75·8	45·8	128·2	163·4	105·0	96·7	148·4	77·5	135·0	132·5	134·2
12-13	82·6	80·2	59·5	125·6	138·7	109·1	68·2	138·7	100·0	143·2	127·3	118·2
13-14	90·3	111·5	35·2	130·3	158·4	93·4	66·7	121·7	76·7	125·0	115·0	130·0
TOTAL	83·4	86·2	46·4	128·2	157·2	102·7	86·7	139·3	81·7	134·0	126·8	129·4

TABLE VII. POOLED RESULTS FOR BOYS AND GIRLS PREFERENCES.

AGE	Bn_1	Bn_2	M_1	M_2	S_1	S_2	S_3	S_4	B_1	B_2	B_3	B_4	NO. OF SUBJECTS
11-12	245½	264	197	389	170½	110½	117½	152	87	158	146	149	57
12-13	119	136½	108½	183½	77	47½	42	66	43	71½	68	63½	27
13-14	196	237	121½	281	110	70½	61½	80½	54½	88	86	95½	39
TOTAL	560½	617½	427	853½	357½	228½	221	298½	184½	317½	300	308	123

TABLE VIII MEANS

AGE	Bn_1	Bn_2	M_1	M_2	S_1	S_2	S_3	S_4	B_1	B_2	B_3	B_4	NO. OF SUBJECTS
11-12	4·31	4·28	3·46	6·82	2·99	1·94	2·06	2·67	1·53	2·77	2·56	2·61	57
12-13	4·41	5·06	4·02	6·80	2·85	1·76	1·56	2·44	1·59	2·65	2·52	2·35	27
13-14	5·03	6·08	3·12	7·21	2·82	1·81	1·58	2·06	1·40	2·26	2·21	2·45	39
TOTAL	4·56	5·02	3·47	6·94	2·91	1·86	1·80	2·43	1·50	2·58	2·44	2·50	123

(over)

TABLE IX PERCENTAGES.

AGE	Br_1	Br_2	M_1	M_2	S_1	S_2	S_3	S_4	B_1	B_2	B_3	B_4
11 - 12	78·4	77·8	62·9	124·0	149·5	97·0	103·0	133·5	76·5	138·5	128·0	130·5
12 - 13	80·1	91·9	73·1	123·6	142·6	88·0	77·8	122·2	79·6	132·4	126·0	117·6
13 - 14	91·5	110·5	56·7	131·0	141·0	90·5	79·0	103·0	70·0	113·0	110·5	122·5
TOTAL	82·9	91·3	63·1	126·2	145·4	92·9	89·9	121·4	75·0	129·1	122·0	125·4

[See text, page 118]

DISTRIBUTION OF RESPONSES

TEST	GROUP I			GROUP II			GROUP III			TOTAL GROUP		
	G	M	B	G	M	B	G	M	B	G	M	B
1	48	7	1	46	8	0	29	3	1	123	18	2
2	14	20	22	16	16	22	4	11	18	34	47	62
3	11	21	24	14	24	16	4	12	17	29	57	57
4	12	23	21	14	22	18	2	17	14	28	62	53
5	21	23	12	22	28	4	9	16	8	52	67	24
6	28	17	11	26	20	8	23	8	2	77	45	21
7	4	22	30	6	16	32	1	15	17	11	53	79
8	8	27	21	6	26	22	0	21	12	14	74	55
9	8	21	27	4	24	26	1	18	14	13	63	67
10	1	26	29	2	20	32	1	11	21	4	57	82
11	4	26	32	8	20	26	1	11	21	13	51	79
12	7	17	32	14	16	24	1	15	17	22	48	73
13	10	28	18	8	30	16	1	21	11	19	79	45
14	4	27	25	12	16	26	7	9	17	23	52	68
15	33	11	12	28	16	10	18	10	5	79	37	27
16	3	21	32	4	18	32	2	13	18	9	52	82
17	5	21	30	4	16	34	2	8	23	11	45	87
18	4	36	16	4	34	16	1	21	11	9	91	43
19	1	26	29	4	30	20	1	15	17	6	71	66
20	18	25	13	20	20	14	7	19	7	45	64	34
21	15	32	9	6	40	8	9	15	9	30	87	26
22	7	27	22	14	26	16	5	18	10	26	71	46
23	5	33	18	4	30	20	5	18	10	14	81	48

(over)

TEST	GROUP I			GROUP II			GROUP III			WHOLE GROUP		
	G	M	B	G	M	B	G	M	B	G	M	B
47	21	28	7	22	20	12	9	14	10	52	62	29
48	4	24	28	4	32	18	1	16	16	9	72	62
49	11	35	10	4	38	12	7	15	11	22	88	33
50	14	25	17	20	16	18	15	15	3	49	56	38
51	5	25	26	4	38	12	5	11	17	14	74	55
52	3	27	26	4	18	32	1	12	20	8	57	78
53	4	27	25	6	26	21	4	13	16	14	66	63
54	41	2	13	32	0	22	19	3	11	92	5	46
55	17	4	35	16	14	24	23	2	8	56	20	67
56	36	2	18	26	6	22	15	0	18	77	8	58
57	21	4	31	14	4	36	14	1	18	49	9	85
58	23	5	28	20	8	26	18	2	13	61	15	67

TEST	GROUP I			GROUP II			GROUP III			WHOLE GROUP		
	G	M	B	G	M	B	G	M	B	G	M	B
24	8	22	26	6	24	24	4	10	19	18	56	69
25	8	28	20	12	28	14	4	19	10	24	75	44
26	16	30	10	12	22	20	8	11	14	36	63	44
27	5	25	26	6	26	22	4	21	8	15	72	56
28	7	33	16	2	36	16	4	22	7	13	91	39
29	3	30	23	6	26	21	4	20	9	13	76	54
30	9	30	17	12	30	12	13	11	9	34	71	38
31	6	23	27	12	18	24	1	9	23	19	50	74
32	5	17	34	4	18	32	2	15	16	11	50	82
33	18	26	12	18	24	12	16	12	5	52	62	29
34	3	32	21	8	28	18	6	18	9	17	78	48
35	4	18	34	6	14	34	1	11	21	11	43	89
36	5	32	19	6	32	16	1	17	15	12	81	50
37	0	14	42	0	16	38	0	5	28	0	35	108
38	10	31	15	4	40	10	1	22	10	15	93	35
39	3	25	28	4	20	30	4	10	19	11	55	77
40	9	29	18	12	30	12	2	17	14	23	76	44
41	17	11	28	10	16	28	5	7	21	32	34	77 (over)
42	3	35	18	2	32	20	3	19	11	8	86	49
43	5	23	28	6	22	28	0	17	16	9	62	72
44	3	12	41	10	14	30	6	6	21	19	32	92
45	26	27	3	28	22	4	17	12	4	71	61	11
46	2	25	29	2	24	28	3	18	12	7	67	69

THE RESULTS WHEN THE 'M' RESPONSES ARE HALVED AND SHARED EQUALLY WITH THE 'G' AND 'B' RESPONSES. THE NEW VALUES OF THE LATTER ARE CALLED G' AND B'.

TEST	GROUP I		GROUP II		GROUP III		WHOLE GROUP	
	G'	B'	G'	B'	G'	B'	G'	B'
1	51½	4½	50	6	30½	2½	132	11
2	24	32	26	30	9½	23½	57½	85½
3	21½	34½	26	28	10	23	57½	85½
4	23½	32½	25	29	10½	22½	59	84
5	32½	23½	36	18	17	16	85½	57½
6	36½	19½	36	18	27	6	99½	43½
7	15	41	16	40	8½	24½	37½	105½
8	21½	34½	19	35	10½	22½	51	92
9	18½	37½	16	38	10	23	44½	98½
10	14	42	12	42	6½	26½	32½	110½
11	14	42	18	36	6½	26½	38½	104½
12	15½	40½	22	32	8½	24½	46	97
13	24	32	23	31	11½	21½	58½	84½
14	17½	38½	20	34	11½	21½	49	94
15	38½	17½	36	18	23	10	97½	45½
16	13½	42½	13	41	8½	24½	35	108
17	15½	40½	12	42	6	27	33½	109½
18	22	34	21	33	10½	21½	54½	88½
19	14	42	19	35	8½	24½	41½	101½

(over)

TEST	GROUP I		GROUP II		GROUP III		WHOLE GROUP	
	G'	B'	G'	B'	G'	B'	G'	B'
20	30½	25½	30	24	16½	16½	77	66
21	31	25	26	28	16½	16½	73½	69½
22	20½	35½	27	27	14	19	61½	81½
23	21½	34½	19	35	14	19	54½	88½
24	19	37	18	36	9	24	46	97
25	22	34	26	28	13½	19½	61½	81½
26	31	25	23	31	13½	19½	67½	75½
27	17½	38½	19	35	14½	18½	51	92
28	23½	32½	20	34	15	18	58½	84½
29	18	38	19	35	14	19	51	92
30	24	32	27	27	18½	16½	69½	73½
31	17½	38½	21	33	5½	27½	44	99
32	13½	42½	13	41	9½	23½	36	107
33	31	25	30	24	22	11	83	60
34	16½	39½	22	32	15	18	56	87
35	13	43	13	41	6½	26½	32½	110½
36	21	35	22	32	9½	23½	52½	90½ (over)
37	7	49	8	46	2½	30½	17½	125½
38	25½	30½	24	30	12	21	61½	81½
39	15½	40½	14	40	9	24	38½	104½
40	23½	32½	27	27	10½	21½	61	82
41	22½	33½	18	36	8½	24½	49	94
42	20½	35½	18	36	12½	20½	51	92

TEST	GROUP I		GROUP II		GROUP III		WHOLE GROUP	
	G'	B'	G'	B'	G'	B'	G'	B'
43	16½	39½	15	39	8½	24½	40	103
44	9	47	17	37	9	24	35	108
45	39½	16½	39	15	23	10	101½	41½
46	14½	41½	14	40	12	21	40½	102½
47	35	21	32	22	16	17	83	60
48	16	40	20	34	9	24	45	98
49	28½	27½	23	31	14½	18½	66	77
50	26½	29½	28	26	22½	10½	77	66
51	17	39	23	31	10½	22½	51	92
52	16½	39½	13	41	7	26	36½	106½
53	17½	38½	19	35	10½	22½	47	96
54	42	14	32	22	20½	12½	94½	48½
55	19	37	23	31	24	9	66	77
56	37	19	29	25	15	18	81	62
57	23	33	16	38	14½	18½	53½	89½
58	25½	30½	24	30	19	14	68½	74½

PERCENTAGE OF $(G' - B')$

$$\text{PERCENTAGE} = 100 \times \frac{G'-B'}{G'+B'}$$

$$= \frac{100(G'-B')}{n} \quad \text{where } n = \text{number of subjects.}$$

TEST	GP. I	GP. II	GP. III	WHOLE GP.
1	84	85	85	85
2	-14	-11	-42	-20
3	-23	-4	-39	-20
4	-16	-7	-36	-17
5	16	33	3	20
6	31	33	64	39
7	-46	-48	-48	-48
8	-23	-30	-36	-29
9	-34	-41	-39	-38
10	-50	-56	-61	-55
11	-50	-33	-61	-46
12	-45	-19	-48	-36
13	-14	-15	-30	-18
14	-55	-26	-30	-31
15	38	33	39	36

TEST	GP. I	GP. II	GP. III	WHOLE GP.
16	-52	-52	-48	-51
17	-45	-56	-64	-53
18	-21	-22	-33	-24
19	-50	-30	-48	-42
20	9	11	0	7
21	11	-4	0	3
22	-9	0	-15	-14
23	-23	-30	-15	-24
24	-32	-33	-45	-36
25	-21	-4	-18	-14
26	11	-15	-18	-6
27	-37	-30	-12	-29
28	-30	-26	-9	-18
29	-35	-30	-15	-29
30	-14	0	12	-3

(over)

TEST	GP. I	GP. II	GP. III	WHOLE GP.
31	-38	-22	-67	-38
32	-52	-52	-42	-50
33	11	11	33	16
34	-41	-19	-9	-22
35	-54	-52	-61	-55
36	-25	-19	-42	-27
37	-75	-70	-85	-76
38	-9	-11	-27	-14
39	-45	-48	-45	-46
40	-16	0	-36	-15
41	-20	-33	-48	-31
42	-27	-33	-24	-29
43	-41	-44	-48	-44
44	-68	-37	-45	-51

TEST	GP. I	GP. II	GP. III	WHOLE GP.
45	41	44	39	42
46	-48	-48	-27	-43
47	25	19	-3	16
48	-43	-26	-45	-37
49	2	-15	-12	-7
50	-5	4	36	7
51	-39	-15	-36	-29
52	-41	-52	-58	-49
53	-38	-30	-36	-34
54	50	19	24	32
55	-32	-15	21	-7
56	32	7	-9	13
57	-18	-41	-12	-25
58	-9	-11	15	-4

[See text, page 125]

TESTS FOR YOUNG CHILDREN

DISTRIBUTIONS OF 'SAME' AND 'DIFFERENT' RESPONSES (S and D).

$$P = \frac{S \sim D}{S + D} \times 100$$

($S \sim D$ means the difference between S and D, the correct answer being written first.)

IN THE LISTS BELOW, A TICK (✓) INDICATES THE CORRECT ANSWER.

TEST I	TOTALS AGE 5 S	D	AGE 6 S	D	WHOLE GROUP S	D	P (PERCENTAGE VALUES) AGE 5	AGE 6	WHOLE GROUP
(a)	12✓	16	7	16	19	32	−14·3	−39·1	−25·5
(b)	6	22✓	3	20	9	42	57·1	73·9	64·7
(c)	8	20✓	6	17	14	37	42·8	47·8	45·1
(d)	14✓	14	12	11	26	25	0	4·3	2·0
(e)	12✓	16	13	10	25	26	−14·3	13·0	−2·0
(f)	10	18✓	7	16	17	34	28·6	39·1	33·3
(g)	8	20✓	6	17	14	37	42·8	47·8	45·1
(h)	12✓	16	12	11	24	27	−14·3	4·3	−5·9
(i)	6	22✓	3	20	9	42	57·1	73·9	64·7
(j)	12✓	16	10	13	22	29	−14·3	−13·0	−13·7
(k)	18✓	10	13	10	31	20	28·6	13·0	21·6
(l)	10	18✓	5	18	15	36	28·6	56·5	41·2
(m)	8	20✓	2	21	10	41	42·8	82·6	60·8
(n)	20✓	8	13	10	33	18	42·8	13·0	29·4
(o)	6	22✓	2	21	8	43	57·1	82·6	68·6
(p)	16✓	12	11	12	27	24	14·3	−4·3	5·9

TEST II

	TOTALS						P		
	AGE 5		AGE 6		WHOLE GROUP		AGE 5	AGE 6	WHOLE GROUP
	S	D	S	D	S	D			
1.	8	20	4	19	12	39	42·9	65·2	52·9
2.	23	5	11	12	34	17	64·3	-4·3	33·3
3.	22	6	12	11	34	17	57·1	4·3	33·3
4.	10	18	1	22	11	40	28·6	91·3	56·9
5.	23	5	14	9	37	14	64·3	21·7	45·1
6.	10	18	3	20	13	38	28·6	73·9	49·0
7.	7	21	4	19	11	40	50·0	65·2	56·9
8.	22	6	12	11	34	17	57·1	4·3	33·3
9.	11	17	4	19	15	36	21·4	65·2	41·2
10.	26	2	13	10	39	12	85·7	13·0	52·9
11.	3	25	2	21	5	46	78·6	82·6	80·4
12.	24	4	13	10	37	14	71·4	13·0	45·1
13.	26	2	13	10	39	12	85·7	13·0	52·9
14.	10	18	5	18	15	36	28·6	56·5	41·2
15.	17	11	9	14	26	25	21·4	-21·7	2·0
16.	10	18	5	18	15	36	28·6	56·5	41·2
17.	10	18	4	19	14	37	28·6	65·2	45·1
18.	20	8	10	13	30	21	42·9	-13·0	17·6
19.	12	16	8	15	20	31	14·3	30·4	21·6
20.	17	11	13	10	30	21	21·4	13·0	17·6
21.	22	6	10	13	32	19	57·1	-13·0	25·5
22.	11	17	10	13	21	30	21·4	13·0	17·6

(over)

TEST II

	TOTALS						P		
	AGE 5		AGE 6		WHOLE GROUP		AGE 5	AGE 6	WHOLE GROUP
	S	D	S	D	S	D			
23.	12	16 ✓	9	14	21	30	14·3	21·7	17·6
24.	15 ✓	13	12	11	27	24	7·1	4·3	5·9
25.	17 ✓	11	15	8	32	19	21·4	30·4	25·5
26.	17	11 ✓	7	16	24	27	-21·4	39·1	5·9
27.	22 ✓	6	16	7	38	13	57·1	39·1	49·0
28.	13	15 ✓	10	13	23	28	7·1	13·0	9·8
29.	11	17 ✓	2	21	13	38	21·4	82·6	49·0
30.	22 ✓	6	12	11	34	17	57·1	4·3	33·3

TEST III

	TOTALS						P		
	AGE 5		AGE 6		WHOLE GROUP		AGE 5	AGE 6	WHOLE GROUP
	S	D	S	D	S	D			
1.	26 ✓	2	12	11	38	13	85·7	4·3	49·0
2.	13	15 ✓	13	10	26	25	7·1	-13·0	-2·0
3	22 ✓	6	14	9	36	15	57·1	21·7	41·2
4.	13	15 ✓	14	9	27	24	7·1	-21·7	-5·9
5.	21	7 ✓	11	12	32	19	-50·0	4·3	-25·6
6.	15	13 ✓	12	11	27	24	-7·1	-4·3	-5·9
7.	19 ✓	9	12	11	31	20	35·7	4·3	21·6
8.	19 ✓	9	14	9	33	18	35·7	21·7	29·4

TEST IV	TOTALS						P		
	AGE 5		AGE 6		WHOLE GROUP		AGE 5	AGE 6	WHOLE GROUP
	S	D	S	D	S	D			
1.	28✓	0	13	10	41	10	100	13·0	60·8
2.	16	12✓	5	18	21	30	-14·3	56·5	17·6
3	14	14✓	6	17	20	31	0	47·8	21·6
4.	16	12✓	5	18	21	30	-14·3	56·5	17·6
5.	18✓	10	14	9	32	19	28·6	21·7	25·5
6.	18✓	10	13	10	31	20	28·6	13·0	21·6
7.	20	8✓	7	16	27	24	-42·9	39·1	-5·9
8.	18✓	10	12	11	30	21	28·6	4·3	17·6
9.	9	19✓	9	14	18	33	35·7	21·7	29·4

TEST V	TOTALS						P		
	AGE 5		AGE 6		WHOLE GROUP		AGE 5	AGE 6	WHOLE GROUP
	S	D	S	D	S	D			
1.	14	14✓	11	12	25	26	0	4·3	2·0
2.	26✓	2	15	8	41	10	85·7	30·4	60·8
3.	18	10✓	12	11	30	21	-28·6	-4·3	-17·6

[See text, page 125]

ORDER OF DIFFICULTY OF THE TESTS

(THE ORDER OF INCREASING DIFFICULTY OF THE TESTS IS SHOWN. THE ITEMS SHOWN IN GROUPS HAVE EQUAL VALUES OF P. i.e. THEY APPEAR TO BE OF EQUAL DIFFICULTY.)

TEST I

AGE 5 :- b, i, o, c, g, m, n, f, k, l, p, d, a, e, h, j.

AGE 6 :- o, m, b, i, l, c, g, f, e, k, n, d, p, j, a.

WHOLE GROUP :- o, b, i, m, c, g, l, f, n, k, p, d, e, h, j, a.

TEST II

AGE 5 :- 10, 13, 11, 12, 2, 5, 3, 8, 21, 27, 30, 7, 1, 18, 4, 6, 14, 16, 17, 9, 15, 20, 22, 25, 29, 19, 23, 24, 28, 26.

AGE 6 :- 4, 11, 29, 6, 1, 7, 9, 17, 14, 16, 26, 27, 19, 25, 5, 23, 10, 12, 13, 20, 22, 28, 3, 8, 24, 30, 2, 18, 21, 15.

TOTAL GROUP :- 11 ; 4, 7 ; 1, 10, 13 ; 6, 27, 29 ; 5, 12, 17 ; 9, 14, 16 ; 2, 3, 8, 30 ; 21, 25 ; 19 ; 18, 20, 22, 23 ; 28 ; 24, 26 ; 15.

TEST III

AGE 5 :- 1 ; 3 ; 7, 8 ; 2, 4 ; 6 ; 5.

AGE 6 :- 3, 8 ; 1, 5, 7 ; 6 ; 2 ; 4.

WHOLE GROUP :- 1 ; 3 ; 8 ; 7 ; 2 ; 4, 6 ; 5.

TEST IV

AGE 5 :- 1 ; 9 ; 5, 6 ; 8 ; 3 ; 2, 4 ; 7.

AGE 6 :- 2, 4 ; 3 ; 7 ; 5, 9 ; 1, 6 ; 8.

WHOLE GROUP :- 1; 9; 5 ; 3, 6 ; 2, 4, 8 ; 7.

TEST V

AGE 5 :- 2, 1, 3.

AGE 6 :- 2, 1, 3.

WHOLE GROUP :- 2, 1, 3.

[See text, page 132]

THE DIFFICULTY OF THE TESTS USING REPEATED NOTES

TEST	REPEATED NOTE	INTERVAL (ABOVE MIDDLE C)	AGE 5	AGE 6	WHOLE GROUP
				P	
2	C	UNISON	64·3	-4·3	33·3 (s)
3	C''	15th.	57·1	4·3	33·3 (s)
5	F'	11th.	64·3	21·7	45·1 (s)
8	C	Unison	57·1	4·3	33·3 (s)
10	E'	10th.	85·7	13·0	52·9 (s)
12	C	Unison	71·4	13·0	45·1 (s)
13	C'	Octave	85·7	13·0	52·9 (s)
15	C	Unison	21·4	-21·7	2·0
18	G	5th.	42·9	-13·0	17·6
20	C	Unison	21·4	13·0	17·6
21	C	Unison	57·1	-13·0	25·5
24	E	3rd.	7·1	4·3	5·9
25	C	Unison	21·4	30·4	25·5
27	D	2nd.	57·1	39·1	49·0 (s)
30	C_2	2nd. octave below or -15th.	57·1	4·3	33·3 (s)

[See text, page 142]

SCORES OBTAINED IN TESTS FOR YOUNG CHILDREN

AGE 5

SUBJECT	TEST I	TEST II	TEST IV
M. McL.	0	-4	3
W. B.	16	22	-3
T. G.	-4	2	1
J. G.	0	2	-3
A. McG.	-2	18	1
J. R.	14	18	3
M. F.	0	4	-3
J. S.	16	16	1
C. D.	0	2	-5
M. R.	-2	14	5
E. R.	-8	16	3
J. M.	-2	-2	-5
F. G.	6	20	3
J. C.	0	10	-3
K. G.	0	22	-1
A. A.	4	12	3
M. H.	6	10	-3
P. McN.	12	26	3
J. T.	-4	10	-3
J. D.	4	20	-5
J. McD.$_2$	0	-2	-1
P. C.	6	2	1

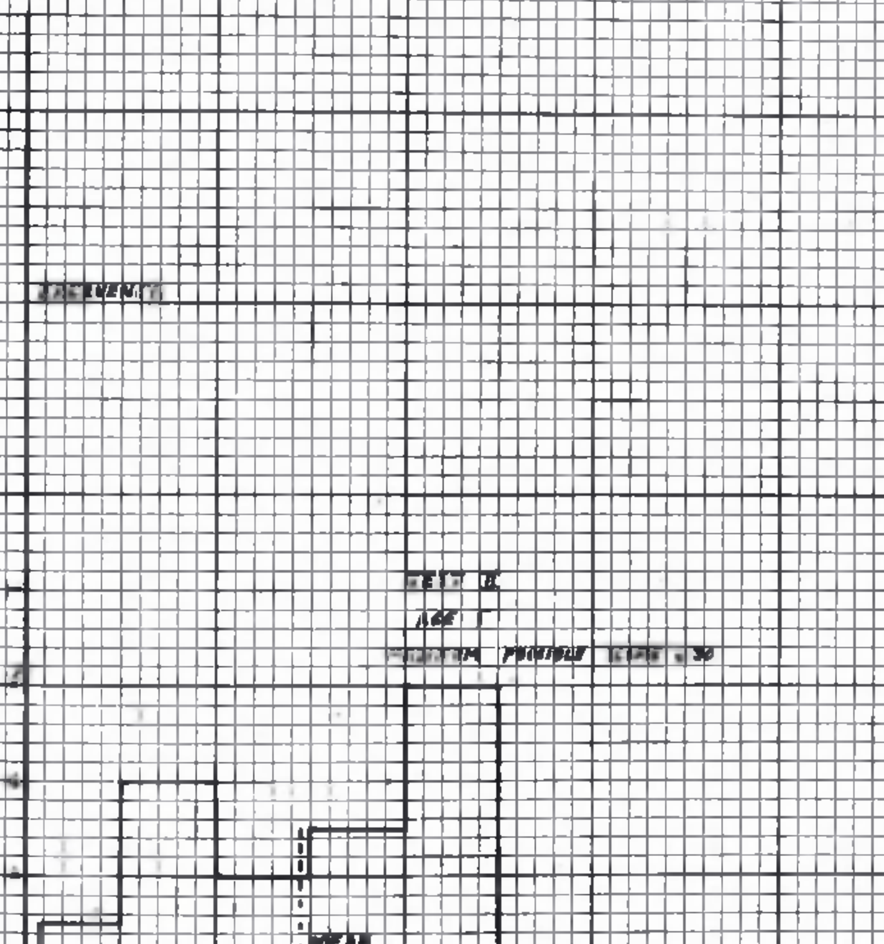
(over)

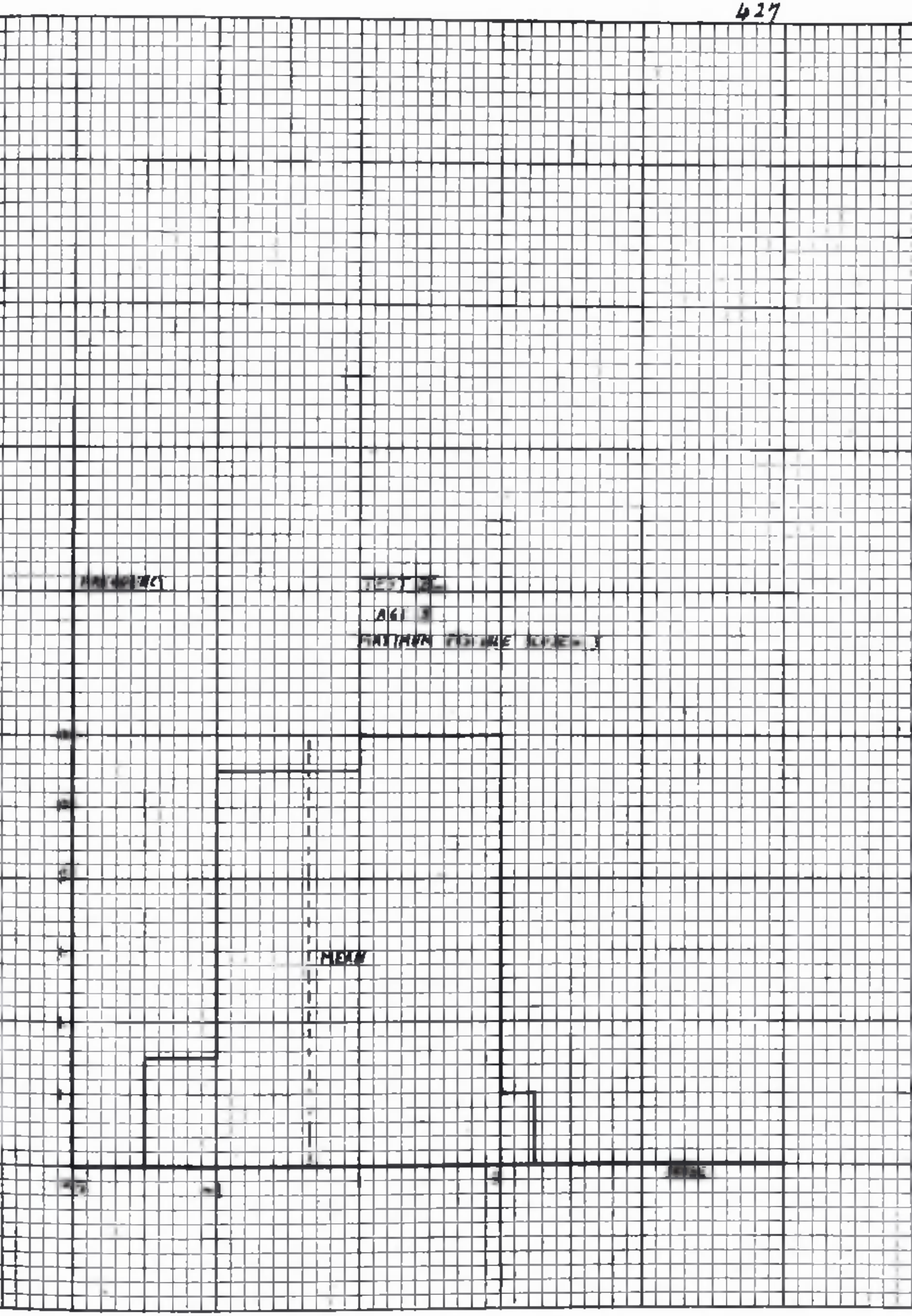
SUBJECT	TEST I	TEST II	TEST IV
A.B.	6	0	1
M.C.	0	15	-3
L. McM.	16	21	5
J. McD.	16	26	1
B.F.	-2	12	-3
I.C.	10	10	-3

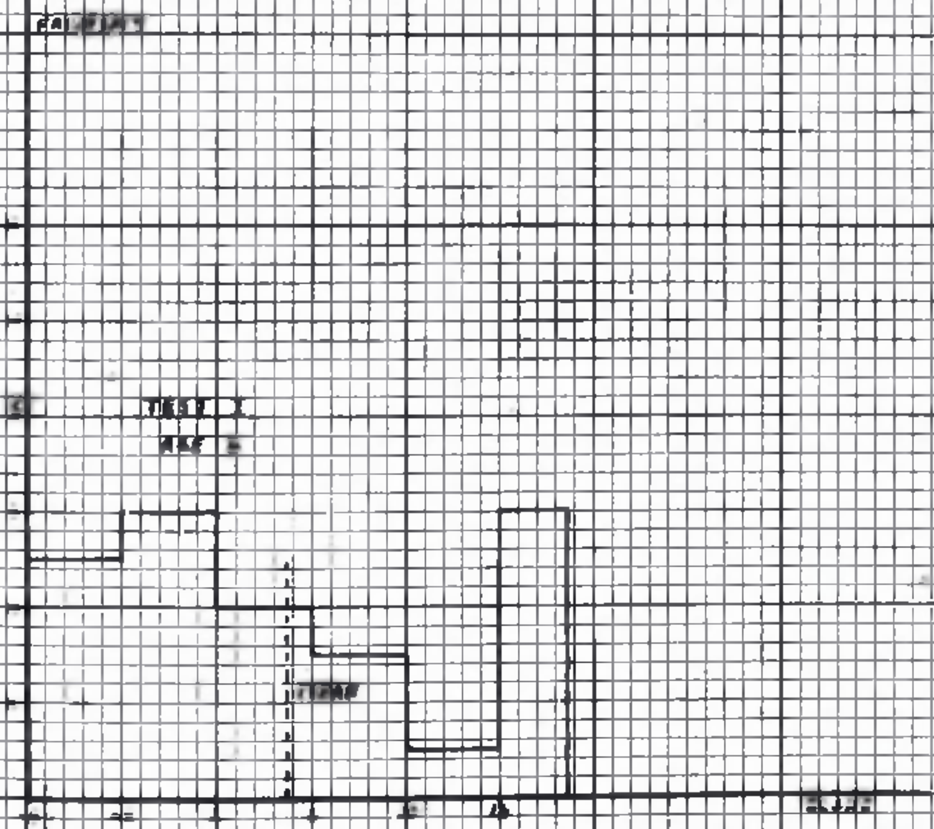
AGE 6

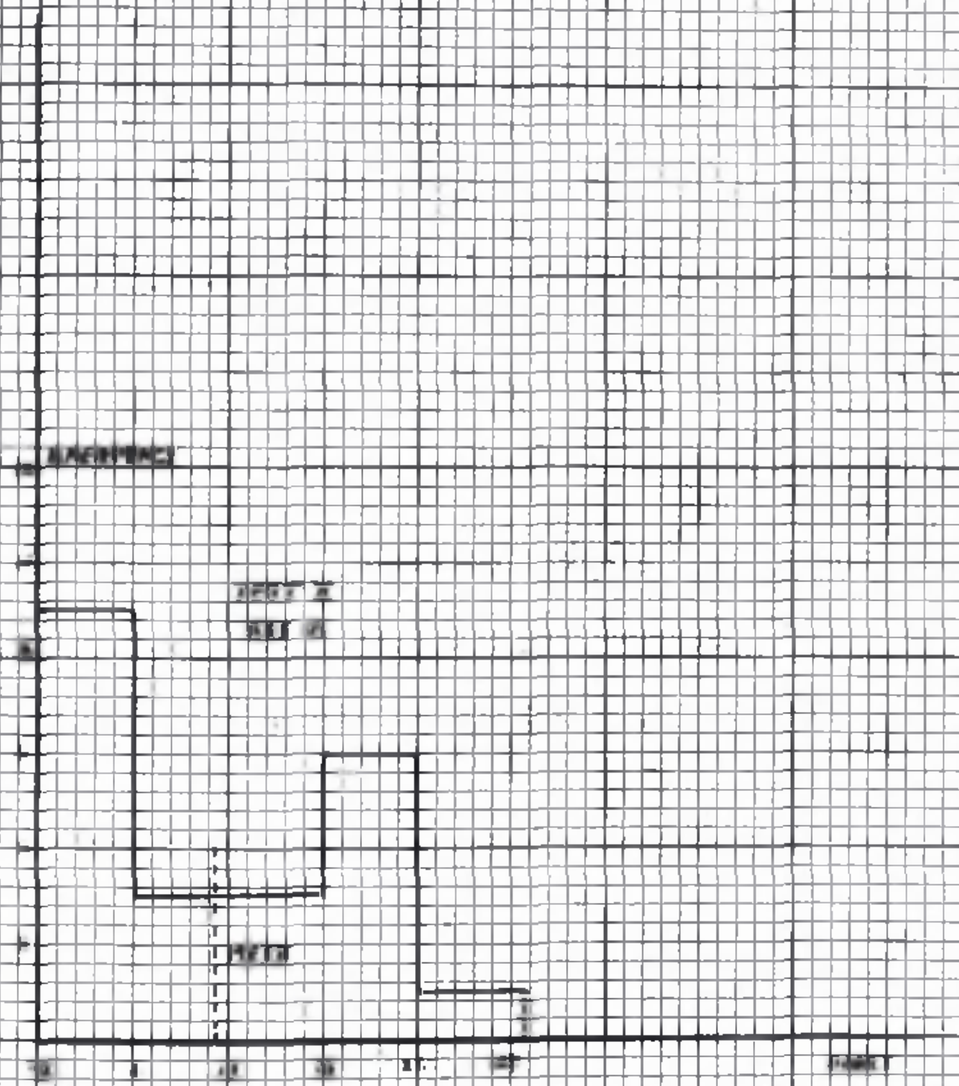
SUBJECT	TEST I	TEST II	TEST IV
M. McG.	2	14	5
E. S.	-6	4	5
C. K.	0	0	5
V. O'B.	-6	-2	3
J. O.	16	20	3
E. McL.	0	0	5
R. C.	8	10	5
A. L.	14	20	1
A. C.	0	0	5
J. McG.	0	0	-3
T. McK	2	0	5
M. D.	6	14	3
B. T.	0	0	-1
T. M.	6	22	-5
A. D.	14	20	-3
J. H.	2	6	-1
J. R.	-6	0	3
J. G.	12	16	5
A. T.	0	0	5
H. McM.	16	28	5
M. McA.	14	20	-1
V. S.	16	18	1
J. B.	4	4	1

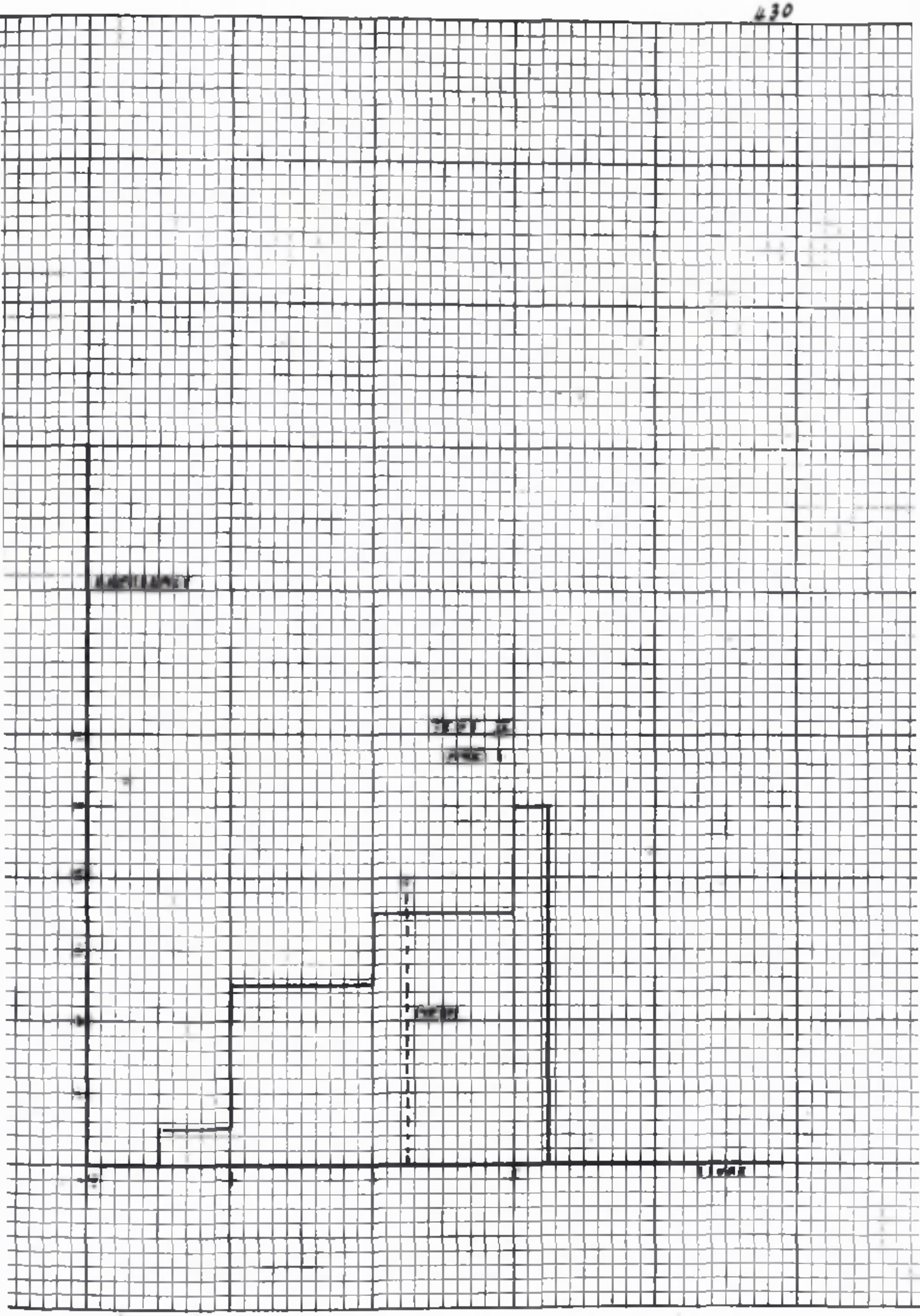
[See text, page 16.2]

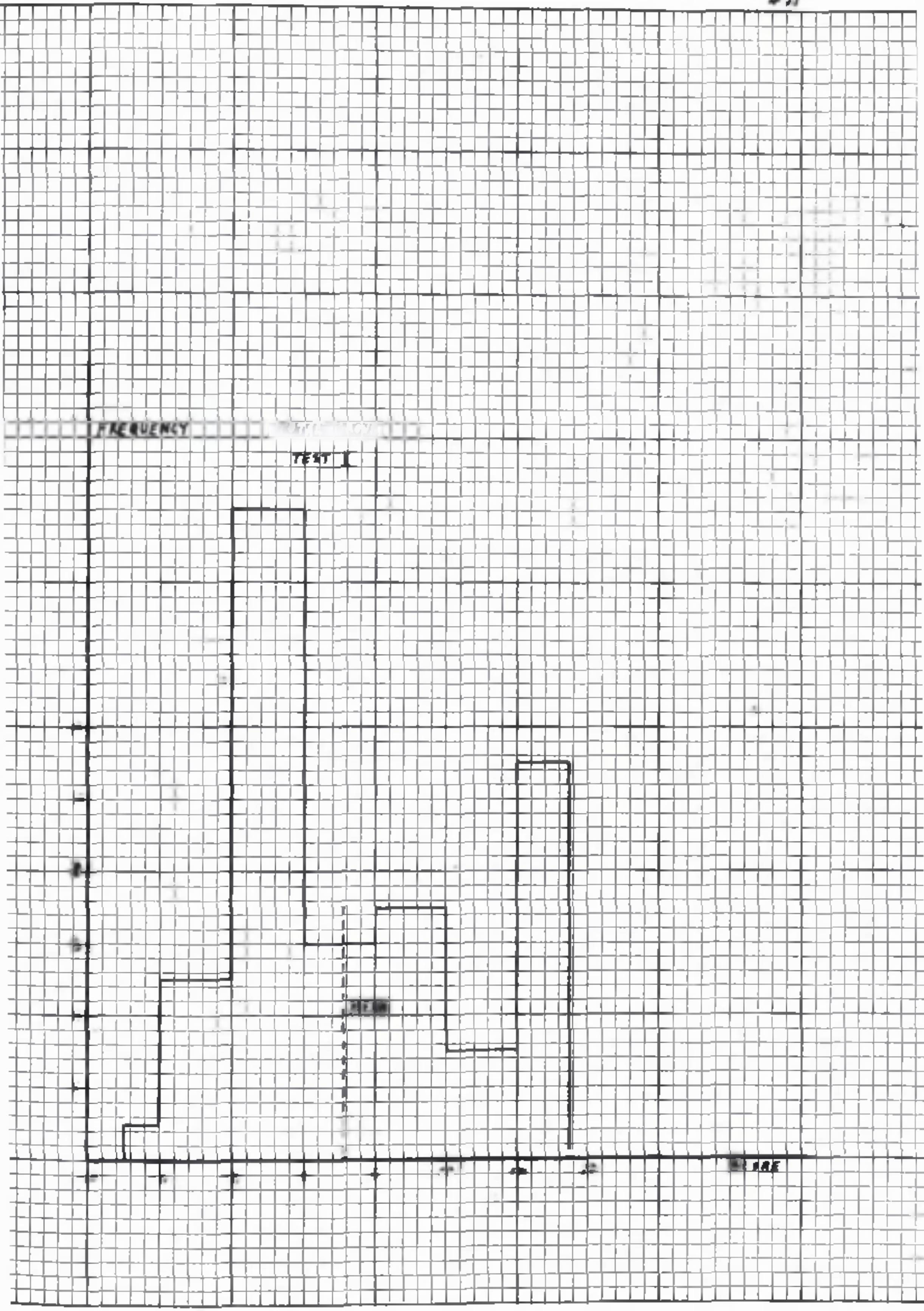

AGE
MEAN
SCORE

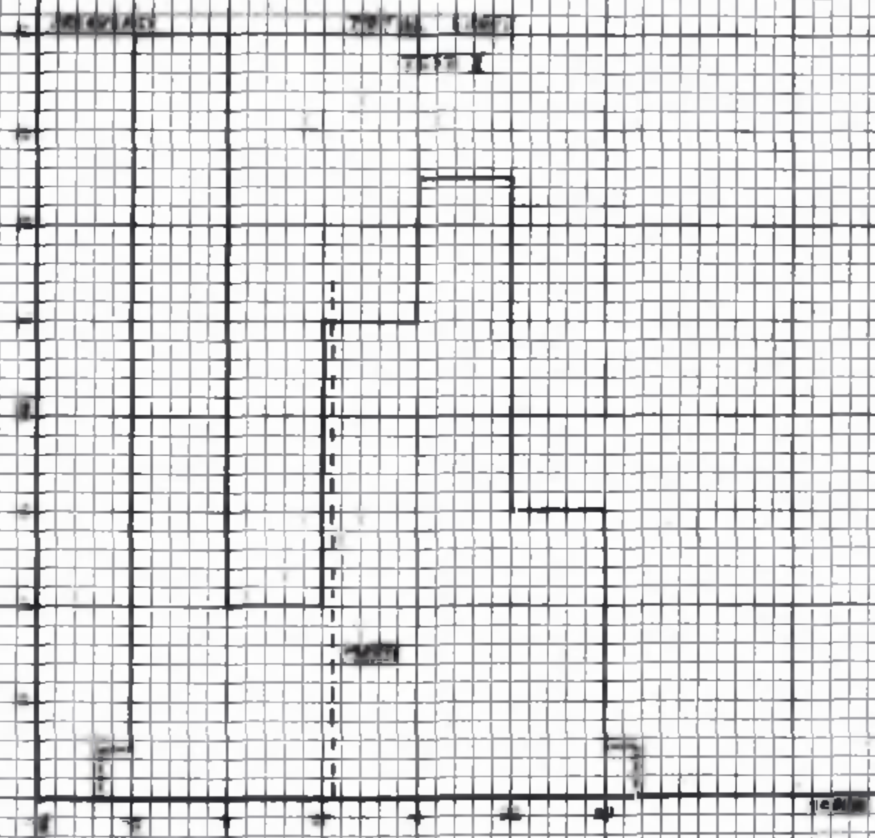

AGE

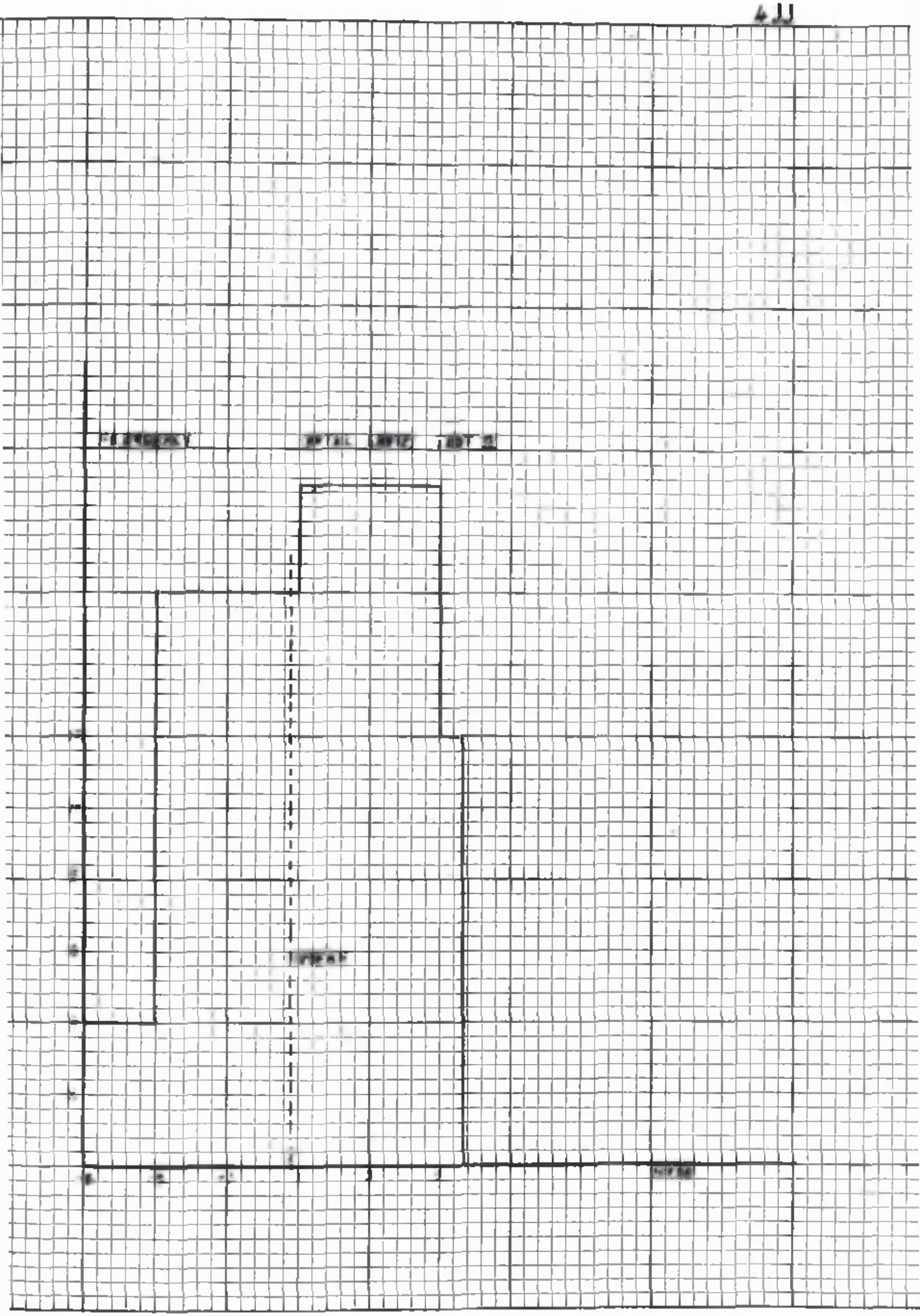







FREQUENCY
TEST I





[See text, page 147]

NORMS. TESTS FOR YOUNG CHILDREN.

SCORES

PERCENTILE VALUE	AGE 5 I	AGE 5 II	AGE 5 IV	AGE 6 I	AGE 6 II	AGE 6 IV	WHOLE GROUP I	WHOLE GROUP II	WHOLE GROUP IV
100	16	26	5	16	28	5	16	28	5
75	9	19	3	13	19	5	11	19	4
50	0	12	1	4	8	3	2	12	1
25	-1	3	-3	0	0	0	0	1	-2
0	-3	-4	-5	-6	-2	-5	-3	-4	-5

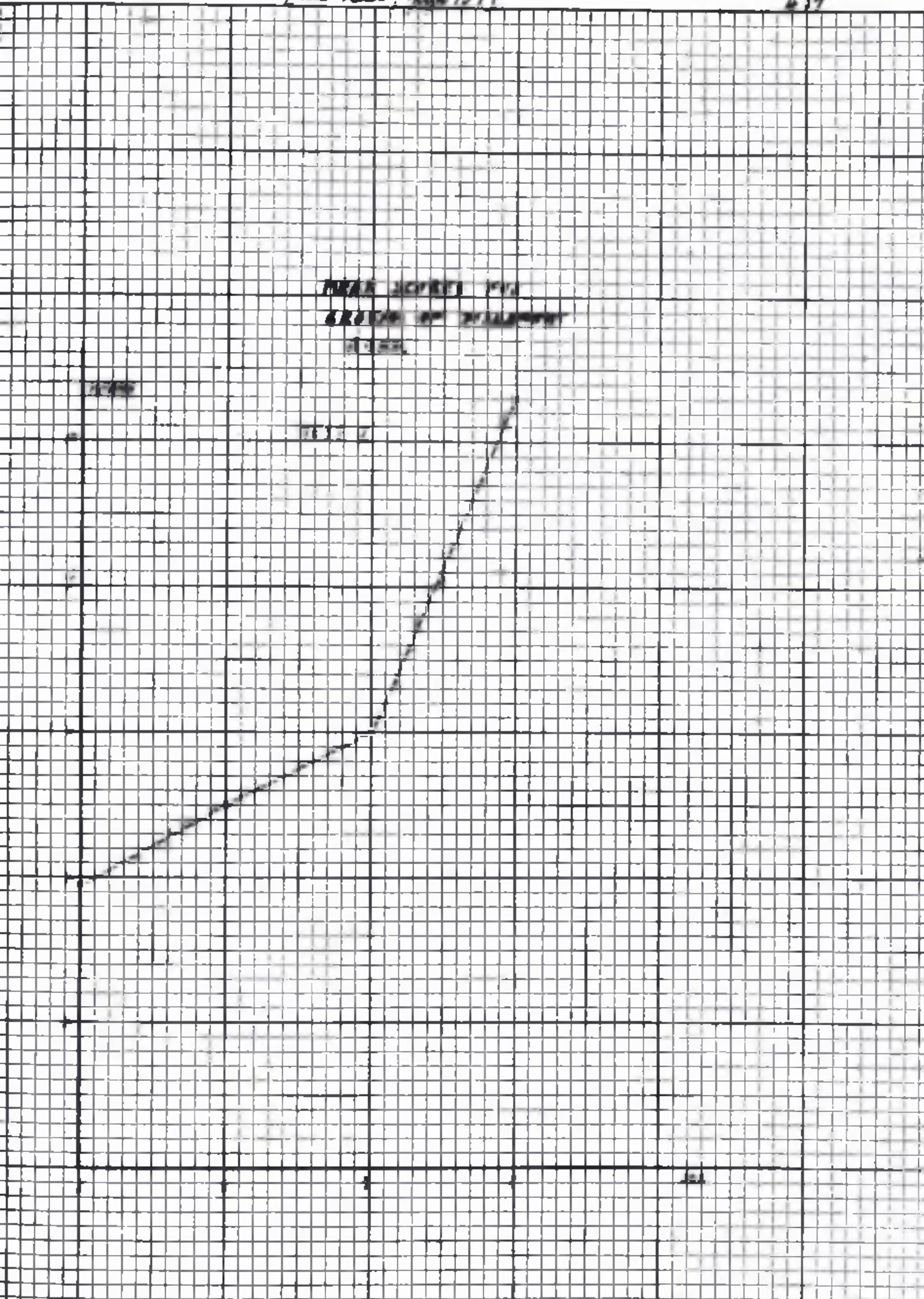
[See text, page 148]

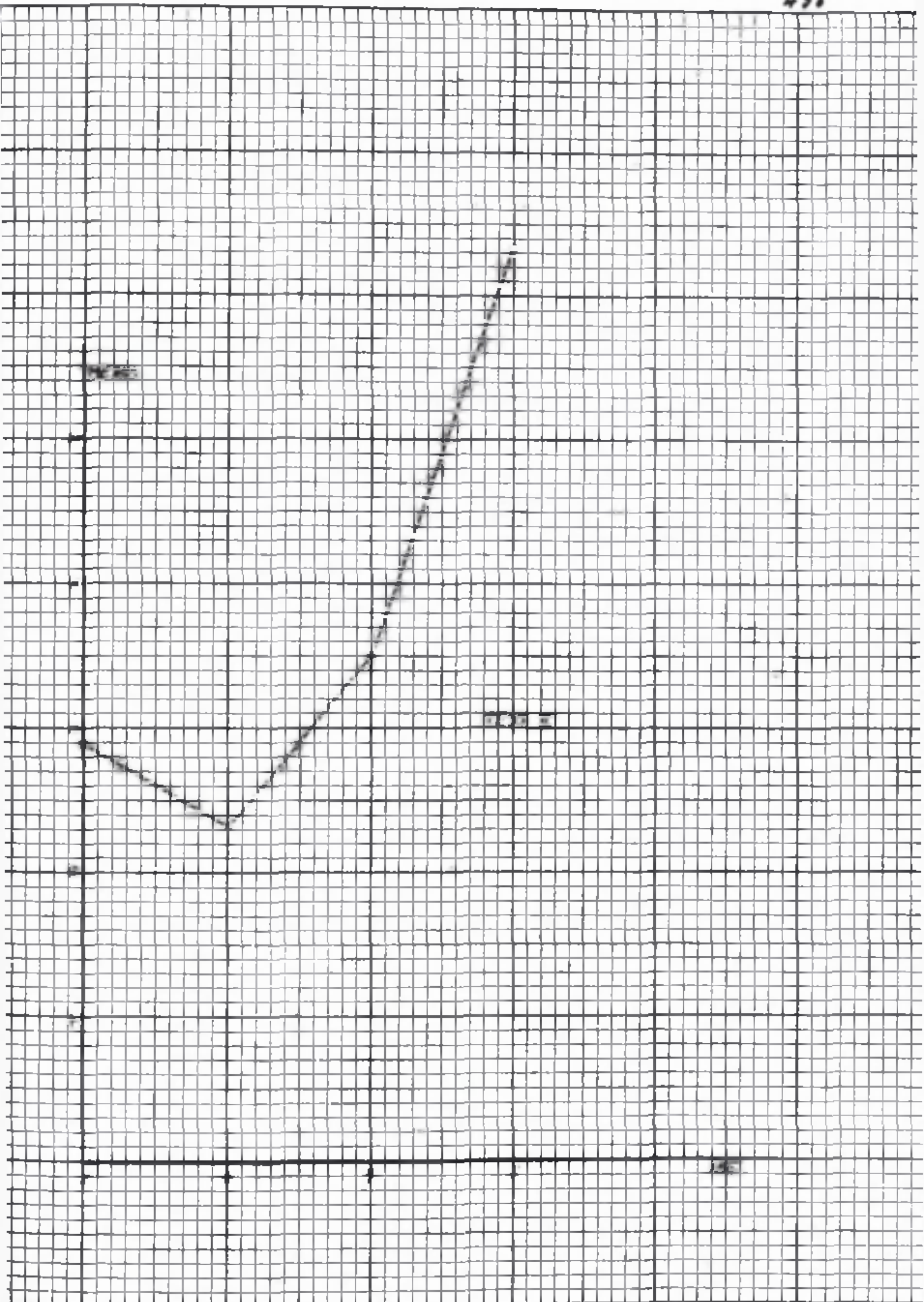
THE SUBJECTS WHEN GRADED ACCORDING TO Z - SCORE

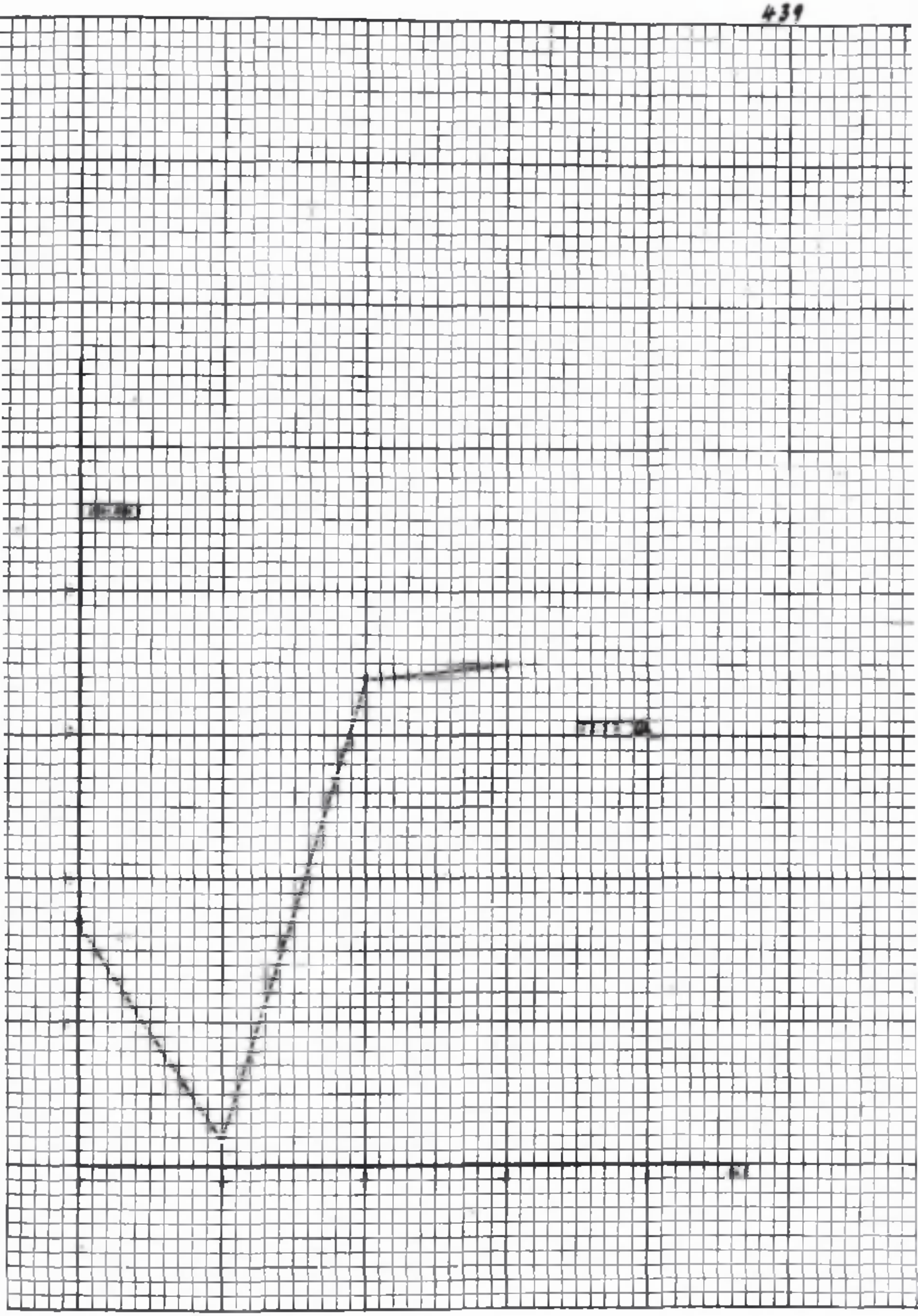
SUBJECT	AVERAGE Z-SCORE	AGE	MENTAL AGE	INTELLIGENCE QUOTIENT.
H. Mc. M	1·61	$6\frac{10}{12}$	$9\frac{2}{12}$	134
L. Mc. M	1·39	$5\frac{8}{12}$	7	123
P. Mc N.	1·15	$5\frac{6}{12}$	$6\frac{3}{12}$	114
J. Mc D.	1·13	$5\frac{9}{12}$	$6\frac{6}{12}$	113
J. D.	1·12	$6\frac{2}{12}$	$7\frac{6}{12}$	122
J. G.	·99	$6\frac{7}{12}$	$7\frac{2}{12}$	109
J. R.	·95	$5\frac{3}{12}$	$5\frac{10}{12}$	111
V. S.	·86	$6\frac{10}{12}$	$6\frac{4}{12}$	93
A. L.	·82	$6\frac{3}{12}$	$7\frac{2}{12}$	115
J. S.	·77	$5\frac{3}{12}$	$5\frac{6}{12}$	105
F. G.	·65	$5\frac{4}{12}$	$5\frac{8}{12}$	106
M. Mc A.	·62	$6\frac{10}{12}$	9	132
R. C.	·58	$6\frac{2}{12}$	6	97
W. B.	·58	$5\frac{3}{12}$	$5\frac{3}{12}$	100
M. Mc G.	·44	6	$6\frac{4}{12}$	106
M. B.	·43	$6\frac{4}{12}$	$6\frac{4}{12}$	100
H. B.	·42	$6\frac{6}{12}$	$8\frac{10}{12}$	136
M. R.	·26	$5\frac{4}{12}$	$5\frac{6}{12}$	103
A. A.	·26	$5\frac{4}{12}$	$5\frac{2}{12}$	97
K. G.	·08	$5\frac{2}{12}$	$6\frac{5}{12}$	125
A. Mc G.	−·00	$5\frac{1}{12}$	$5\frac{4}{12}$	105
T. Mc K.	−·06	$6\frac{3}{12}$	$7\frac{1}{12}$	113
T. M.	−·09	$6\frac{2}{12}$	$8\frac{1}{12}$	131

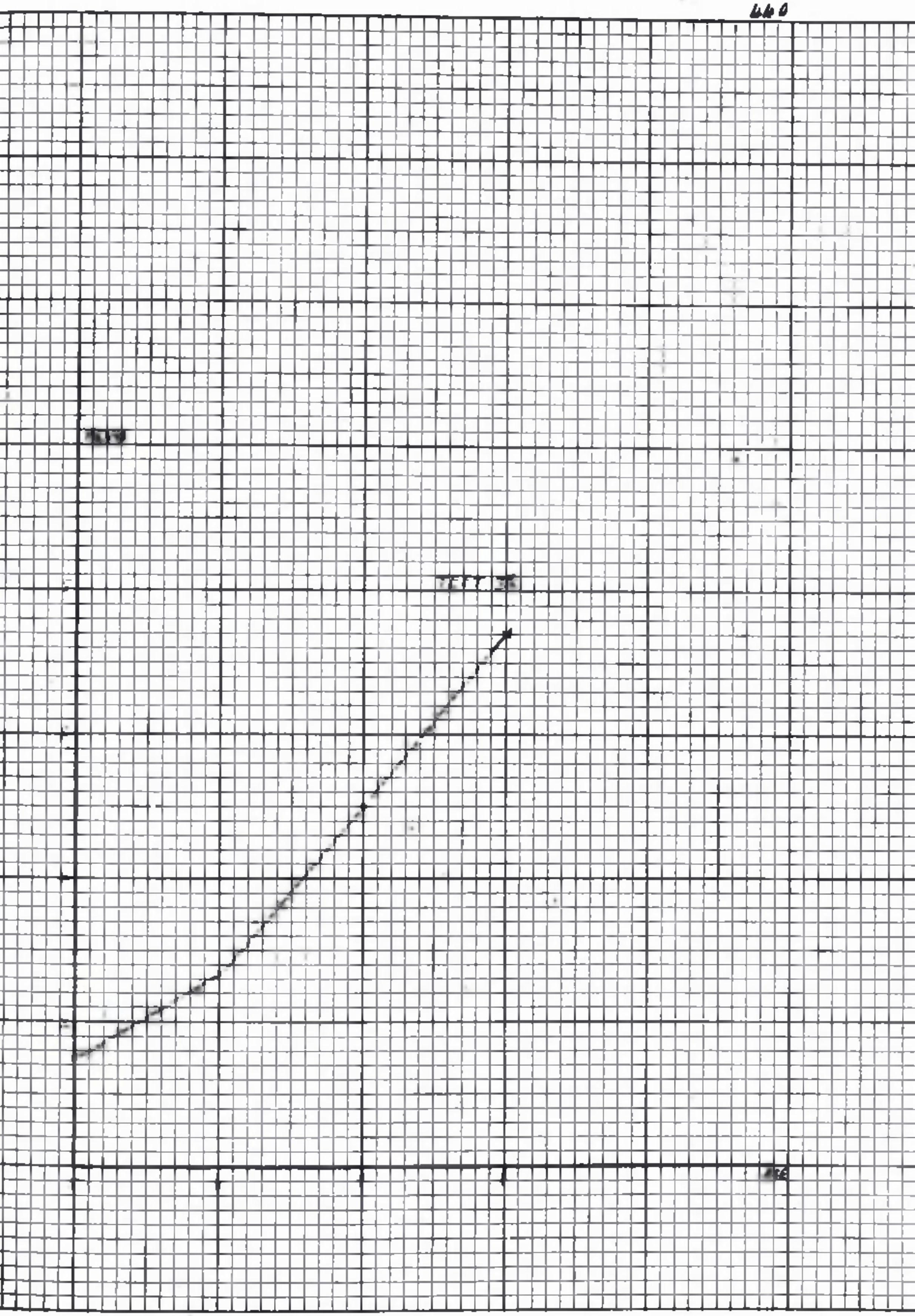
SUBJECT	AVERAGE Z-SCORE	AGE	MENTAL AGE	INTELLIGENCE QUOTIENT
I.C.	-·13	5 9/12	5 6/12	96
E.R.	-·15	5 4/12	5 6/12	103
A.T.	-·16	6 7/12	5 6/12	84
A.C.	-·16	6 4/12	5 8/12	89
E. McL.	-·16	6 2/12	5 8/12	92
C.K.	-·16	6 1/12	5 4/12	88
P.C.	-·21	5 5/12	4 4/12	80
J.D.	-·26	5 5/12	4 10/12	89
A.B.	-·28	5 5/12	5	92
E.S.	-·30	6 1/12	5 8/12	93
M.C.	-·31	5 6/12	6	109
J.B.	-·32	6 11/12	6 10/12	99
M.H.	-·32	5 4/12	5 4/12	100
J.H.	-·45	6 6/12	6 10/12	105
M.McL.	-·50	5	6	120
J.C.	-·60	5 4/12	5 2/12	96
B.F.	-·62	5 9/12	5 4/12	93
J.K.	-·64	6 7/12	5 8/12	86
T.G.	-·67	5 2/12	5	97
V.O'B.	-·71	6 3/12	5 3/12	84
B.T.	-·76	6 6/12	6	92
J.T.	-·79	5 5/12	5 1/12	95
M.F.	-·82	5 3/12	5 8/12	108
J. McD₂	-·84	5 6/12	5 4/12	98
J.G.	-·89	5 3/12	5 3/12	100
J. McG.	-·96	6 4/12	5 6/12	87
C.D.	-1·09	5 2/12	5 1/12	98
J.M.	-1·33	5 4/12	5 7/12	105

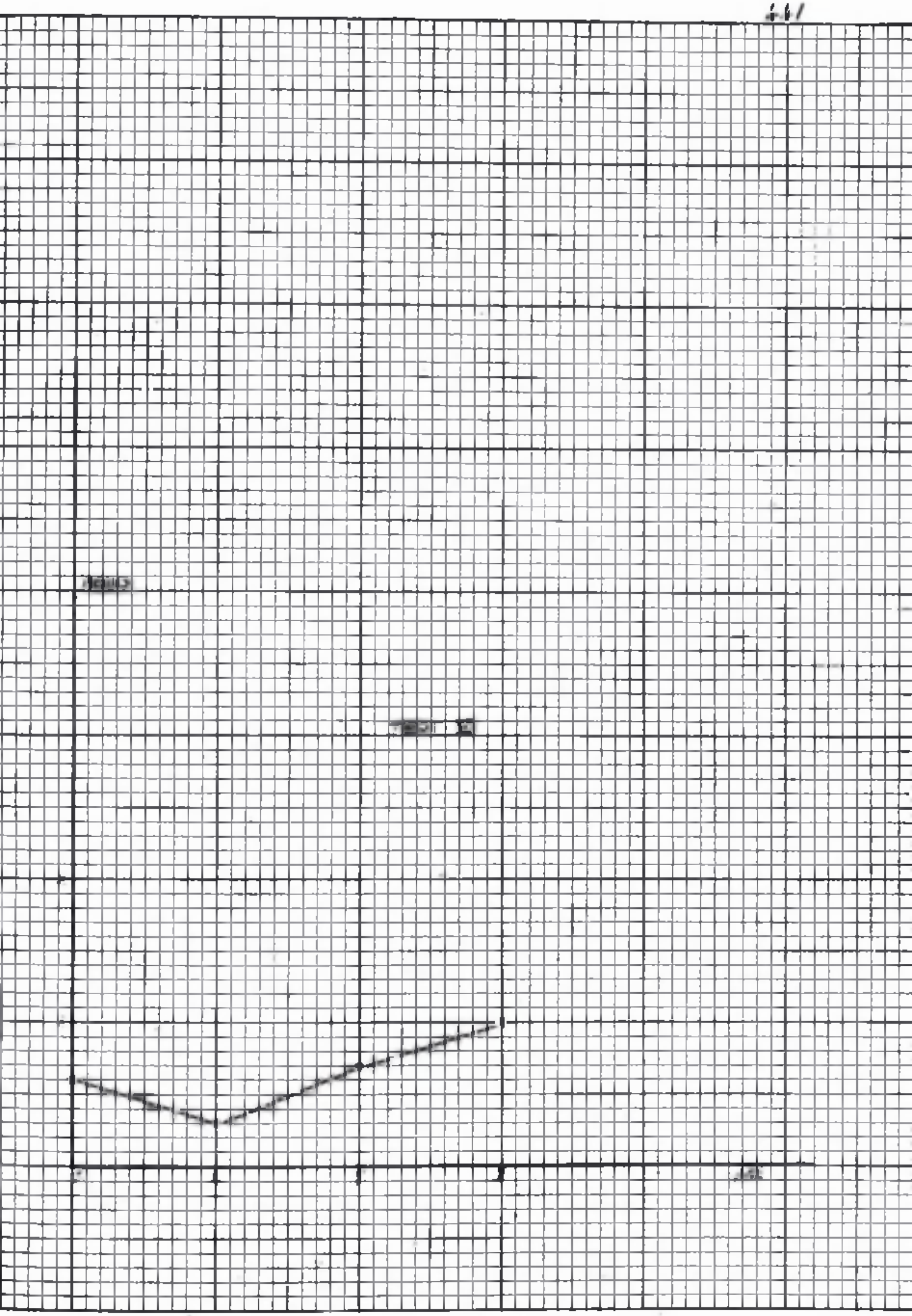
[See text, page 157]











[See text, page 161]

PITCH TEST ORDER OF INCREASING DIFFICULTY.

THE ITEMS IN BRACKETS APPEAR TO BE OF EQUAL DIFFICULTY.

AGE 7.

SPONTANEOUS :- (29, 16, 6), (4, 11, 14), 1, 9, (7, 19, 26), (17, 23, 28), 22.

NAMED :- (1, 29), 16, (4, 19), (6, 7, 14, 26), (9, 11, 23), 17, (22, 28).

AGE 8.

SPONTANEOUS :- (1, 4, 7, 9, 11, 14, 16), 22, (26, 28, 29), 19, 6, 23, 17.

NAMED :- (1, 29), (4, 16, 19, 26), (17, 6, 7, 9, 11, 14), 23, 28, 22

[See text, page 162]

NORMS

TABLE A — 'SPONTANEOUS' RESULTS

PERCENTILE VALUE	AGE 7 I	AGE 7 II	AGE 7 IV	AGE 8 I	AGE 8 II	AGE 8 IV
100	12	20	5	16	28	5
75	7	16	5	15	28	5
50	6	14	3	12	26	5
25	4	11	3	6	22	3
0	2	4	-1	0	22	1
MEANS	6·0	14·0	3·4	10·6	25·4	3·8

TABLE B — 'SPONTANEOUS' RESULTS

PERCENTILE VALUE	AGE 7 I	AGE 7 II	AGE 7 III	AGE 7 IV	AGE 7 V	AGE 8 I	AGE 8 II	AGE 8 III	AGE 8 IV	AGE 8 V
100	12	20	6	9	3	16	28	8	9	3
75	7	16	4	7	2	15	28	4	9	2
50	6	14	4	5	2	12	26	4	9	2
25	4	11	3	3	1	6	22	2	6	2
0	2	4	0	1	1	0	22	0	3	1
MEANS	6·0	14·0	3·6	5·0	1·9	10·6	25·6	3·5	7·6	2·3

TABLE C. 'NAMED' RESULTS

	AGE 7			AGE 8		
PERCENTILE VALUE	I	II	III	I	II	III
100	14	9	4	16	15	4
75	11	5	2	16	12	4
50	8	1	2	16	9	4
25	8	-3	1	16	4	3
0	0	-11	0	14	-3	0
MEANS	9·0	0·6	1·9	15·9	8·3	3·3

[See text, page 169]

RESULTS

'R' means 'Response'. N means 'Number of Responses' expressed as a percentage, while N_1, N_2, N_3 refer to first, second and third attempts, respectively. These values have been expressed as percentages of the number of subjects in the age group, so that the distributions of the responses can be compared at different ages. Therefore

$$N = \frac{\text{number of responses of a particular value}}{\text{maximum number possible (or no. of persons in group)}} \times 100$$

Groups A, B, C will refer to those of age 12, 13, 14 years respectively, and group D will be the whole group. The tables show the values of N for these groups.

TEST 1

Values of N

R	2
A	100
B	100
C	100
D	100

TEST 2

N

R	2	3	4	5
A	-	47·6	52·4	-
B	1·9	40·7	55·6	1·9
C	-	53·6	46·4	-
D	1·0	45·6	52·4	1·0

TEST 3

N

R	1	2	3	4
A	-	14·3	85·7	-
B	1·9	9·3	81·5	7·4
C	-	3·6	96·4	-
D	1·0	8·7	86·4	3·9

TEST 4

R	2	3	4	5	6	7
A	-	4·8	47·6	23·8	23·8	-
B	1·9	1·9	25·9	46·3	20·4	3·7
C	-	-	39·3	42·9	17·9	-
D	1·0	1·9	34·0	40·8	20·4	1·9

TEST 5

R	1	3	4	5	6	7	8	9	12
A	-	-	4·8	23·8	38·1	19·0	14·3	-	-
B	1·9	1·9	1·9	14·8	31·5	20·4	25·9	-	1·9
C	3·6	-	-	17·9	32·1	25·0	17·9	3·6	-
D	1·9	1·0	1·9	17·5	33·0	21·4	21·4	1·0	1·0

TEST 6

N

R	1	3	4	5	6	7	8	9	11
A	-	4·8	28·6	52·4	14·3	-	-	-	-
B	1·9	-	20·4	42·6	16·7	9·3	1·9	5·6	1·9
C	-	-	35·7	39·3	21·4	3·6	-	-	-
D	1·0	1·0	26·2	43·7	17·5	5·8	1·0	2·9	1·0

TEST 7

R	2	3
A	100	-
B	96·3	3·7
C	96·4	3·6
D	97·1	2·9

TEST 8

R	3	4	5
A	4·8	95·2	-
B	3·7	94·4	1·9
C	-	100	-
D	2·9	96·1	1·0

TEST 9

R	1	2	3	4
A	-	-	100	-
B	1·9	-	96·3	1·9
C	-	3·6	89·3	7·1
D	1·0	1·0	95·1	2·9

TEST 10

R	2	3	5	6	7
A	-	-	-	95·2	4·8
B	1·9	-	-	92·6	5·6
C	-	3·6	3·6	92·9	-
D	1·0	1·0	1·0	93·2	3·9

TEST 11

R	2	3	6	8	9
A	-	-	-	95·2	4·8
B	1·9	-	-	98·1	-
C	-	3·6	3·6	92·9	-
D	1·0	1·0	1·0	96·1	1·0

TEST 12

R	2	5	6	7	8
A	-	-	100	-	-
B	1·9	1·9	92·6	3·7	-
C	-	-	92·9	3·6	3·6
D	1·0	1·0	96·1	2·9	1·0

TEST 13

R	1	2	3	4	6
A	-	100	-	-	-
B	1·9	90·7	5·6	1·9	-
C	3·6	92·9	-	-	3·6
D	1·9	93·2	2·9	1·0	1·0

TEST 14

N

R	1	2	3
A	-	95·2	4·8
B	3·7	94·4	1·9
C	7·1	92·9	-
D	3·9	94·2	1·9

TEST 15

R	1	2	3	4
A	-	90·5	-	9·5
B	3·7	83·3	7·4	5·6
C	-	100	-	-
D	1·9	89·3	3·9	4·9

TEST 16

R	1	2	3	4	6	7
A	-	-	-	95·2	4·8	-
B	1·9	-	1·9	92·6	1·9	1·9
C	-	3·6	3·6	92·9	-	-
D	1·0	1·0	1·9	93·2	1·9	1·0

TEST 17

	R	1	2	3	4	5	6	7	12
A	N_1	-	-	-	-	4·8	90·5	-	4·8
	N_2	-	-	4·8	4·8	4·8	76·2	4·8	4·8
B	N_1	-	-	1·9	1·9	9·3	81·5	5·6	-
	N_2	-	-	5·6	1·9	1·9	88·9	1·9	-
C	N_1	3·6	-	3·6	-	-	92·9	-	-
	N_2	-	3·6	3·6	-	3·6	82·1	7·1	-
D	N_1	1·0	-	1·9	1·0	5·8	86·4	2·9	1·0
	N_2	-	1·0	4·9	1·9	2·9	84·5	3·9	1·0

TEST 18

R	1	2	3	4
A	4·8	85·7	4·8	4·8
B	1·9	83·3	9·3	5·6
C	7·1	92·9	-	-
D	3·9	86·4	5·8	3·9

TEST 19

R	1	2	3	4
A	-	100	-	-
B	5·6	88·9	1·9	3·7
C	-	100	-	-
D	2·9	94·2	1·0	1·9

TEST 20

R	3	4	6	7	8
A	-	95·2	-	-	4·8
B	3·7	90·7	3·7	1·9	-
C	3·6	96·4	-	-	-
D	2·9	93·2	1·9	1·0	1·0

TEST 21

R	1	3	4	6
A	-	95·2	-	4·8
B	-	96·3	1·9	1·9
C	3·6	96·4	-	-
D	1·0	96·1	1·0	1·9

TEST 22

R	1	3	4	5	6	8	12
A	-	-	90.5	-	-	4.8	4.8
B	-	1.9	90.7	5.6	1.9	-	-
C	3.6	-	89.3	3.6	3.6	-	-
D	1.0	1.0	90.3	3.9	1.9	1.0	1.0

TEST 23

R	1	2	3	4
A	-	-	95.2	4.8
B	-	5.6	94.4	-
C	3.6	-	96.4	-
D	1.0	2.9	95.4	1.0

TEST 24

R	2	3
A	100	-
B	98.1	1.9
C	96.4	3.6
D	98.1	1.9

TEST 25

R	1	2	3	4	5
A	-	90.5	4.8	4.8	-
B	-	94.4	3.7	-	1.9
C	3.6	96.4	-	-	-
D	1.0	94.2	2.9	1.0	1.0

THE TABULATED RESULTS BECOME SEPARATED AT THIS POINT.

A TEST 26

R	1	2	3	4	5	6	7	8	9	10	15	18	19
N_1	61.9	4.8	-	-	4.8	14.3	4.8	9.5	4.8	-	9.5	4.8	-
N_2	33.3	-	-	14.3	-	19.0	-	4.8	9.5	-	-	19.0	-
N_3	33.3	-	4.8	-	4.8	19.0	4.8	4.8	4.8	4.8	-	14.3	4.8

B. TEST 26

R	1	2	3	4	5	6	7	8	9	10	16	18
N_1	50.0	5.6	13.0	7.4	3.7	7.4	-	7.4	1.9	1.9	-	1.9
N_2	50.0	1.9	-	1.9	7.4	22.2	5.6	1.9	3.7	3.7	1.9	-
N_3	62.6	7.4	-	3.7	3.7	25.9	3.7	9.3	1.9	-	1.9	-

C. TEST 26

R	1	2	3	4	5	6	7	8
N_1	67·9	3·6	7·1	3·6	3·6	14·3	-	-
N_2	50·0	17·9	3·6	3·6	3·6	17·9	-	3·6
N_3	66·3	3·6	-	10·7	-	14·3	3·6	3·6

J. TEST 26

R	1	2	3	4	5	6	7	8	9	10	15	16	18	19
N_1	53·4	4·9	8·7	4·9	3·9	10·7	1·0	5·8	1·9	1·0	1·9	-	1·9	-
N_2	46·6	5·8	1·0	4·9	4·9	20·4	2·9	2·9	3·9	1·9	-	1·0	3·9	-
N_3	46·6	4·9	1·0	4·9	2·9	21·4	3·9	6·8	1·9	1·0	-	1·0	2·9	1·0

A. TEST 27.

R	1	3	4	5	6	7	8	9	12	14	15	18
N_1	38·1	4·8	4·8	28·6	-	4·8	4·8	-	-	4·8	4·8	4·8
N_2	28·6	-	-	42·9	4·8	4·8	4·8	4·8	4·8	-	4·8	-
N_3	28·6	9·5	4·8	28·6	14·3	-	9·5	-	-	-	4·8	-

B. TEST 27

R	1	2	3	4	5	6	7	8	14	15
N_1	40·7	1·9	3·7	9·3	29·6	9·3	1·9	1·9	-	1·9
N_2	37·0	5·6	5·6	3·7	25·9	9·3	7·4	3·7	1·9	-
N_3	31·0	9·3	3·7	5·6	31·5	5·6	-	5·6	1·9	-

C. TEST 27

R	1	2	3	4	5	6	15
N_1	50·0	3·6	-	14·3	25·0	3·6	3·6
N_2	46·4	7·1	10·7	-	17·9	14·3	3·6
N_3	50·0	3·6	7·1	7·1	21·4	7·1	3·6

D. TEST 27

R	1	2	3	4	5	6	7	8	9	11	14	15	18
N_1	61·7	1·9	2·9	9·7	28·2	5·8	1·9	1·9	-	-	1·0	2·9	1·0
N_2	37·9	4·9	5·8	1·9	29·2	9·7	4·9	2·9	1·0	1·0	1·0	1·9	-
N_3	38·8	5·8	9·5	5·3	25·2	7·8	-	4·9	-	-	1·0	1·9	-

A TEST 28

R	1	2	3	4	5	6	9
N_1	-	33.3	57.1	4.8	-	4.8	4.8
N_2	9.5	9.5	57.1	4.8	4.8	4.8	9.5
N_3	33.3	14.3	47.6	-	-	-	4.8

B TEST 28

R	1	2	3	4	5	7	9	10
N_1	5.6	42.6	37.0	9.3	3.7	-	-	1.9
N_2	22.2	24.1	37.0	11.1	1.9	1.9	1.9	-
N_3	44.4	18.5	25.9	5.6	3.7	-	1.9	-

C TEST 28

R	1	2	3	4	5	9	10
N_1	-	60.7	28.6	3.6	-	3.6	3.6
N_2	39.3	21.4	28.6	-	3.6	-	7.1
N_3	60.7	7.1	25.0	-	-	3.6	3.6

D TEST 28

R	1	2	3	4	5	6	7	9	10
N_1	2.9	45.6	39.9	6.8	1.9	1.0	-	1.9	1.9
N_2	26.3	20.4	38.8	6.8	2.9	1.0	1.0	2.9	1.9
N_3	46.6	16.6	30.1	2.9	1.9	-	-	2.9	1.0

A TEST 29

R	1	2	4	6	7	12
N_1	57.1	-	33.3	4.8	-	4.8
N_2	52.4	-	33.3	9.5	-	4.8
N_3	57.1	14.3	19.0	-	4.8	4.8

B TEST 29

R	1	2	3	4	5	6	7	8	10	12
N_1	53.7	5.6	1.9	14.8	9.3	9.3	1.9	1.9	-	1.9
N_2	53.7	5.6	7.4	20.4	3.7	5.6	-	-	1.9	1.9
N_3	50.0	7.4	7.4	22.2	-	5.6	3.7	-	1.9	1.9

C TEST 29

R	1	2	3	4	6	7	12
N_1	60.7	10.7	7.1	14.3	-	-	7.1
N_2	67.9	-	10.7	14.3	-	-	7.1
N_3	67.9	3.6	10.7	7.1	3.6	3.6	3.6

D. TEST 29.

R	1	2	3	4	5	6	7	8	10	12
N_1	56.3	5.8	2.9	18.6	4.9	5.8	1.0	1.0	-	3.9
N_2	67.3	2.9	6.8	21.4	1.9	4.9	-	-	1.0	3.9
N_3	56.3	7.8	6.8	19.5	-	3.9	3.9	-	1.0	2.9

A TEST 30

R	1	3	4	5	6	7	10	12
N_1	38.1	9.5	4.8	4.8	23.8	4.8	4.8	9.5
N_2	42.9	4.8	4.8	4.8	33.3	4.8	-	4.8
N_3	38.1	9.5	4.8	-	42.9	-	-	4.8

B. TEST 30

R	1	2	3	4	5	6	7	8	9	12
N_1	48.1	7.4	3.7	13.0	11.1	11.1	-	1.9	1.9	1.9
N_2	46.3	5.6	-	11.1	16.7	14.8	3.7	1.9	-	1.9
N_3	40.7	5.6	3.7	3.7	3.7	30.2	3.7	-	-	3.7

C TEST 30

R	1	4	5	6	7	8	11	12
N_1	53·6	25·0	7·1	3·6	3·6	-	-	7·1
N_2	46·4	14·3	10·7	17·9	3·6	-	3·6	3·6
N_3	50·0	14·3	7·1	17·9	-	3·6	3·6	3·6

D TEST 30

R	1	2	3	4	5	6	7	8	9	10	11	12
N_1	47·6	3·9	3·9	14·6	5·7	11·6	1·9	1·0	1·0	1·0	-	4·9
N_2	45·6	2·9	1·0	10·7	11·6	19·4	3·9	1·0	-	-	1·0	2·9
N_3	42·7	2·9	3·9	6·8	3·9	32·0	1·9	1·0	-	-	1·0	3·9

A TEST 31

R	1	2	3	4	5	6	10
N_1	23·1	14·3	4·8	9·5	42·9	-	4·8
N_2	28·6	9·5	4·8	9·5	42·9	4·8	-
N_3	19·0	14·3	4·8	4·8	52·4	4·8	-

B TEST 31

R	1	2	3	4	5	6	10
N_1	24·1	18·5	9·3	11·1	33·3	1·9	1·9
N_2	25·9	13·0	3·7	9·3	44·4	1·9	1·9
N_3	29·6	7·4	-	16·7	40·7	1·9	3·7

C TEST 31

R	1	2	3	4	5	10
N_1	39·3	17·9	3·6	10·7	21·4	7·1
N_2	32·1	7·1	10·7	10·7	32·1	7·1
N_3	32·1	3·6	3·6	17·9	35·7	7·1

D TEST 31

R	1	2	3	4	5	6	10
N_1	28·2	17·5	6·8	10·7	32·0	1·0	3·9
N_2	28·2	10·7	5·8	9·7	40·8	1·9	2·9
N_3	25·2	7·8	1·9	14·6	41·7	1·9	3·9

A TEST 32

R	1	2	3	4	5	6	8
N_1	23·8	-	19·0	47·6	4·8	-	4·8
N_2	19·0	-	4·8	76·2	-	-	-
N_3	14·3	9·5	-	71·4	-	4·8	-

B. TEST 32

R	1	2	3	4	5	6	8	9
N_1	38·9	7·4	11·1	35·2	1·9	1·9	1·9	1·9
N_2	42·6	11·1	3·7	37·0	3·7	-	1·9	-
N_3	38·9	11·1	3·7	37·0	5·6	1·9	1·9	-

C. TEST 32

R	1	2	3	4	5	8	9
N_1	39·3	10·7	3·6	35·7	3·6	3·6	3·6
N_2	35·7	10·7	3·6	42·9	-	7·1	-
N_3	32·1	14·3	-	46·4	-	7·1	-

D TEST 32

R	1	2	3	4	5	6	8	9
N_1	35·9	6·8	10·7	37·9	2·9	1·0	2·9	1·9
N_2	35·9	5·7	3·9	46·6	1·9	-	2·9	-
N_3	32·0	11·6	1·9	46·6	2·9	1·9	2·9	-

A TEST 33

R	2	3	5	6
N_1	4.8	4.8	9.5	81.0
N_2	4.8	9.5	-	85.7
N_3	4.8	4.8	-	90.5

B TEST 33

R	1	2	3	4	5	6	7
N_1	1.9	16.7	5.6	-	3.7	72.2	-
N_2	3.7	5.6	5.6	-	5.6	79.6	-
N_3	3.7	3.7	3.7	3.7	3.7	79.6	1.9

C. TEST 33

R	1	2	3	4	5	6	7	12
N_1	7.1	17.9	-	3.6	3.6	67.9	-	-
N_2	-	7.1	7.1	3.6	7.1	71.4	-	3.6
N_3	-	-	3.6	-	-	89.3	3.6	3.6

D TEST 33

R	1	2	3	4	5	6	7	12
N_1	2.9	16.6	3.9	1.0	4.9	72.8	-	-
N_2	1.9	5.8	6.8	1.0	4.9	78.6	-	1.0
N_3	1.9	2.9	3.9	1.9	1.9	86.5	1.9	1.0

A. TEST 34

R	1	2	5	8	9	10
N_1	-	4.8	9.5	4.8	4.8	76.2
N_2	-	4.8	4.8	4.8	-	85.7
N_3	4.8	4.8	4.8	-	-	85.7

B. TEST 34

R	1	2	5	8	9	10	12
N_1	1.9	1.9	7.4	-	1.9	85.2	1.9
N_2	5.6	-	5.6	1.9	-	87.0	-
N_3	1.9	-	3.7	-	1.9	92.6	-

C TEST 34.

R.	1	5	8	10
N_1	3.6	7.1	3.6	85.7
N_2	3.6	3.6	-	92.9
N_3	3.6	7.1	-	89.3

D TEST 34

R	1	2	5	8	9	10	12
N_1	1.9	1.9	7.8	1.9	1.9	85.5	1.0
N_2	3.9	1.0	4.9	1.9	-	88.3	-
N_3	2.9	1.0	4.9	-	1.0	90.3	-

A. TEST 35

R	1	2	4	8
N_1	-	-	23.8	76.2
N_2	4.8	9.5	14.3	71.4
N_3	9.5	-	9.5	81.0

B TEST 35

R	1	2	3	4	5	6	7	8
N_1	-	1.9	-	13.0	1.9	-	1.9	81.5
N_2	1.9	9.3	-	9.3	-	1.9	-	77.8
N_3	3.7	1.9	1.9	9.3	-	-	1.9	81.5

C. TEST 35

R	1	4	5	7	8
N_1	3·6	7·1	-	-	89·3
N_2	7·1	7·1	-	7·1	78·6
N_3	3·6	7·1	3·6	3·6	82·1

D. TEST 35

R	1	2	3	4	5	6	7	8
N_1	1·0	1·0	-	13·6	1·0	-	1·0	82·5
N_2	3·9	6·8	-	9·7	-	1·0	1·9	76·7
N_3	4·9	1·0	1·0	8·7	1·0	-	1·9	81·6

A. TEST 36.

R	1	2	3	4
N_1	4·8	19·0	4·8	71·4
N_2	4·8	9·5	-	85·7
N_3	-	23·8	-	76·2

B. TEST 36

R	1	2	3	4
N_1	-	18·5	1·9	79·6
N_2	3·7	18·5	7·4	70·4
N_3	3·7	20·4	3·7	72·2

C. TEST 36

R	2	3	4	5	8
N_1	17·9	-	78·6	3·6	-
N_2	10·7	3·6	82·1	-	3·6
N_3	10·7	3·6	82·1	-	3·6

D. TEST 36

R	1	2	3	4	5	8
N_1	1·0	18·4	1·9	77·7	1·0	-
N_2	2·9	16·6	4·9	76·7	-	1·0
N_3	1·9	18·4	2·9	75·7	-	1·0

A. TEST 37

R	1	2	3	4	5	6
N_1	14·3	19·0	19·0	28·6	14·3	4·8
N_2	4·8	9·5	23·8	57·1	-	4·8
N_3	4·8	19·0	4·8	61·9	4·8	4·8

B. TEST 37

R	1	2	3	4	5	6	7
N_1	5·6	11·1	24·1	46·3	11·1	-	1·9
N_2	1·9	9·3	25·9	51·9	11·1	-	-
N_3	-	11·1	16·7	61·1	5·6	5·6	-

C. TEST 37

R	1	2	3	4	5	6
N_1	7·1	7·1	35·7	42·9	7·1	-
N_2	-	14·3	14·3	64·3	-	7·1
N_3	-	10·7	7·1	71·4	-	10·7

D. TEST 37

R	1	2	3	4	5	6	7
N_1	7·8	11·6	26·2	41·7	10·7	1·0	1·0
N_2	1·9	10·7	22·3	56·3	5·8	2·9	-
N_3	1·0	12·6	11·6	66·1	3·9	6·8	-

A. TEST 38

R	1	2	3	4	5	6	8
N_1	4.8	4.8	-	14.3	66.6	4.8	4.8
N_2	-	4.8	-	4.8	85.7	-	4.8
N_3	-	-	4.8	4.8	85.7	-	4.8

B. TEST 38

R	1	2	3	4	5	6	7	9
N_1	5.6	1.9	3.7	14.8	59.3	9.3	3.7	1.9
N_2	1.9	1.9	7.4	14.8	63.0	5.6	5.6	-
N_3	3.7	1.9	5.6	13.0	68.5	1.9	3.7	1.9

C. TEST 38.

R	1	3	4	5	6	8
N_1	3.6	10.7	14.3	64.3	-	7.1
N_2	-	3.6	25.0	64.3	3.6	3.6
N_3	-	7.1	14.3	71.4	3.6	3.6

D. TEST 38

R	1	2	3	4	5	6	7	8	9
N_1	4.9	1.9	4.9	14.6	62.1	5.8	1.9	2.9	1.0
N_2	1.0	1.9	4.9	15.6	68.0	3.9	2.9	1.9	-
N_3	1.9	1.0	5.8	11.6	72.8	1.9	1.9	1.9	1.0

A. TEST 39

R	2	3	4	5	6	7	10
N_1	4.8	-	4.8	-	85.7	-	4.8
N_2	-	4.8	-	4.8	85.7	-	4.8
N_3	-	4.8	-	9.5	76.2	4.8	4.8

B. TEST 39

R	1	2	3	4	5	6	7	8
N_1	-	7.4	-	3.7	11.1	68.5	7.4	1.9
N_2	1.9	1.9	1.9	3.7	9.3	72.2	9.3	-
N_3	3.7	1.9	1.9	1.9	5.6	70.4	13.0	1.9

C. TEST 39

R	2	3	5	6	7
N_1	3.6	-	3.6	92.9	-
N_2	3.6	-	7.1	85.7	3.6
N_3	3.6	3.6	-	92.9	-

D. TEST 39.

R	1	2	3	4	5	6	7	8	10
N_1	-	5.8	-	2.9	6.8	78.6	3.9	1.0	1.0
N_2	1.0	1.9	1.9	1.9	7.8	78.6	5.8	-	1.0
N_3	1.9	1.9	2.9	1.0	4.9	77.7	7.8	1.0	1.0

A TEST 40

R	1	2	3	4
N	9.5	81.0	4.8	4.8

B. TEST 40

R	1	2	3	4	5	7
N	11.1	63.0	9.3	9.3	3.7	3.7

C. TEST 40

R	1	2	3	5	8
N	10.7	75.0	7.1	3.6	3.6

D. TEST 40

R	1	2	3	4	5	7	8
N	10.7	69.9	7.8	5.8	2.9	1.9	1.0

A TEST 41

R	1	2	4	5	8
N	61·9	4·8	14·3	4·8	14·3

B. TEST 41

R	1	3	4	5	6	7	8	9	10	12
N	57·4	1·9	16·7	3·7	5·6	5·6	1·9	1·9	1·9	3·7

C TEST 41

R	1	2	3	4	8	14
N	50·0	7·1	21·4	14·3	3·6	3·6

D. TEST 41

R	1	2	3	4	5	6	7	8	9	10	12	14
N	56·3	2·9	6·8	15·5	2·9	2·9	2·9	4·9	1·0	1·0	1·0	1·0

A TEST 42

R	1	2	3	4	5	6
N	19·0	9·5	38·1	23·8	4·8	4·8

B. TEST 42

R	1	2	3	4	5	6	7	11	13
N	31·5	3·7	37·0	7·4	9·3	3·7	3·7	1·9	1·9

C TEST 42

R	1	2	3	4	8	12
N	28·6	10·7	50·0	3·6	3·6	3·6

D TEST 42

R	1	2	3	4	5	6	9	11	12	13
N	28·2	6·8	40·8	9·7	6·8	2·9	1·9	1·0	1·0	1·0

A. TEST 43

R	1	2	3	4	5	6	8	9
N_1	33·3	4·8	14·3	-	14·3	4·8	9·5	19·0
N_2	28·6	9·5	9·5	9·5	9·5	-	4·8	28·6
N_3	38·1	9·5	9·5	-	14·3	-	-	28·6

B. TEST 43

R	1	2	3	4	5	6	8	9	10	11
N_1	38·9	1·9	16·7	7·4	1·9	1·9	5·6	25·9	-	1·9
N_2	29·6	1·9	16·7	7·4	-	1·9	3·7	33·3	1·9	3·7
N_3	29·6	5·6	11·1	13·0	-	-	-	37·0	1·9	1·9

C. TEST 43

R	1	2	3	4	5	6	8	9
N_1	28·6	10·7	14·3	10·7	3·6	3·6	3·6	25·0
N_2	35·7	3·6	14·3	7·1	7·1	-	3·6	28·6
N_3	32·1	7·1	17·9	3·6	7·1	-	-	32·1

D. TEST 43

R	1	2	3	4	5	6	8	9	10	11
N_1	34·9	4·9	14·6	6·8	4·9	2·9	5·8	24·3	-	1·0
N_2	31·1	3·9	13·6	7·8	3·9	1·0	5·9	31·1	1·9	1·9
N_3	32·0	6·8	12·6	7·8	6·9	-	-	36·0	1·0	1·0

A. TEST 44

R	1	2	3	4	5	6	8	9
N_1	47·6	4·8	14·3	9·5	9·5	-	-	14·3
N_2	38·1	4·8	-	19·0	9·5	4·8	9·5	14·3
N_3	38·1	4·8	4·8	4·8	9·5	9·5	9·5	19·0

B TEST 44

R	1	2	3	4	5	6	8	9	10
N_1	27·8	9·3	13·0	7·4	-	3·7	3·7	33·3	1·9
N_2	22·2	5·6	7·4	7·4	7·4	3·7	1·9	42·6	1·9
N_3	27·8	9·3	3·7	7·4	7·4	3·7	-	38·9	1·9

C. TEST 44.

R	1	2	3	4	5	6	8	9
N_1	17.9	3.6	14.3	14.3	14.3	-	3.6	32.1
N_2	21.4	7.1	-	21.4	14.3	-	3.6	32.1
N_3	14.3	10.7	-	14.3	14.3	3.6	3.6	39.3

D. TEST 44

R	1	2	3	4	5	6	8	9	10
N_1	29.1	6.8	13.6	9.7	5.8	1.9	2.9	29.1	1.0
N_2	25.2	5.8	3.9	13.6	9.7	2.9	3.9	34.0	1.0
N_3	26.2	8.7	2.9	8.7	9.7	4.9	2.9	34.9	1.0

A. TEST 45

R	1	2	3	4	5	6	8	9	10
N_1	4.8	14.3	9.5	9.5	23.8	9.5	-	28.6	-
N_2	4.8	9.5	23.8	-	23.8	-	9.5	23.8	4.8
N_3	14.3	4.8	19.0	4.8	19.0	4.8	-	33.3	-

B. TEST 45.

R	1	2	3	4	5	6	7	8	9	10
N_1	13.0	5.6	20.4	5.6	11.1	3.7	1.9	-	35.2	3.7
N_2	16.7	7.4	24.1	3.7	9.3	1.9	-	3.7	29.6	3.7
N_3	16.7	5.6	18.5	5.6	5.6	3.7	1.9	1.9	38.9	1.9

C. TEST 45.

R	1	2	3	4	5	6	7	9
N_1	17.9	-	7.1	10.7	14.3	10.7	3.6	35.7
N_2	21.4	7.1	7.1	-	21.4	-	7.1	35.7
N_3	10.7	7.1	7.1	14.3	17.9	-	3.6	39.3

D TEST 45

R	1	2	3	4	5	6	7	8	9	10
N_1	12.6	5.8	14.6	7.8	14.6	6.8	1.9	-	34.0	1.9
N_2	15.5	7.8	19.4	1.9	15.5	1.0	1.9	3.9	30.1	2.9
N_3	14.6	5.8	16.5	7.8	11.6	2.9	1.9	1.0	37.9	1.0

A TEST 46

R	1	2	3	5	6	7	8	9	11	12
N_1	33.3	-	14.3	4.8	23.8	-	-	4.8	-	19.0
N_2	23.8	9.5	14.3	4.8	19.0	-	-	4.8	4.8	19.0
N_3	23.8	-	9.5	4.8	14.3	9.5	4.8	9.5	-	19.0

B. TEST 46

R	1	2	3	4	5	6	7	8	9	10	11	12	13	14
N_1	27.8	7.4	11.1	7.4	3.7	3.7	1.9	1.9	-	1.9	3.7	25.9	1.9	1.9
N_2	25.9	7.4	9.3	11.1	-	9.3	1.9	-	3.7	-	1.9	22.2	5.6	1.9
N_3	25.9	7.4	13.0	7.4	5.6	7.4	-	1.9	3.7	-	3.7	22.2	1.9	-

C. TEST 46

R	1	2	3	4	5	6	12	13
N_1	28.6	3.6	10.7	7.1	10.7	10.7	25.0	3.6
N_2	35.7	-	14.3	3.6	-	17.9	28.6	-
N_3	25.0	-	10.7	7.1	3.6	25.0	28.6	-

D TEST 46

R	1	2	3	4	5	6	7	8	9	10	11	12	13	14
N_1	29.1	4.9	11.6	5.8	5.8	9.7	1.0	1.0	1.0	1.0	1.9	26.3	1.9	1.0
N_2	28.2	5.8	11.6	4.8	[illegible]	13.6	1.0	-	2.9	-	1.9	23.3	2.9	1.0
N_3	26.2	3.9	11.6	5.8	4.9	13.6	1.9	1.9	3.9	-	1.9	23.3	1.0	-

A TEST 47

R	1	2	3	4	5	6	8	9	11	12
N_1	14·3	9·5	9·5	14·3	9·5	14·3	-	-	23·8	4·8
N_2	4·8	9·5	23·8	-	4·8	19·0	4·8	4·8	4·8	23·8
N_3	4·8	9·5	9·5	14·3	-	33·3	4·8	-	4·8	19·0

B TEST 47

R	1	2	3	4	5	6	7	8	9	10	11	12
N_1	18·5	5·6	11·1	5·6	14·8	5·6	-	1·9	1·9	-	33·3	1·9
N_2	20·4	7·4	7·4	9·3	1·9	11·1	1·9	-	3·7	1·9	7·4	27·8
N_3	18·5	5·6	13·0	3·7	1·9	13·0	3·7	3·7	-	3·7	1·9	31·5

C TEST 47

R	1	2	3	4	5	6	7	11	12
N_1	14·3	10·7	7·1	25·0	3·6	3·6	3·6	28·6	3·6
N_2	17·9	17·9	14·3	3·6	-	10·7	3·6	3·6	28·6
N_3	21·4	7·1	10·7	3·6	3·6	10·7	10·7	3·6	28·6

D TEST 47

R	1	2	3	4	5	6	7	8	9	10	11	12
N_1	16·5	7·8	9·7	12·6	10·7	6·8	1·0	1·0	1·0	-	30·1	2·9
N_2	16·5	10·7	12·6	5·8	1·9	11·6	1·9	1·0	2·9	1·0	5·8	27·2
N_3	16·5	6·8	11·6	5·8	1·9	16·5	4·9	2·9	-	1·9	2·9	22·3

A. TEST 48

R	1	2	4	5	6	8	9	10	13	16
N_1	33·3	-	4·8	-	9·5	23·8	9·5	4·8	-	14·3
N_2	33·3	4·8	4·8	4·8	4·8	19·0	4·8	-	4·8	19·0
N_3	33·3	-	14·3	-	4·8	23·8	9·5	-	-	14·3

B TEST 48

R	1	2	3	4	5	6	7	8	9	12	14	15	16	17
N_1	29·6	7·4	1·9	9·3	-	-	1·9	16·7	3·7	1·9	1·9	1·9	20·4	3·7
N_2	29·6	7·4	-	5·6	1·9	1·9	1·9	22·2	3·7	-	-	-	22·2	3·7
N_3	25·9	9·3	3·7	9·3	-	-	3·7	11·1	3·7	-	-	-	31·5	1·9

C. TEST 48

R	1	2	3	4	5	6	7	8	9	10	13	14	15	16	17
N_1	32·1	10·7	3·6	3·6	3·6	-	-	17·9	-	3·6	-	3·6	-	17·9	3·6
N_2	32·1	7·1	3·6	7·1	-	-	3·6	21·4	-	-	3·6	-	-	21·4	-
N_3	35·7	3·6	7·1	3·6	-	-	-	21·4	3·6	-	-	-	-	25·0	-

D TEST 48

R	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17
N_1	31·1	6·8	1·9	6·8	1·0	1·9	1·0	18·4	3·9	1·9	1·0	-	1·9	1·0	18·4	2·9
N_2	31·1	6·8	1·0	5·8	1·9	1·9	1·9	21·4	2·9	-	-	1·9	-	-	21·4	1·9
N_3	30·1	5·8	3·9	8·7	-	1·0	1·9	16·5	4·9	-	-	-	-	-	24·3	1·0

A. TEST 49

R	1	2	3	4	5	6	7	9	12
N_1	14·3	9·5	4·8	9·5	-	14·3	19·0	4·8	23·8
N_2	19·0	4·8	4·8	19·0	4·8	19·0	14·3	4·8	9·5
N_3	14·3	9·5	19·0	9·5	14·3	14·3	4·8	-	14·3

B. TEST 49

R	1	2	3	4	5	6	8	10	11	12	13
N_1	22·2	9·3	9·3	3·7	1·9	16·7	3·7	1·9	1·9	25·9	3·7
N_2	20·4	13·0	9·3	3·7	1·9	16·7	1·9	-	-	33·3	-
N_3	18·5	5·6	18·5	9·3	-	20·4	1·9	-	1·9	24·1	-

C TEST 49

R	1	2	3	4	5	6	7	9	11	12
N_1	14·3	7·1	17·9	7·1	-	21·4	3·6	-	-	28·6
N_2	7·1	7·1	14·3	17·9	-	21·4	-	7·1	-	25·0
N_3	14·3	3·6	21·4	7·1	14·3	14·3	-	-	3·6	21·4

D. TEST 49

R	1	2	3	4	5	6	7	8	9	10	11	12	13
N_1	13·6	8·7	10·7	3·9	1·0	17·5	6·9	1·9	1·0	1·0	1·0	26·2	1·9
N_2	16·5	9·7	9·7	10·7	1·9	13·6	2·9	1·0	2·9	-	-	26·2	-
N_3	16·5	5·8	19·4	5·8	6·8	17·5	1·0	1·0	-	-	1·9	21·4	-

A TEST 50

R	1	2	4	5	6	8	9
N_1	33·3	4·8	28·6	4·8	-	23·8	4·8
N_2	33·3	9·5	23·8	4·8	4·8	23·8	-
N_3	28·6	-	42·9	-	4·8	23·8	-

B. TEST 50

R	1	2	3	4	5	6	7	8	9	10
N_1	27·8	9·3	3·7	16·7	3·7	7·4	-	27·8	1·9	1·9
N_2	18·5	16·7	5·6	24·1	3·7	1·9	1·9	25·9	1·9	-
N_3	22·2	9·3	5·6	25·9	-	3·7	3·7	29·6	-	-

C TEST 50

R	1	2	3	4	5	6	7	8	9
N_1	35·7	3·6	3·6	17·9	3·6	3·6	3·6	28·6	-
N_2	25·0	14·3	3·6	14·3	7·1	-	-	35·7	-
N_3	28·6	7·1	3·6	21·4	3·6	-	-	32·1	3·6

D. TEST 50

R	1	2	3	4	5	6	7	8	9	10
N_1	31·1	6·8	2·9	18·4	3·9	4·9	1·0	29·2	1·9	1·0
N_2	23·3	16·5	3·9	21·4	4·9	1·9	1·0	28·2	1·0	-
N_3	25·2	6·8	3·9	28·2	1·0	2·9	1·9	29·1	1·0	-

A. TEST 51

R	1	2	3	4	5	6	8	9
N_1	47·6	9·5	4·8	4·8	-	4·8	23·8	4·8
N_2	47·6	4·8	-	14·3	-	-	33·3	-
N_3	47·6	4·8	-	19·0	4·8	-	23·8	-

B. TEST 51

R	1	2	3	4	5	6	7	8	9
N_1	29·6	14·8	3·7	20·4	3·7	-	-	25·9	1·9
N_2	24·1	18·5	-	24·1	-	3·7	-	29·6	-
N_3	25·9	13·0	-	25·9	-	1·9	1·9	31·5	-

C TEST 51

R	1	2	3	4	5	7	8
N_1	28.6	7.1	7.1	14.3	-	3.6	39.3
N_2	42.9	3.6	3.6	10.7	3.6	3.6	32.1
N_3	35.7	10.7	-	10.7	3.6	3.6	35.7

D. TEST 51.

R	1	2	3	4	5	6	7	8	9
N_1	33.0	11.6	4.9	15.5	1.9	1.0	1.0	29.1	1.9
N_2	36.0	11.6	1.0	15.6	1.0	1.9	1.0	31.1	-
N_3	33.0	10.[illegible]	-	20.4	1.9	1.0	1.9	31.1	-

A TEST 52.

R	1	2	3	4	5	6	7	8	11	12
N_1	23.8	-	4.8	9.5	-	23.8	14.3	-	-	19.0
N_2	9.5	4.8	4.8	19.0	4.8	19.0	9.5	4.8	4.8	19.0
N_3	14.3	4.8	9.5	19.0	-	19.0	4.8	9.5	-	19.0

B TEST 52.

R	1	2	3	4	5	6	7	8	9	11	12
N_1	16.7	5.6	14.8	7.4	3.7	20.1	1.9	3.7	1.9	1.9	18.5
N_2	13.0	9.3	9.3	16.8	1.9	20.4	1.9	3.7	1.9	-	24.1
N_3	18.5	11.1	14.8	7.4	1.9	18.5	1.9	-	3.7	1.9	20.4

C TEST 52.

R	1	2	3	4	5	6	7	8	11	12	13
N_1	25.0	17.9	3.6	3.6	3.6	14.3	10.7	-	3.6	17.9	-
N_2	14.3	17.9	3.6	3.6	7.1	25.0	7.1	-	-	17.9	3.6
N_3	14.3	14.3	7.1	3.6	-	21.4	10.7	3.6	-	25.0	-

D TEST 52

R	1	2	3	4	5	6	7	8	9	11	12	13
N_1	21.4	7.8	9.7	6.8	2.9	21.4	6.8	1.9	1.0	1.9	18.4	-
N_2	12.6	10.7	6.8	12.6	3.9	21.4	4.9	2.9	1.0	1.0	21.4	1.0
N_3	16.5	10.7	11.6	8.7	1.0	19.4	4.9	2.9	1.9	1.0	21.4	-

A. TEST 53.

R	1	2	3	4	5	6	7	8	9	11	12
N_1	19.0	4.8	4.8	9.5	14.3	19.0	-	4.8	4.8	-	14.3
N_2	9.5	14.3	4.8	14.3	-	19.0	9.5	4.8	4.8	-	19.0
N_3	14.3	4.8	-	19.0	-	19.0	9.5	4.8	-	4.8	23.8

B TEST 53.

R	1	2	3	4	5	6	7	8	9	10	11	12	13
N_1	24.1	1.9	13.0	13.0	1.9	18.5	9.3	1.9	-	-	1.9	16.7	3.7
N_2	22.2	9.3	13.0	9.3	5.6	9.3	3.7	1.9	-	-	1.9	24.1	-
N_3	16.7	9.3	7.4	16.7	-	14.8	3.7	1.9	1.9	1.9	1.9	24.1	-

C. TEST 53

R	1	2	3	4	5	6	7	8	9	10	12
N_1	10.7	3.6	-	25.0	3.6	17.9	3.6	7.1	3.6	7.1	17.9
N_2	10.7	3.6	17.9	17.9	3.6	14.3	10.7	-	-	-	21.4
N_3	14.3	7.1	3.6	21.4	3.6	21.4	3.6	-	3.6	-	21.4

D. TEST 53

R	1	2	3	4	5	6	7	8	9	10	11	12	13
N_1	19.4	2.9	7.8	15.5	6.9	15.5	5.8	3.9	2.9	1.9	1.0	16.5	1.9
N_2	16.5	8.7	12.6	12.6	3.9	13.6	6.8	1.9	1.0	-	1.0	23.3	-
N_3	15.5	7.8	6.9	18.4	1.0	19.5	6.9	1.9	1.9	1.0	1.9	23.3	-

A. TEST 54

R	1	2	3	4	5	6	8	9	10	15	19	20
N_1	33.3	-	4.8	4.8	4.8	4.8	14.3	14.3	4.8	9.5	4.8	-
N_2	23.8	4.8	-	9.5	4.8	4.8	9.5	23.8	-	14.3	4.8	-
N_3	14.3	-	-	4.8	9.5	4.8	14.3	23.8	-	19.0	4.8	4.8

B TEST 54

R	1	2	3	4	5	6	7	8	9	10	11	15	17	18	19	20
N_1	25.9	5.6	3.7	3.7	1.9	7.4	1.9	5.6	11.1	-	3.7	3.7	1.9	13.0	3.7	7.4
N_2	25.9	5.6	5.6	1.9	1.9	3.7	-	5.6	18.5	3.7	1.9	-	1.9	14.8	7.4	1.9
N_3	25.9	5.6	1.9	3.7	1.9	1.9	1.9	5.6	12.2	5.6	1.9	-	-	18.5	3.7	-

C. TEST 54

R	1	2	3	4	5	6	7	8	9	10	12	16	17	18	19	20
N_1	32.1	3.6	-	3.6	3.6	10.7	-	3.6	21.4	-	-	7.1	-	10.7	3.6	-
N_2	17.9	7.1	-	10.7	3.6	10.7	-	3.6	17.9	3.6	3.6	-	3.6	14.3	-	3.6
N_3	17.9	3.6	7.1	10.7	-	7.1	3.6	3.6	17.9	-	3.6	3.6	-	14.3	7.1	-

D TEST 54.

R	1	2	3	4	5	6	7	8	9	10	11	12	15	17	18	19	20
N_1	29.1	3.9	2.9	3.9	2.9	7.8	1.0	6.8	16.6	1.0	1.9	-	3.9	1.0	11.6	3.9	3.9
N_2	33.3	5.8	2.9	5.8	2.9	5.8	-	5.8	19.4	2.9	1.0	1.0	-	1.9	16.6	4.9	1.9
N_3	21.6	3.9	2.9	5.8	2.9	3.9	1.9	6.8	21.6	2.9	1.0	1.0	1.0	-	17.5	4.9	1.0

A. TEST 55

R	1	2	4	5	6	7	8	9	10	11	13	16	17	27	28
N_1	19.0	-	-	4.8	-	33.3	-	-	9.5	-	4.8	9.5	-	-	19.0
N_2	14.3	4.8	-	-	-	38.1	4.8	4.8	4.8	-	4.8	4.8	4.8	4.8	9.5
N_3	14.3	9.5	4.8	-	4.8	19.0	9.5	-	4.8	4.8	4.8	4.8	-	-	19.0

B. TEST 55

R	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	18	23	24	25	26	27	28	29
N_1	29.6	3.7	1.9	-	-	-	11.1	1.9	-	5.6	1.9	-	3.7	11.1	3.7	3.7	-	1.9	-	-	3.7	1.9	5.6	9.3
N_2	27.8	5.6	1.9	-	-	-	16.7	1.9	1.9	-	-	-	9.3	16.7	-	1.9	-	1.9	1.9	1.9	5.6	3.7	3.7	-
N_3	24.1	3.7	-	3.7	1.9	3.7	11.1	1.9	-	-	-	1.9	5.6	20.4	-	1.9	1.9	-	1.9	3.7	3.7	1.9	5.6	1.9

C. TEST 55

R	1	2	3	4	5	6	7	8	9	10	11	13	16	21	22	23	24	27	28	29
N_1	28.6	-	3.6	10.7	3.6	3.6	3.6	3.6	3.6	-	3.6	7.1	7.1	-	-	3.6	-	-	10.7	10.7
N_2	25.0	10.7	-	7.1	-	-	7.1	-	3.6	-	-	3.6	10.7	7.1	3.6	-	-	-	21.4	-
N_3	17.9	-	10.7	-	-	7.1	14.3	-	3.6	3.6	3.6	3.6	10.7	-	-	-	3.6	3.6	14.3	3.6

D TEST 55

R	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	21	22	23	24	25	26	27	28	29
N_1	26.2	1.9	1.9	2.9	1.9	1.0	13.6	1.9	1.0	4.9	1.9	-	4.9	9.7	1.9	1.9	-	-	-	-	1.9	-	-	1.9	1.0	9.7	7.8
N_2	14.3	6.8	1.0	1.9	-	-	17.5	1.9	2.9	1.0	-	-	6.8	13.6	-	1.0	1.0	-	1.9	1.0	1.0	1.0	1.0	2.9	2.9	9.7	-
N_3	20.4	3.9	2.9	2.9	1.0	4.9	13.6	3.9	1.0	1.9	1.9	1.0	4.9	16.6	-	1.0	-	1.0	-	-	-	1.9	1.9	1.9	1.7	10.7	1.9

A TEST 56.

R	1	2	3	4	5	6	8	9	10	17	18	21	22
N_1	-	4.8	-	19.0	23.8	14.3	4.8	-	9.5	4.8	14.3	-	-
N_2	4.8	9.5	4.8	9.5	33.3	14.3	-	4.8	-	-	9.5	-	4.8
N_3	-	9.5	4.8	-	47.6	19.0	-	-	4.8	-	9.5	4.8	-

B TEST 56

R	1	2	3	4	5	6	7	8	9	10	11	16	17	18	19	20	21	22
N_1	20.4	3.7	3.7	1.9	18.5	7.4	9.3	7.4	7.4	9.3	1.9	1.9	1.9	1.9	1.9	5.6	1.9	-
N_2	16.7	1.9	5.6	7.4	24.1	13.0	7.4	3.7	1.9	9.3	-	1.9	1.9	-	1.9	1.9	-	3.7
N_3	22.2	1.9	1.9	-	24.1	16.7	9.3	3.7	5.6	5.6	-	-	-	1.9	-	5.6	1.9	-

C TEST 56

R	1	2	3	4	5	6	7	8	9	10	16	17	19	20	21	28
N_1	14.3	-	3.6	7.1	32.1	17.9	3.6	-	7.1	3.6	3.6	3.6	3.6	3.6	3.6	3.6
N_2	10.7	-	-	10.7	28.6	-	10.7	3.6	7.1	3.6	-	-	7.1	10.7	-	-
N_3	10.7	3.6	3.6	7.1	32.1	7.1	7.1	-	3.6	7.1	-	3.6	-	10.3	-	-

D. TEST 56

R	1	2	3	4	5	6	7	8	9	10	11	16	17	18	19	20	21	22	28
N_1	11.6	2.9	2.9	6.8	21.6	11.6	6.8	4.9	5.8	7.8	1.0	1.9	2.9	1.0	1.9	6.8	1.9	-	1.0
N_2	12.6	2.9	2.9	5.7	29.1	10.9	6.8	2.9	3.9	4.9	-	1.0	1.0	-	2.9	5.8	-	2.9	-
N_3	14.0	3.9	2.9	1.9	31.1	14.6	6.8	1.9	3.9	5.8	~	-	1.0	1.0	-	8.7	1.9	-	-

A. TEST 57

R	1	2	3	4	6	8
N_1	-	66.6	14.3	14.3	-	4.8
N_2	-	71.4	4.8	9.5	4.8	9.5
N_3	9.5	61.9	4.8	14.3	4.8	4.8

B. TEST 57.

R	1	2	3	4	5	6	7	8	9	16
N_1	5.6	46.3	11.1	18.5	-	-	3.7	11.1	1.9	1.9
N_2	3.7	61.1	11.1	24.1	-	-	-	9.3	1.9	1.9
N_3	3.7	44.4	7.4	27.8	1.9	1.9	-	9.3	1.9	1.9

C TEST 57.

R	1	2	3	4	6	7	8
N_1	10.7	35.7	10.7	21.4	3.6	-	17.9
N_2	17.9	35.7	3.6	25.0	-	3.6	14.3
N_3	10.7	42.9	10.7	21.4	-	-	14.3

D. TEST 57

R	1	2	3	4	5	6	7	8	9	16
N_1	5.8	47.6	11.6	18.4	-	1.0	1.9	11.6	1.0	1.0
N_2	6.8	49.5	7.8	21.4	-	1.0	1.0	10.7	1.0	1.0
N_3	6.8	47.6	7.8	23.3	1.0	1.9	-	9.7	1.0	1.0

A. TEST 58

R	2	3	4	5	7	8	9
N_1	38.1	9.5	33.3	-	-	14.3	4.8
N_2	47.6	9.6	23.8	4.8	-	9.5	4.8
N_3	57.1	-	19.0	-	4.8	14.3	4.8

B. TEST 58

R	1	2	3	4	5	6	7	8	9	14
N_1	5.6	33.3	3.7	36.2	3.7	1.9	1.9	13.0	1.9	-
N_2	3.7	37.0	-	38.9	5.6	-	-	13.0	-	1.9
N_3	3.7	40.7	3.7	31.5	3.7	-	1.9	13.0	-	1.9

C TEST 58

R	1	2	3	4	8
N_1	10.7	32.1	14.3	14.3	28.6
N_2	7.1	46.4	3.6	17.9	25.0
N_3	7.1	46.4	3.6	17.9	25.0

D TEST 58

R	1	2	3	4	5	6	7	8	9	16
N_1	5.8	36.9	7.8	29.1	1.9	1.0	1.0	19.5	1.9	-
N_2	2.9	61.7	2.9	30.1	3.9	-	-	18.5	1.0	1.0
N_3	3.9	45.6	2.9	28.2	1.9	-	1.9	16.5	1.0	1.0

A TEST 59

R	1	2	4	5	6	7	8
N_1	-	57·1	23·8	4·8	4·8	-	9·5
N_2	-	57·1	33·3	-	4·8	4·8	9·5
N_3	4·8	61·9	14·3	4·8	4·8	-	9·5

B. TEST 59.

R	1	2	3	4	5	6	7	8	10
N_1	5·6	44·4	7·4	26·1	1·9	1·9	1·9	8·1	1·9
N_2	7·4	37·0	7·4	27·8	3·7	1·9	1·9	11·1	1·9
N_3	3·7	46·3	9·3	25·9	-	-	1·9	11·1	1·9

C. TEST 59.

R	1	2	3	4	5	8	9
N_1	17·9	42·9	10·7	7·1	3·6	17·9	-
N_2	10·7	42·9	7·1	21·4	-	14·3	3·6
N_3	10·7	46·4	10·7	14·3	-	17·9	-

D. TEST 59.

R	1	2	3	4	5	6	7	8	9	10
N_1	7·8	46·6	6·8	19·4	3·9	1·9	1·0	12·6	-	1·0
N_2	6·8	42·7	5·8	25·2	1·9	1·9	1·9	11·6	1·0	1·0
N_3	5·8	49·5	7·8	20·4	1·0	1·0	1·0	12·6	-	1·0

A. TEST 60.

R	1	2	3	4	8	9
N_1	4·8	66·6	14·3	9·5	-	4·8
N_2	-	71·4	14·3	9·5	4·8	-
N_3	-	71·4	14·3	9·5	4·8	-

B. TEST 60

R	1	2	3	4	5	6	8
N_1	1·9	51·9	11·1	25·9	1·9	-	7·4
N_2	1·9	48·1	13·0	25·9	3·7	1·9	5·6
N_3	3·7	53·7	9·3	22·2	1·9	3·7	5·6

C. TEST 60.

R	1	2	3	4	5	6	7	8
N_1	3·6	78·6	-	10·7	-	3·6	3·6	3·6
N_2	7·1	64·3	7·1	10·7	3·6	3·6	-	3·6
N_3	7·1	71·4	3·6	7·1	-	3·6	-	7·1

D. TEST 60

R	1	2	3	4	5	6	7	8	9
N_1	2·9	61·1	8·7	18·4	1·0	1·0	1·0	4·9	1·0
N_2	2·9	59·8	11·6	18·4	2·9	1·9	-	4·9	-
N_3	3·9	62·1	8·7	16·5	1·0	2·9	-	5·8	-

A TEST 61

R	1	2	3	4	5	6	8
N_1	9·5	57·1	4·8	19·0	4·8	-	4·8
N_2	4·8	66·6	4·8	14·3	-	4·8	4·8
N_3	4·8	61·9	4·8	28·6	-	-	-

B. TEST 61

R	1	2	3	4	5	6	7	8	12
N_1	13·0	48·1	7·4	16·8	5·6	3·7	-	5·6	1·9
N_2	16·7	42·6	7·4	20·4	3·7	3·7	-	3·7	1·9
N_3	7·4	55·6	5·6	22·2	-	1·9	1·9	3·7	1·9

C. TEST 61

R	1	2	3	4	5	8
N_1	16·7	56·0	21·4	13·7	-	7·1
N_2	10·7	53·6	14·3	10·7	3·6	7·1
N_3	10·7	64·3	10·7	7·1	-	7·1

D TEST 61

R	1	2	3	4	5	6	7	8	12
N_1	11·6	50·5	10·7	14·6	3·9	1·9	-	5·8	1·0
N_2	12·6	50·6	8·7	16·5	2·9	2·9	-	4·9	1·0
N_3	7·8	59·2	6·8	19·4	-	1·0	1·0	3·9	1·0

A. TEST 62

R	1	2	3	4	6	7	8	12
N_1	4·8	4·8	61·9	9·5	14·3	-	-	4·8
N_2	-	9·5	71·4	4·8	4·8	4·8	-	4·8
N_3	-	4·8	71·4	9·5	9·5	-	4·8	-

B. TEST 62

R	1	2	3	4	5	6	7	12
N_1	5·6	9·3	48·1	13·0	1·9	13·0	5·6	3·7
N_2	5·6	7·4	53·7	9·3	1·9	13·0	5·6	3·7
N_3	9·3	3·7	51·9	13·0	1·9	9·3	5·6	5·6

C. TEST 62

R	1	2	3	4	6	10	12
N_1	14·3	3·6	57·1	3·6	14·3	-	7·1
N_2	14·3	-	60·7	10·7	7·1	3·6	3·6
N_3	14·3	7·1	60·7	3·6	7·1	-	7·1

D. TEST 62

R	1	2	3	4	5	6	7	8	10	12
N_1	7·8	6·8	53·4	9·7	1·0	13·6	2·9	-	-	4·9
N_2	6·8	5·8	59·2	8·7	1·0	9·7	3·9	-	1·0	3·9
N_3	8·7	4·9	58·2	9·7	1·0	8·7	2·9	1·0	-	4·9

A. TEST 63

R	1	2	3	4	5	7	8
N_1	33·3	23·8	23·8	9·5	4·8	-	4·8
N_2	33·3	19·0	23·8	4·8	-	19·0	-
N_3	33·3	19·0	23·8	9·5	-	14·3	-

B. TEST 63

R	1	2	3	4	5	7	8	13
N_1	22·2	25·9	16·7	11·1	3·7	16·7	1·9	1·9
N_2	25·9	20·4	18·5	13·0	3·7	16·7	-	1·9
N_3	27·8	20·4	16·7	13·0	3·7	16·7	-	1·9

C. TEST 63

R	1	2	3	4	6	7
N_1	25·0	50·0	7·1	3·6	-	14·3
N_2	35·7	21·4	17·9	10·7	-	14·3
N_3	35·7	17·9	3·6	17·9	3·6	21·4

D TEST 63

R	1	2	3	4	5	6	7	8	13
N_1	25·2	32·0	15·5	8·7	1·0	1·9	12·6	1·9	1·0
N_2	30·1	20·4	19·4	10·7	-	1·9	16·5	-	1·0
N_3	31·1	19·4	14·6	13·6	-	2·9	17·5	-	1·0

A. TEST 64.

R	1	2	3	4	5	6	7	10	12
N_1	14.3	-	9.5	14.3	9.5	28.6	4.8	-	19.0
N_2	14.3	4.8	4.8	23.8	-	23.8	4.8	4.8	19.0
N_3	19.0	-	4.8	23.8	-	33.3	4.8	-	14.3

B. TEST 64

R	1	2	3	4	5	6	7	8	12	18
N_1	11.1	9.3	9.3	13.0	3.7	33.3	7.4	1.9	9.3	1.9
N_2	13.0	7.4	18.5	13.0	9.3	24.1	5.6	-	7.4	1.9
N_3	11.1	9.3	9.3	16.7	5.6	37.0	1.9	-	7.4	1.9

C. TEST 64

R	1	2	3	4	5	6	7	8	12
N_1	21.4	3.6	10.7	17.9	7.1	28.6	-	-	10.7
N_2	14.3	10.7	10.7	21.4	-	-	-	32.1	10.7
N_3	21.4	7.1	3.6	25.0	-	25.0	3.6	3.6	10.7

D. TEST 64.

R	1	2	3	4	5	6	7	8	10	12	18
N_1	14.6	5.8	9.7	14.6	5.8	31.1	4.9	1.0	-	11.6	1.0
N_2	13.6	7.8	13.6	17.5	4.9	17.5	3.9	8.7	1.0	10.7	1.0
N_3	15.5	6.8	6.8	20.6	2.9	33.0	2.9	1.0	-	9.7	1.0

A. TEST 65

R	1	2	3	4	5	6	7	8	9	14	15
N_1	19.0	-	4.8	4.8	4.8	14.3	14.3	4.8	28.6	4.8	-
N_2	9.5	-	9.5	14.3	4.8	14.3	9.5	9.5	23.8	-	4.8
N_3	9.5	-	4.8	14.3	4.8	23.8	14.3	4.8	19.0	4.8	-

B. TEST 65

R	1	2	3	4	5	6	7	8	9	10	11	18
N_1	14.8	5.6	5.6	1.9	1.9	13.0	11.1	9.3	22.2	5.6	1.9	7.4
N_2	16.7	7.4	5.6	3.7	-	18.5	9.3	11.1	18.5	1.9	-	7.4
N_3	18.5	7.4	5.6	-	-	27.8	11.1	5.6	16.7	1.9	-	5.6

C. TEST 65

R	1	2	3	4	5	6	7	8	9	10	12	16	17	18	19
N_1	17.9	-	3.6	7.1	7.1	21.4	7.1	10.7	10.7	-	3.6	3.6	-	3.6	3.6
N_2	21.4	-	3.6	-	10.7	21.4	3.6	17.9	7.1	-	3.6	-	3.6	7.1	-
N_3	14.3	3.6	3.6	-	10.7	25.0	7.1	14.3	7.1	3.6	3.6	-	-	3.6	3.6

D. TEST 65

R	1	2	3	4	5	6	7	8	9	10	11	12	14	15	16	17	18	19
N_1	16.0	2.9	4.9	2.9	3.9	18.5	10.7	8.7	20.6	2.9	1.4	1.0	1.0	-	1.0	-	6.9	1.0
N_2	16.5	3.9	5.8	4.9	3.9	11.6	7.8	12.6	16.6	1.0	-	1.0	-	1.0	-	1.0	5.8	-
N_3	15.5	4.9	6.9	2.9	3.9	26.2	10.7	7.8	14.6	1.9	-	1.0	1.0	-	-	-	3.9	1.0

A TEST 66

R	1	2	3	4	5	6	7	8	9	15
N_1	4.8	-	4.8	23.8	33.3	9.5	4.8	4.8	9.5	4.8
N_2	4.8	-	4.8	9.5	23.8	19.0	4.8	19.0	4.8	4.8
N_3	4.8	4.8	-	-	47.6	23.8	-	9.5	4.8	4.8

B TEST 66

R	1	2	3	4	5	6	7	8	9	14	15	16	18
N_1	11.1	1.9	9.3	26.1	22.2	13.0	11.1	3.7	1.9	-	1.9	-	-
N_2	11.1	7.4	3.7	5.6	27.8	16.8	16.8	5.6	3.7	1.9	-	1.9	1.9
N'_3	11.1	7.4	11.1	5.6	33.3	16.8	9.3	3.7	1.9	-	1.9	-	-

C. TEST 66

R	1	2	3	4	5	6	7	8	9	12	14	15	16
N_1	28.6	-	3.6	21.4	21.4	7.1	-	10.7	3.6	-	-	7.1	3.6
N_2	14.3	3.6	3.6	3.6	50.0	3.6	-	7.1	-	3.6	3.6	3.6	3.6
N_3	14.3	3.6	-	10.7	35.7	7.1	7.1	7.1	-	3.6	-	7.1	3.6

D. TEST 66

R	1	2	3	4	5	6	7	8	9	12	14	15	16	18
N_1	12.6	1.0	6.8	23.3	26.3	10.7	6.8	6.8	3.9	-	-	3.9	1.0	-
N_2	10.7	4.9	3.9	5.8	36.0	12.6	8.7	8.7	2.9	1.0	1.9	1.9	1.9	1.0
N_3	10.7	5.8	5.8	5.8	36.9	14.6	6.8	5.8	1.9	1.0	-	3.9	1.0	-

A TEST 67

R	1	3	4	5	6	7	8	9	13	18
N_1	19.0	-	4.8	4.8	33.3	9.5	4.8	14.3	4.8	4.8
N_2	9.5	-	-	9.5	47.6	19.0	-	9.5	-	4.8
N_3	4.8	4.8	4.8	9.5	52.4	4.8	4.8	9.5	-	4.8

B TEST 67

R	1	2	3	4	5	6	7	8	9	10	18	19
N_1	14.8	3.7	3.7	-	3.7	24.1	20.4	1.9	20.4	1.9	1.9	3.7
N_2	11.1	5.6	1.9	-	9.3	35.2	11.1	5.6	16.7	1.9	1.9	-
N_3	9.3	3.7	7.4	1.9	7.4	35.2	9.3	9.6	14.8	1.9	1.9	-

C. TEST 67

R	1	2	3	4	5	6	7	8	9	12	13	16	17	18	19
N_1	14.3	-	-	3.6	17.9	28.6	10.7	3.6	7.1	3.6	3.6	-	-	3.6	3.6
N_2	14.3	3.6	-	3.6	3.6	39.3	3.6	7.1	10.7	3.6	-	-	3.6	3.6	3.6
N_3	10.7	3.6	3.6	3.6	3.6	39.3	3.6	10.7	10.7	3.6	-	3.6	-	-	3.6

D. TEST 67

R	1	2	3	4	5	6	7	8	9	10	12	13	16	17	18	19
N_1	15.5	1.9	1.9	1.9	7.8	27.2	15.5	2.9	[illegible]	1.0	1.0	1.9	-	-	2.9	2.9
N_2	11.6	3.9	1.0	1.0	7.8	38.8	10.7	4.9	13.6	1.0	1.0	-	-	1.0	2.9	1.0
N_3	8.7	2.9	5.8	2.9	6.8	39.8	6.8	7.8	12.6	1.0	1.0	-	1.0	-	1.9	1.0

[See text, page 172]

SCORING KEY.

Test	Acceptable answer	Test	Acceptable answer
26	6 OR 3 OR 2	49	3 (6)
27	5	50	1 OR 2 OR 4
28	3	51	1 OR 2 OR 4
29	4 OR 2	52	4 OR 2.
30	6 OR 3 OR 2	53	4 OR 2
31	5	54	6 OR 3
32	4 OR 2	55	7
33	3 (6)	56	5
34	5 (10)	57	2 OR 4
35	4 (2) (8)	58	2 OR 4
36	2 (4)	59	2 OR 4
37	3	60	2 OR 4
38	4 OR 2	61	2 OR 4
39	5	62	3 OR 2
43	3	63	1
44	3	64	4 OR 2
45	3	65	6 OR 3 OR 2
46	3	66	5
47	3 (6)	67	6 OR 3 OR 2
48	4		

[See text, page 172]

THE SUBJECTS WHO SCORED IN THE HARMONIC TESTS

Subject	Total of 4 tests	Rank in teacher's estimate	Rank in group music test	Rank in I.Q.
T.T.	3	B	6	41½
A.D	2	C	25	36½
A.McK.	2	A	5	1
M.B	1	C	27	31½
M.D.	1	C	9	3
P.Q.	1	B	48	26
J.M.	1	C	23	43½
W.P.	1	A	36	4½
D.S.	1	B	30	13
M.M.	1	A	18	14
T.K.	1	B	31½	48

A mean square contingency coefficient was worked out between success in the harmony tests and success in the perception tests as a whole. The contingency table becomes;

Harmony

Perception		A	B
	A	6	17
	B	5	20

The A and B groups of the perception tests are made up of the individuals on either side of the median. The harmony groups are composed of those who made any score and those who made no score respectively,

C = ·01 ;

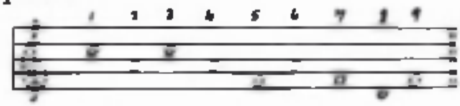
corrected C = ·01

There is therefore no significant relationship between shape perception in melodies and shape perception of harmonies, at least according to the measures and tests used here. The functions concerned with these processes should therefore be regarded as independent at age 13, although they may possibly show some overlap at later ages or after special training.

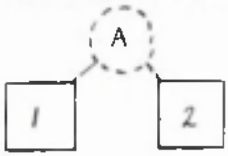
The independence demonstrated here shows the need for training harmonic sense. It is not enough to assume that melodic training will automatically develop harmonic sense.

[See text, page 176] ANALYSIS.

Consider the example:-



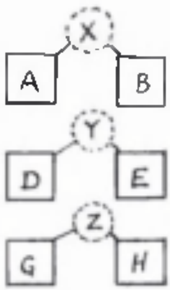
(a) After hearing notes 1 and 2, the subject, by means of the principle 'Eduction of Relations' tends to perceive the relation between them, viz., a fall in pitch, or 'downward movement', or 'downward progression'.



'A' represents the relation 'downward movement'.

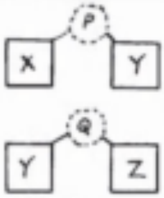
Continuing with 2-3, 3-4, etc., the relations B, C, D, E, F, G, H are evoked, where C, D, F, G, are relations like A, whereas B, E, H, are relations of the type 'upward movement'. From these relations, a further elaboration takes place, of the form:-

(b)



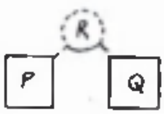
where X, Y, Z are relations of the type 'down, then up'.

(c) Next the relations:-



where P and Q are relations of the type 'equal' or 'similar' or 'related'.

(d) Next:-



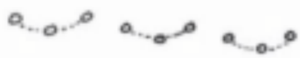
where R is of the type 'equal' (or similar or related).

At this stage, the three-fold grouping of the melody should be apparent.

Stage (a) depends on the Sense of Pitch followed by the principle 'Eduction of Relations', whilst the remainder depend on the latter principle only. At all stages, the influence of imagery is clearly apparent. The task of determining the groups is obviously quite complex and shows that a number of answers could be given to the question, "How many groups are in the melody?", depending on the stage of the analysis which the subject was able to attain. A very important process which may not be clear in the preceding drawing occurs at stage b, where it is seen that the relations C and F must be inhibited so that relations X, Y and Z may be evoked.

There is another way of analysing the stages. It may be said that whenever the melody has been heard, the notes stand revealed in relation to one another, just as dots in this diagram do:-

This spatial analogy recalls, of course, the drawings used so much by the Gestalt psychologists and would suggest that the recognition of groups, within a melody was a similar process to the recognition of spatial groups, i.e., due to the recognition of 'shape' or configuration as an immediate experience, so that a pictorial method of depicting the auditory experience would be:-



This process consists therefore of the operation of the Sense of Pitch and the recognition of 'configuration'. Other methods of analysing the processes used in group perception will be found to be compressed forms of the 'Spearman' analysis, or compounds of the two.

[See text, page 180]

A CONSIDERATION OF THE SEPARATE TESTS.

Groups A, B, and C will refer to those of age 12, 13 and 14 years respectively, while group D will be the whole group of subjects. The structure of each test will be indicated in brackets, the numbers referring to the numbers of the tests. In inspecting the tables on page 445 of appendix it is worth remembering that a frequency of 1, gives N the values 4·8, 1·1, 3·6 and 1·0 respectively for the groups.

Tests 1 to 6 were each played at a high speed.

1. (2 notes).

    Every group gave N = 100.

2. (4 notes).

    Modal response is 4; little difference with age; response of 3 is almost as common.

3. (3 notes).

    Modal response is 3 (may be more likely as age increases); response of 2 of small frequency, and appears to decrease as age increases.

4. (6 notes).

    Modal response of 4 in group A is of smaller importance in groups B and C. Modal response for the latter is 5. Response 6 decreases with age.

5. (8 notes; major scale).

    Modal value is 6 for all groups, but the responses cluster in a marked way round the values 5, 6, 7, 8. If the responses for 6, 7, 8, are pooled for each group, the totals for the groups are 71·4, 77·8, 75·0 respectively.

6. (6 notes of scale).

    Modal value is 5; frequency decreases with age. The frequency of 6 increases with age.

Tests 7 to 12 were each played at a slow rate.

7. (2 notes).

    Modal value is 2. In groups B and C the response 3 occurs with frequencies 3·7 and 3·6 (i.e., the responses of 2 and 1 individuals respectively).

8. (4 notes).

Mode is 4; increase with age.

9. (3 notes).

Mode is 3; decrease with age.

10. (6 notes).

Mode is 6. 2, 3, 6, and 7 also appear.

11. (8 notes).

Mode is 8. 2, 3 and 6 also appear.

12. (6 notes).

Mode is 6.

The table below will facilitate comparisons. Only acceptable values of R have been considered in tabulating values of N. The latter have been written in the order, A, B, C and D.

TEST 1	100	100	100	100
TEST 7	100	96·3	96·4	97·1

TEST 2	52·4	35·6	46·4	52·4
TEST 8	95·2	94·4	100	96·1

TEST 3	85·7	81·5	96·4	86·4
TEST 9	100	96·3	89·3	95·1

TEST 4	23·8	20·4	17·9	20·4
TEST 10	95·2	92·6	92·9	93·2

TEST 5	14·3	25·9	17·9	21·4
TEST 11	95·2	98·1	92·9	96·1

TEST 6	14·3	16·7	21·4	17·5
TEST 12	100	91·6	92·9	96·2

A striking fact about the results is that so few of the subjects gave the response 1. The object of tests 1 to 12 was to see if any important difference could be found between the perception of musical structures presented at high and low speeds. It is apparent that there is a strong tendency for the subjects to count the separate notes in the tests, in spite of the use of the practice tests. For example, test 1 is the 'unit' or group used in the third practice test, and the subjects appeared to thoroughly understand the task and perform the practice tests well. Again, this method of counting the notes was absent in the allied tests 13 to 16. However, it can be said that the subjects do not recognise any groups in tests 1 to 12, but the result may be due to the presentation of melodies which are too elemental.

For this reason, conclusions about grouping can only be tentatively drawn for the latter tests. Those subjects who gave responses suggesting that they perceived groups were very few in number (although their influence on the distributions of the response categories in the tables was noticeable), and were all below average in the perception test scores. For example, in tests 5 and 11, where the major scale is used, those who respond 1, 2 or 4 instead of 8 are not those who do well in the other perception tests, and who therefore might be expected to have special ability in perceiving groups, but those whose performance is below average.

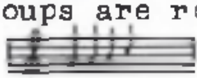
Further, by considering the tables on the preceding page it is clear that a slow speed facilitates the counting of notes. This would be obvious without any testing, yet it is not an unqualified result, for in test 7 three individuals gave the response 3 instead of 2. Certainly these were persons who made low scores in the perception test, yet in the latter they successfully performed much harder tests. Other failures in the slow tests are almost as surprising. In tests 2, 4, 5, 6 the subjects tend to give answers 'lagging behind' the true answer. (Note 'lag' in the mode). Some subjects 'overshoot the mark' and give answers greater than the true answers but these are few, so few indeed that these greater and less answers cannot be regarded as a chance scatter about the true value. Probably four notes at this tempo (𝅗𝅥 = 144 M.M.) puts a strain on the clarity of the primary memory image derived from the sounds. This image would be derived from notes occupying in all ·42 secs., each note being ·10 sec. in duration. Yet 4 quavers at this tempo do not set up a well-defined limit, as the modal values for longer melodies will show. Two processes seem to be in operation, one a drive of perceptual activity (whose 'length' depends on the length of the melody) and a contracting tendency determined by the primary memory image. The former recalls Wertheimer's observation on the successive illumination of small electric bulbs (A, B, C, D, etc.). If the bulbs are not too far apart and if they light in succession at a suitably short interval, the observer sees a point of light flowing from A to D as a continuous flow. On the principle of isomorphism, a similar flow of energy or mental activity could result from the hearing of the tests. The existence of this flow would explain the varying positions of the lagging mode, and the tendency of a few subjects to state a number of notes exceeding the true number. The latter phenomenon is strongly marked in test 6, which follows the longest test, number 5; more strongly marked than in test 4 which also consists of six notes. This hypothesis of a process analogous to that involved in Wertheimer's visual observation, together with the assumption that once an active

form of this process is evoked, it tends to recur again (a well known property of neural processes), will explain all these occurrences and some similar ones (e.g., in tests 10 and 12) in the slower tests. It is interesting to note that the longest test, number 5, took only ·83 seconds to play (each note being ·10 secs.) yet 21% of all the subjects were correct in observing 8 notes, 43% observed 7 or 8, and 76% observed 6, 7 or 8. At this speed this is a creditable performance for the children and gives some indication of the rapidity at which a quite elaborate primary memory image can be formed.

The order of difficulty of tests 1 to 6 can be seen from the percentages (for group D) on page 473. Test 6, consisting of 6 notes, appears to be the hardest, but when the result is pooled with that of test 4, which also consists of 6 notes, the order of increasing difficulty becomes:- Tests 1, 3, 2, 4 and 6, 5, i.e., 2, 3, 4, 6 and 8 notes respectively. Since the subjects appear to be counting the notes, this is perfectly natural but, as has been observed above, the counting process is carried out with material so short in duration that the accuracy, on the whole, is creditable.

Tests 13 to 25.

In these tests the ability of the subjects to perceive groups is in marked contrast to their failure to do so in the preceding tests. This is doubtless due to the value of 'rests', the detaching effect of which breaks up the melodies so that groups are readily observed, e.g.,



can be heard, by a musical person, as a series of notes consisting of 1, 2 or 4 groups, each of these three modes of perception being facilitated by the listener 'projecting' 4, 2 or 1 accents respectively, or thinking of the 4 notes as related in various ways, harmonic or melodic, to other musical material, although neither of these processes is necessary. Actually such a listener would no doubt say that the notes consist of one group, because there is nothing to give meaning or definition to any other grouping. If the same four notes were heard as,

there would be two groups obvious, because of the rest. If this were found to be easy, it would not be because the test was longer or shorter, or because the pitch or duration of the notes was altered, but simply because of the demarcation provided by the rest. Similarly if we compare tests 1 to 12 with tests 13 to 25, we can see that the notes are generally similar in pitch and duration, so the readiness with which groups are observed shows that the subjects are aware of the segregating effect of rests. In the second example above, the answer 1 could be accepted, for a musical person could consider these notes to form one group, but this would not be a valid answer for most people since it would signify a failure to perceive any groups. The answer 1 is therefore equivocal, depending on whether a subject has the mental organisation capable of perceiving complex unities, or whether he lacks such an organisation.

The results of the tests are summarised below.

Test.	No. of groups	No. of notes in each group	Mode
13	2	2	2
14	2	2	2
15	2	2	2
16	4	2	4
17	6	2	6
18	2	3	2
19	2	3	2
20	4	3	4
21	3	3	3
22	4	4	4
23	3	4	3
24	2	4	2
25	2	4	2

The variations of the results with age are small and inconclusive. When the tests are arranged in order of increasing difficulty, the order shown below is obtained. Group D was used for this comparison and the numbers in brackets show the percentage of the group which obtained the modal answer.

Test 24 (98·1)
21 (96·1)
23 (95·1)
14, 19, 25 (94·2)
16, 13, 20 (93·2)
22 (90·3)
15 (89·3)
18 (86·4)
17 (84·5)

The tests in this order are written out overleaf. The numbers above each group and rest show the duration of these in seconds (estimated from the metronome rate).

ORDER OF INCREASING DIFFICULTY

Relations between order of difficulty and other variables.

Variables	Calculated measure (ρ).
Time taken to perform corresponding test item	·40 ± ·16 ('t' test gives $\cdot 1 < P < \cdot 2$)
Duration of the notes ignoring duration value of rests.	·50 ± ·15 ($\cdot 05 < P < \cdot 10$)
The actual number of notes in each test.	·03
Number of rests.	·40 ± ·16
The duration of all the rests in each test.	·26
Duration of each rest.	·15
The ratio, duration of notes ÷ no. of groups.	·25
The number of groups	·32

Each of these eight variables are possible measures of the difficulty of the tests, since they represent various ways of measuring the total duration of each test, or the stimulation portions (the actual sounds), or the amount of detachment between the groups, or compounds of these. None of the above results passes the criterion of significance ($P = \cdot 05$) so no conclusion can be drawn. At the most one could hazard the hypothesis that total duration of test, the duration of the notes alone, and the number of rests, play a determining role. It is very surprising that more positive results for these three variables were not obtained, since the first seems a satisfactory measure of the 'span' of the test (i.e., the measure of concentration needed to apprehend the test), the second the total stimulation period, and the last the extent to which the melody was articulated. Of course it could be maintained that none of these is very suitable as a measure. To use visual analogies, the first corresponds to numbers of dots spread in groups in a straight line. The length of the line may or may not be a measure of difficulty in perception. For the second, the length of the line taken up by dots is the corresponding measure, which one would expect to be a better measure of difficulty (as is suggested by the value of ρ), while the third, corresponding to the length occupied by spaces, has the disadvantages of the first. The fact that the actual number of notes has no apparent influence on the difficulty of the tests (ρ = ·03) is not surprising when one considers the visual analogy. If there are 6 clusters, A to F, it does not matter how many dots are in each cluster when one observes that there are six groups; provided that there is sufficient detachment between the groups it does not matter if each cluster contains 30 dots or 3 dots.

Next, the mean value of N for each of the four types of groups was worked out, yielding the following order for increasing difficulty:-

3 groups.	Mean = 95·6
2 groups.	Mean = 92·8
4 groups.	Mean = 92·2
6 groups.	Mean = 84·5

If the responses of those subjects who gave 2 as an answer when 4 was expected are added in, while the responses of those who gave 2 or 3 instead of 6 are also added, the means become 95·6, 92·8, 92·5, 90·2. If we agree that these correspond to Triple, Duple and Compound Time, the order appears quite reasonable, since there is a tendency for time to exhibit such an order of difficulty to children[88]. (e.g., young children in a percussion band, or young pianists). Nevertheless the differences in the above series are small and show that the majority of the children managed to detect the groups with marked success.

It may be considered now if those who did not give the modal response are superior or inferior. It is possible that those who give responses smaller than the mode are superior subjects who perceive a smaller number of groups by virtue of their power to perceive a larger unit as the basis of a group[89], while those who give an answer larger than the mode may be superior subjects by reason of a fertile musical imagery which, by a process of perseveration, 'overshoots the mark', and leads the subjects to recognise groups in their mental experiences which have no objective reality. On the other hand, subjects who give responses above or below the mode may be inferior - incapable of accurate perception.

C. V. Stanford[88] points out that triple rhythm was used universally till 1300, suggesting that the Church approval of the Trinity was probably a weighty reason.

Britton[89], page 36, maintains that the fundamental unit of group perception is a section of two notes. (Riemann's view[90]). This academic view is not profitable in listening to music. It is seen in an absurd form when it is applied, as Britton does, to hymn tunes. For the listener, the unit is surely the phrase.

It was found that those who did not give the modal response were generally inferior in measures of musical abilities.

Further, the response 1 is mainly that of inferior subjects. The 'superior' subjects who gave this response were just a little above average in either test. It is unlikely therefore that 1 is the response of an individual who can perceive smaller groups as an integral part of one dominant group.

It is noticeable how few of the subjects counted the separate notes as an answer to the number of groups. There were only 7 cases of this, due to 6 individuals. Only one of them (responding to Test 15) was of an ability above the average.

Some other tests are worthy of consideration. If M is taken to mean the group test in musical ability and P the perception test, the responses to these tests can be summarised as follows, letters of the alphabet denoting different subjects:-

Test 16 (4 groups). Response 2. Subject A: M+ and P-.
Response 3. " B: M- and P-.

Test 17 (6 groups). Response 3. Subject C: M- and P+ (very high).
" D: M- and P+.
" E: M- and P+.
" F: M- and P-.
" B: M- and P-.
Response 2. Subject G: M+ and P+.

Test 25 (2 groups). Response 1. Subject G: M+ and P+.

The above responses are possible answers to the tests, if the subjects 'phrase' small groups into larger ones, but this is hardly acceptable as a possibility unless some evidence of such an ability is adduced. The Seashore results for the subjects are:-

Subject	S_1	S_2	S_3	S_4	S_5	S_6
A	50	86	92	70	42	64
B	46	92	66	70	32	58
C	54	94	92	68	54	78
D	18	84	96	72	42	70
E	100	92	90	60	52	86
F	60	82	94	66	30	56
G	46	78	68	64	46	64

It will be seen that the subjects are relatively weak in Sense of Pitch or Tonal Memory (or both). Subject C is a keen singer and an active member of the school choir. She plays the piano a little. Subject E is the son of a violinist and plays the violin a little. Subject G is above average in both the M and P tests, yet had 5 responses differing from the modal values in the tests considered in this section. She reported that she had ear trouble at age 7 (evidently a discharge condition following scarlet fever) but has never suffered from noticeable deafness since then. It is conceivable that this condition affected the ear in part of its sensory structure but had little effect on the central processes. This hypothesis would explain the Seashore weaknesses and the relative efficiency in the M and P tests. The response of 1 in Test 25, surprising in her case, is therefore explicable as being due to an inefficiency or inertia in sensory activity. In all these cases, only subjects C and E are sufficiently superior to justify the acceptance of their responses as being possibly due to a superior organisation of perceptual processes, i.e., two subjects out of 103. If such a superiority of organisation exists, it seems to be scarce in this age range (12 to 14+).

Tests 26 to 42.

These tests do not use rests to segregate the groups; the segregation is effected by means of time, accent, or harmonic relations. The table overleaf summarises the results.

In several of the tests one could say that a certain response was to be expected, according to the structure of the test, while yet regarding other responses as acceptable - perhaps equally acceptable. The latter type of alternative answer is indicated by the use of the word 'or' in the table (e.g., 6 or 3 or 2), while answers which are considered inferior are shown in brackets. The modal values are tabulated for groups A, B, C and the whole group, D. Some difficulties arose here. The response 1 was the mode in certain tests but this, as has been observed before, is an equivocal answer demanding further scrutiny, so in such cases the next most frequently occurring answer was also given. Where the modal response is not the expected one, the actual result for the expected response is placed in the table. In addition, the results for alternative answers may be of importance, so these are also inserted for certain tests. After each response is placed in brackets the percentage value of N, the number of occurrences.

TEST	NUMBER OF GROUPS	NUMBER OF NOTES IN EACH GROUP	MODE A	MODE B	MODE C	MODE D
26	6 or 3 or 2	3 or 6 or 9	1(33·3), 6(19·0), 3(4·8), 2(0)	1(42·6), 6(25·9), 3(0), 2(7·4)	1(64·3), 6(16·3), 3(0), 2(3·6)	1(66·3), 6(21·4), 3(1·4), 2(4·9)
27	5	3	1(28·6), 5(28·6)	1(37·0), 5(31·5)	1(50·0), 5(21·4)	1(38·5), 5(28·2)
28	3	3	1(33·3), 3(47·6)	1(44·4), 3(25·9)	1(60·7), 3(25·0)	1(46·6), 3(30·1)
29	4 or 2	3 or 6	1(57·1), 2(14·3), 4(19·0)	1(50·0), 2(7·4), 4(33·[illegible])	1(67·9), 2(3·6), 3(10·[illegible]), 4(7·1)	1(56·3), 2(7·8), 4(17·5)
30	6 or 3 or 2	2 or 4 or 6	1(38·1), 6(42·9), 3(4·5), 2(4)	1(40·7), 6(35·2), 3(1·[illegible]), 2(5·6)	1(50·0), 6(17·9), 3(0), 2(0)	1(42·7), 6(32·0), 3(1·9), 2(2·9)
31	5	2	1(19·0), 5(52·4)	1(29·6), 5(40·7)	1(32·1), 5(35·7)	1(28·2), 5(41·7)
32	4 or 2	2 or 4	1(14·3), 4(71·4), 2(4·5)	1(38·9), 4(37·0), 2(11·1)	1(32·1), 4(46·4), 2(14·3)	1(32·0), 4(46·6), 2(11·6)
33	3 (6)	2 chords or 1	3(4·8), 6(90·5)	3(3·7), 6(79·6)	3(3·6), 6(89·3)	3(3·9), 6(84·5)
34	5 (10)	" "	5(4·8), 10(85·7)	5(0), 10(92·6)	5(7·1), 10(89·3)	5(4·9), 10(90·3)
35	4 (2) (8)	2 chords or 4 or 1	4(9·5), 2(0), 8(81·0)	4(9·3), 2(1·9), 8(81·5)	4(7·1), 2(0), 8(82·[illegible])	4(5·7), 2(1·0), 8(81·6)
36	2 (4)	2 chords or 1	2(23·8), 4(76·2)	2(20·4), 4(72·2)	2(10·7), 4(82·1)	2(18·4), 4(75·7)
37	3	2	3(4·8), 4(61·9)	3(14·7), 4(61·1)	3(7·1), 4(71·4)	3(11·6), 4(66·1)
38	4 or 2	2 or 4	4(4·8), 5(85·7), 2(0)	4(13·0), 5(68·5), 2(1·9)	4(14·3), 5(71·4), 2(0)	4(11·6), 5(72·8), 2(1·0)
39	5	2	5(9·5), 6(76·2)	5(5·6), 6(70·4)	5(0), 6(92·9)	5(4·9), 6(77·7)
40	2	4	2(81·0)	2(63·0)	2(75·0)	2(69·5)
41	4	4	1(61·9), 4(14·3), 2(14·3)	1(67·0), 4(18·7), 2([illegible])	1(50·0), 3(21·4), 4(14·3), 2(3·6)	1(56·3), 4(15·5), 2(4·9)
42	3	4	1(19·0), 3(38·1), 4(23·8)	1(31·6), 3(37·0)	1(28·6), 3(50·0)	1(28·2), 3(60·8)

The large incidence of the response 1 is noteworthy and will be considered in detail later. The subjects are clearly less successful in these tests than in the preceding ones, again showing the major role of the 'rest', in facilitating group perception.

Test 26 (6 major chords in arpeggio). 21·4% of whole group gave 6 as response, while 2 and 3 had little support.

Test 27 (5 chords - arpeggios with roots ascending by a step). Slight increase (28·2%) in number giving expected response.

Test 28 (3 chords of above type). 30·1% give expected response.

Test 29 (4 chords - arpeggios of tonic chord). Response 4 (17·5%) more common than 2 (7·8%).

These four tests involve grouping based on harmonic relations - the relation of notes in a chord, together with relations based on direction of movement. Only about a quarter of the subjects were successful. The difficulty of this group of tests depends on the length of the test (Test 29 is based on one chord and is rather different from the others.) In spite of this observation on the difficulty of these tests being due to their length, it is to be noted that halving the length of a test does not make it very much easier, (cf., Test 28 and Test 26), a result suggesting that the task is of considerable intrinsic difficulty.

Test 30 (6 groups). Mode is 6. The smaller number of groups 3 and 2 obtain negligible support.

Test 31 (5 groups). Mode is 5.

Test 32 (6 groups). Mode is 4. The small number 2 gets a fair amount of support, increasing with age.

This variety of test (using a rotary movement based on simple intervals like the octave, fifth and third) appears to be substantially easier than the last. (Mean value of N for the modes is 40 compared with 24). Not one of the tests 26 to 30 is so well done as any of tests 30 to 32, (using group D for comparison). Some of the former tests have fewer notes in all than some of the latter tests, so total length of test is not sufficient to account for the relative difficulty. But the former tests used three notes of a chord for one group whereas the latter tests used two notes. If tests 27 and 31 are compared, it will be seen that both consist of 5 groups, test 27 consisting of groups using the third and fifth of the first note of the group, while test 31 uses only the first note and the fifth, yet the latter is the easier test at all three ages. One would expect that the use of the third would 'bind' the note and its fifth together, demonstrating the notes in the relation 'major triad' or 'minor triad', and therefore acting as a segregating influence. On the contrary, the intermediate note appears to be disturbing in the perception of groups.

The order of difficulty in the three tests is 32, 31, 30. Although the tests increase in difficulty in this order, they also increase in length in this order, so the result appears inconclusive. Yet the introspections of some subjects lead them to conclude that 31 is easier than 32, others that 32 is easier than 31, and others that they are equally difficult. As a speculation, the writer thinks that the interval used plays a part and the above order of third, fifth, and octave increases in difficulty because the intervals proceed from the less 'perfect' to the more 'perfect'.

Tests 33 to 36 have been considered already (page 172) where it was observed that few of the subjects obtained scores in the perception test from these particular four tests. The modes for these tests are the total number of chords in each test. There is little capacity evident for perceiving the relation between one chord and another, the relation which may be called 'harmonic progression': In Test 36 this little evinced capacity receives its greatest manifestation, where the result is 75·7% for response 4 and 18·4% for response 2. It was evident before (page 172) that subjects capable of perceiving harmonic progression at these ages have claim to be regarded as being of more than average musical ability.

Tests 37 to 39 are of peculiar interest. They were deliberately framed to investigate the question, "How do subjects react to a rhythmic pattern which is musically incomplete?" No musical phrase would end, as these tests do, with a quarter note of short duration preceded by a three-quarter note (at least at a quick tempo). For example, test 37 (of the form 'taa-a-fe, taa-a-fe, taa-a-fe') is logically possible in a mathematical sense, but not in a musical sense. In fact, in playing it the pianist has to direct his attention to a point beyond the last note, to an imagined terminal note, and to preserve the time value of the semi-quaver he has to adjust his fingering of the notes and his muscular, rotational movements towards this imagined termination. (These two adjustments are of types common in pianoforte playing, to secure technical accuracy.) In every test there is a marked tendency for the subjects to state that there is one group more than the number phenomenally present. This occurs with about 70% of the subjects, and the tendency increases with the length of the test. If the long note is represented by a white rectangle and the short note by a black rectangle, test 37 can be represented by the drawing below.

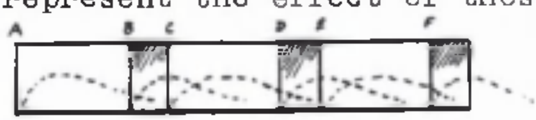
In visual perception there is nothing in this drawing to indicate the result obtained above, but that, of course, is because the drawing is static, whereas in music the time element is of great importance. In music we are dealing with percepts moving in the time flow, so that these percepts are functions of time. To suggest this, the arrow heads in the figure below are necessary.

so that the following figure represents the phenomenon

The dotted figure is a vague entity - an awareness, illusion or "ghost" note. (Reference will be made to this later.) The numbers below represent the groups corresponding to the subjects' responses.

This recalls experiments on visual phenomena subject to movement. Figures A and B represent rotating drums. After these have been set rotating slowly, a form of

equilibrium is set up in the perception of the movement. When the drum is suddenly brought to rest, the observer does not see the vertical lines or the helix immediately at rest, but sees a movement of dark lines (which have no objective reality) which must be due to processes which accompanied the perception of the original movement. More directly related to the musical phenomenon are the stroboscopic experiments of Wertheimer (page 474). Another form of explanation could be given. "During and after its application, a stimulus evokes a whole series of changes in consciousness. We have, for example, the developing, the full and the fading sensation, the after-sensation and the primary memory image. ---- When two momentary sounds are separated by a brief interval, of about 550σ, the various changes in consciousness can be comprehended without difficulty as a single whole; they are subsumed into a unitary state of consciousness." These words of Myers[91] may be applied here. Let the full lines represent the notes of the test, as in the previous drawings and let the dotted lines represent the effect of these on consciousness.



Myers says that a sound needs about 550σ for the development of its complete effect on consciousness and in these tests the metronome rate is ♩ = 96 so that a semi-quaver is 200σ in duration and a dotted quaver is 600σ. Naturally the heights and shapes of the dotted lines are speculative, as are also the inter-relations between these which might produce an aggrandisement of effect. However, we can at least say that some activation of consciousness will follow the last semi-quaver and the awareness of this could lead the subject to say that there was something beyond this semi-quaver, that is, a fourth group. But is this acceptable? This lagging of effects in consciousness would make note A different in consciousness from note C, and even if this is true it makes no difference to the accuracy of perception of groups in the earlier portion of the test. This is not so strong an objection as the following. If a series of rapid scale notes were played, with each note 200σ in duration, then the last note could be the tonic.

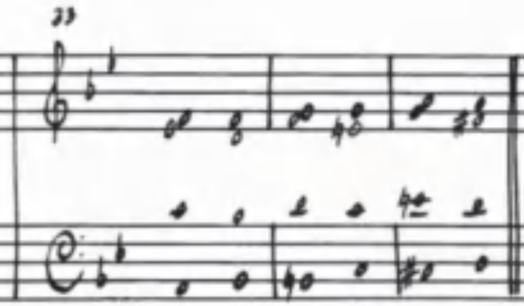
e.g., 

But the 'lag' of the above view would be as present here as in Test 37, yet no one maintains that another note (or notes) lies beyond the tonic (as the writer has found by experiment); it is not merely a lag or perseveration which is operating, but one designed to give form, shape or coherence to the experience. In the last musical example we have a perception which is a 'closed configuration'. In test 37, the perception is not a closed configuration, and by the principle of isomorphism processes are set up to effect closure. In test 37, the test ends on the tonic, but this is not sufficient because an important part of the configuration is the rhythmic progression of the semi-quaver to the dotted quaver, its point of rest; that is, the point of closure for this group. A repetition of the tonic as a longer note, or the addition of almost any other note would have effected closure, although the supertonic A happens to reproduce the pattern most satisfactorily. From the table of results it is seen that, as the number of groups in this type of test increases, there is a greater tendency for the subjects to report that the number of groups is one more than the number actually present. The tables for successive hearings show that this is not a practice effect, or,

ORDER OF INCREASING DIFFICULTY.

486A

486C



at least, that the practice effect is slight, so that this observation on length of test makes the resemblance to stroboscopic experiments all the more striking. These results suggest that perception of rhythmic groups is a Gestalt problem.

Tests 40 to 42.

These are chromatic scale passages accented in groups of four.

Test 40 (2 groups). Mode is 2 (69·8% for whole group).
Test 41 (4 groups). Mode is 4 (15·5% for whole group).
Test 42 (3 groups). Mode is 3. The incidence of this value appears to increase with age. (40·8% for whole group).

The order of difficulty is clearly Test 41, 42, 40, so that the difficulty of the test increases as the length increases. In fact, the number of modal responses diminishes rapidly as the length increases. This is probably due to the chromatic scale failing to give any 'cue', by way of interval or key, which would facilitate the apprehension of groups. Further, this difficulty inherent in the use of chromatic passages would render the formation of memory images more difficult than 'tuneful' passages would do, so that the subject would be handicapped in this manner from attempting to obtain the answer by imaginal activity. Evidently the 'blur' of pitch produced by the chromatic notes produces a confusion in the subjects which accents cannot completely neutralise. The success of the subjects in test 40 shows that accent has an important role in segregating groups. Indeed, the result for that test is the highest of all the tests correctly (or acceptably) performed. The lower values for tests 41 and 42 are, as has been said, probably due to the lack of pitch cues, and serve to remind us that pitch, the approach to an accented note, and the harmony used with that note are all factors, in addition to the intensity accent, affecting the saliency of the accented note.

The table overleaf shows the modal responses, with the corresponding percentages in brackets, for tests 43 to 67. The U responses and other responses related to the number of groups in each test have also been added. The U percentage is written first whilst the mode is second. As before, the number of groups in brackets means that the number is an acceptable but inferior type of response.

[See text, page 185]

TESTS 43 TO 67.

TEST	NUMBER OF GROUPS	NUMBER OF NOTES IN EACH GROUP	MODE A	MODE B	MODE C	MODE D
43	3	3	1(38·1), 9(28·6), 3(9·5)	1(29·6), 9(37·0), 3(11·1)	1(32·1), 9(32·1), 3(17·9)	1(32·0), 9(34·0), 3(12·6)
44	3	3	1(38·1), 9(19·0), 3(4·8)	1(27·8), 9(38·9), 3(3·7)	1(14·3), 9(39·3), 3(0)	1(26·2), 9(34·9), 3(2·9)
45	3	3	1(14·3), 9(33·3), 3(19·0)	1(16·7), 9(38·9), 3(18·5)	1(10·7), 9(39·3), 3(7·1)	1(14·6), 9(37·9), 3(18·5)
46	3	4	1(28·6), 12(19·0), 3(9·5), 12(19·0)	1(25·9), 12(22·2), 3(13·0), 6(13·0)	1(25·0), 12(28·6), 3(10·7), 6(10·7)	1(26·2), 12(23·3), 3(11·6), 3(11·6)
47	3(6)	4(2)	1(4·8), 6(33·3), 3(9·5), 6(14·3), 16(14·3)	1(18·5), 12(31·5), 3(11·1), 4(9·3), 8(11·1)	1(21·4), 12(28·6), 3(10·7), 4(3·6), 8(21·4)	1(16·5), 12(28·2), 6(16·5), 8(16·5)
48	4	4	1(33·3), 8(23·8), 6(14·3), 12(14·3)	1(25·9), 16(31·5), 3(18·5), 6(20·4)	1(35·7), 16(25·0), 3(21·4), 6(14·3)	1(30·1), 16(26·2), 6(8·9), 6(17·5)
49	3(6)	4(2)	1(14·3), 3(19·0), 2(0), 8(23·8)	1(18·0), 12(26·1), 2(9·3)	1(14·3), 12(21·4), 4(21·4), 2(7·1)	1(16·5), 12(21·4), 3(19·4), 4(28·2), 2(6·8)
50	1 or 2 or 4	8 or 4 or 2	1(28·6), 4(42·9), 2(4·8), 4(19·0)	1(22·2), 8(29·6), 4(25·9), 4(25·9)	1(28·6), 8(32·1), 2(10·7), 4(10·7)	1(25·2), 8(29·1), 4(20·4)
51	1 or 2 or 4	8 or 4 or 2	1(47·6), 8(23·8), 12(19·0)	1(25·9), 8(31·5), 2(13·0), 4(7·4)	1(35·7), 8(35·7), 2(14·3), 4(3·6)	1(33·0), 8(31·1), 2(10·7), 2(10·7), 4(8·7)
52	4 or 2	3 or 6	1(14·3), 4(19·0), 2(4·8), 4(19·0), 2(4·8)	1(18·5), 12(20·4), 2(9·3), 4(16·7), 2(9·3)	1(14·3), 12(25·0), 4(21·4), 2(7·1)	1(16·5), 12(21·4), 4(18·4), 2(7·8)
53	4 or 2	3 or 6	1(14·3), 12(23·8), 6(4·8), 18(19·0), 3(4·8)	1(16·7), 12(26·1), 6(1·9), 18(18·5), 3(1·9)	1(14·3), 12(21·4), 18(14·3), 6(7·1), 3(7·1)	1(15·5), 12(23·3), 18(17·5), 3(2·9)
54	6 or 3	3 or 6	1(14·3), 9(23·8), 18(19·0)	1(25·9), 9(22·2), 18(5·6)	1(17·9), 9(17·9), 14(10·7), 7(14·3)	1(21·4), 9(21·4), 6(...), 7(13·6), 28(10·7)
55	7	4	1(14·3), 7(19·0), 14(4·8)	1(16·1), 14(20·4), 7(11·1)	1(17·9), 28(14·3)	1(20·4), 14(14·6)
56	5	4	1(0), 5(47·6), 4(14·3)	1(22·2), 5(24·1), 4(27·8)	1(10·7), 5(32·1), 4(21·4)	1(16·6), 5(31·1), 4(23·3)
57	2 or 4	4 or 2	1(9·5), 2(61·9), 2(57·1)	1(3·7), 2(44·4), 4(31·5)	1(10·7), 2(42·9), 4(17·9)	1(6·8), 2(47·6), 4(25·2)
58	2 or 4	4 or 2	1(57·1), 4(19·0), 4(14·3)	1(3·7), 2(40·7), 4(25·9)	1(7·1), 2(46·4), 4(14·3)	1(3·9), 2(45·6), 4(20·4)
59	2 or 4	4 or 2	1(4·8), 2(61·9),	1(3·7), 2(46·3), 4(22·2)	1(10·7), 2(46·4), 4(7·1)	1(5·8), 2(49·5),
60	2 or 4	4 or 2	1(0), 2(71·4), 4(9·5), 4(28·6)	1(3·7), 2(51·7), 4(22·2)	1(7·1), 2(71·4), 4(7·1)	1(2·9), 2(62·1), 4(15·...)
61	2 or 4	4 or 2	1(4·8), 2(61·9),	1(7·4), 2(55·6), 2(3·7)	1(10·7), 2(46·3), 2(7·1)	1(7·8), 2(59·2), 4(...)
62	3 or 2	4 or (8+4)	1(0), 3(71·4), 2(4·8), 7(14·3), 2(19·4), 4(...)	1(9·3), 3(51·9), 3(16·7), 4(13·0), 4(...)	1(14·3), 3(60·7), 2(17·9), 3(3·6), 4(17·9)	1(8·7), 3(51·2), 2(4·9), 3(16·6), 4(15·6)
63	1	7	1(33·3), 3(23·8), 4(23·8), 2(0)	1(27·8), 2(20·4), 4(16·7), 12(7·4), 2(9·3)	1(35·7), 7(21·4), 4(25·0), 12(10·7), 2(3·6)	1(31·1), 7(17·5), 2(19·4), 4(20·4), 2(6·8)
64	4 or 2	3 or 6	1(19·0), 6(33·3), 12(14·3), 2(0), 18(0)	1(11·1), 6(37·0), 2(0), 18(5·6)	1(21·4), 6(25·0), 3(3·6), 2(3·6), 18(3·6)	1(15·5), 6(33·0), 12(...), 18(3·9), 3(4·9), 2(4·9)
65	6 or 3 or 2	3 or 6 or 9	1(9·5), 6(23·8), 3(4·8), 15(4·8)	1(18·5), 6(27·8), 3(4·8)	1(14·3), 6(25·0),	1(16·5), 6(26·2), 15(3·9)
66	5	3	1(4·8), 5(47·6), 3(4·8), 2(0), 15(4·8)	1(4·1), 5(37·5), 15(1·9), 18(1·9), 2(0)	1(14·3), 5(35·7), 15(7·1), 3(3·6), 2(3·6)	1(10·7), 5(36·9), 15(1·9), 3(5·8), 2(2·9)
67	6 or 3 or 2	3 or 6 or 9	1(4·8), 6(32·4),	1(9·3), 6(35·2), 3(4·8),	1(10·7), 6(39·3), 18(0),	1(8·7), 6(39·8),

In scanning this table one might possibly think that there was a greater tendency on the part of the subjects to give U responses than in the case of the table on page 482, referring to the preceding set of tests. Actually in the latter table the average value of the U percentage is 41·6% while in the former table it is 17·1%, so that the incidence of U responses tends to be substantially less in the tests on the preceding page. What is noticeable is that U responses occur in every cell but three of the last table, that is, in every test, whereas on page 482 the U responses occur only in 9 tests out of 17. Another noticeable point is that the tendency to count single notes instead of groups is marked in the last table. Both these observations show that the tests are fairly difficult for the subjects. The tests consist of melodies played without rests or accents to delimit the group structure, so the subject has to react to the 'shape' of the melody.

Tests 43 to 49.

In tests 43 to 46 the modal value is, in each case, the number of notes in the melody. The percentage of subjects giving the correct number of groups in the melodies is about 10%.

In test 47, about 10% of the subjects give the correct response. More (16·5%) give the response 6 (grouping in pairs of notes), but most (28·2%) count the number of notes.

In test 48, there is much the same result for the responses, 4, 8 and 16.

In test 49, the modal value is the number of notes, but the correct response 3 is almost as common, while the acceptable response 6 is almost as frequent as the latter.

The order of increasing difficulty of these tests, based on the frequency of the correct responses is 49, 47, 45, 43, 46, 48 and 44. It is clear from this list that the length of the test (the number of notes in it, since the tempo is constant) is not sufficient to account for this order, although it will certainly have some influence. A similar deduction applies to the number of groups in each test. The writer thinks that a quasi-harmonic explanation would be in order. The groups of notes in these tests either form chords or suggest chords. One group can be distinguished from another by the subject realising that they belong to different chords, although, of course, subjects of these ages could not explain their processes of perception in this way. Nevertheless, these subjects have some degree of awareness of chord relationships, both between chords of a given key and to the prevailing key of the music which is being heard. Hence a method of detecting groups which is essentially harmonic - groups belonging to the same chord will tend to lack the segregation and discreteness of groups belonging to different chords; groups based on chords which possess mutual harmonic relations such that one chord tends to follow the other naturally and harmoniously will, on the whole, tend to lack the discreteness of chords which are only slightly related; both these principles will depend on whether or not the chords used are harmonious with, or salient against, the prevailing key or tonality.

Tests 50 and 51. (The major scale, ascending and descending, repectively).

In test 50 the modal response is 8, the number of notes in the test, but the number of 4 responses is almost as prominent. The percentages are 8 (29·1), 4 (28·2), 1(25·2), and 2 (6·8).

A somewhat similar result is obtained for test 51, the percentages for the whole group being 1 (33·0), 8 (31·1), 4 (20·4), and 2 (10·7). It is clear that the response 2 gets little support, which is surprising, since scale passages are commonly accented in groups of 4; further, a major scale is constructed of two equal parts (tetrachords), with an identical arrangement of tones and semitones. It might be thought that these, following the ideas of the Gestalt psychologists, were identical in 'shape' and therefore would be seen readily as two entities. But the Gestalt psychologists could very properly retort that this is not a true interpretation of their views and that these tetrachords are similar, but not identical, figures. If heard in isolation, separately, without a key being established, one could be judged as being identical with the other (each is, in sol-fa, d, r, m, f or s, l, t, d') but when heard together, each 'shape' links up with the other shape to form a new 'shape', that corresponding to the major scale. To put it another way, each has the configuration represented by d, r, m, f but when they are played in succession the result is not d, r, m, f, (d, r, m, f), the brackets suggesting a higher pitch level, but d, r, m, f, s, l, t, d'. The latter 'shape' has the strongest system of bonds or inter-relations - it has the strongest configurational properties. Indeed, the teaching of sol-fa is directed towards the building up of patterns based on the major scale so that an individual perceives a note, not in isolation, but in relation to other notes, and fundamentally in relation to that pattern which we call 'key'. The paragraph above is not meant to be understood as an argument against the perception of two groups in a scale passage. It is intended merely as a likely explanation of the experimental results. On the contrary, just as a performer can accent scale passages in twos, fours, eights, or threes, sixes, etc., so a proficient listener should be able to hear various groupings, although, of course, he will tend to prefer one type, or a very few types of groupings.

It will be seen, also, that when the responses for tests 50 and 51 are compared there is a reduction of the number of '4' responses in the latter test, while the 1, 2 and 8 responses increase. This might be due to chance, but if not, it illustrates an interesting point. In the descending scale there is a progression from a high note to a low note, the tonic, a kind of base or zero level. In vocal music the singing of a high note is regarded by many as being more of a muscular effort or strain, whereas the tonic, in a lower position, is regarded as a comfortable note to sing. In progressing from the high note to the low, therefore, a listener, by a kind of empathy, may be aware of a relaxation of tension, so that there is an accompanying awareness of continuity of progression. On the other hand, in an ascending scale, there is an increase of tension as the notes pass from the comfortable level to higher levels, and the listener is aware of less 'drive', momentum or progression. This would explain the above results. These observations agree with those obtained previously about pitch direction. ("Melodic music tends downwards".).

(Additional analyses of scale passages occur on page 506).

Tests 52 to 55.

Test 52 (4 groups or 2). Mode 12, the number of notes in the melody; 1 (16·5%), 2 (10·7), 4(8·7).

Test 53 (4 groups or 2). Mode 12, the number of notes; 1 (15·5), 4 (18·4), 2 (7·8).

Test 54 (6 groups or 3). Mode 9 (21·4) or 1 (21·4), 18 (17·5), 6 (3·9), 3 (2·9).

There are 18 notes in the test, and about 20% of the group count the separate notes, 20% give the response 1 and 20% group the notes in pairs, thus using about 60% of the group. These three types of response are approximately the same for all the groups, and of these the grouping of pairs is rather unexpected. Grouping in threes would seem more natural, for this would resemble the "mordent" progression (upper or lower), in which the first and third notes are the same. Grouping of the notes into sixes would appear to be the most natural response, yet both the latter types of response get little support. The results show thatthis is a difficult test and no doubt the grouping in pairs is used because it fits the total length of the test.

Test 55 (7 groups of 4 notes). Mode 1 (20·4), 14 (14·6), 7 (13·6), 28 (10·7). Like the last, this appears to be a difficult test, with the counting of single notes and pairs of notes as important methods of response.

In this set of tests the order of increasing difficulty is 53, 55, 52, 54. Length of test does not account completely for this order, since the number of notes in each is respectively 12, 28, 12, 18. Test 53 consists of mordents (upper) on the notes of the supertonic 7th., while test 52 consists of mordents (lower) on the notes of the tonic 7th., chord. It seems likely that difficulty depends on the harmonic basis of the melodic progression. In test 52 the starting notes of each group are d, m, s, notes which are strongly related. This may account for the number of "2" groups being a little greater than the number of "4" groups. In test 53 the starting notes of the group are d', l, f (a less strongly related set of notes) and the addition of the note r is more disturbing to unity of relationship than the addition of t to the former set. This disturbance could account for the number of "4" groups being distinctly greater than the number of "2" groups. It might be maintained that previous remarks were inconsistent with this hypothesis (page 491). It might be said that test 52, being a rising progression, should, by the hypothesis of 'tension', tend to break up into groups more readily than the downward progression of test 53. There may be no conflict between the hypotheses. In fact, the results are consistent with both. In test 52 the percentages are 2 (10·7), and 4 (8·7); in test 53 they are 2 (7·8) and 4 (18·7). In the former, the tendencies of segregation and unification would, by hypothesis, be in conflict, yet the effect of tension to produce segregation could not be expected to be large in a short passage of notes extending over less than an octave and it is reasonable to expect that the tendency to unification based on the tonic chord would be, at least, a little greater. This agrees with the above figures. In test 53, the tendency towards unification would not be very great in a passage less than an octave, whereas the tendency to segregation produced by the notes of a relatively unfamiliar chord like the supertonic 7th., could be greater. (Of the two progressions, d, m, s, t and d', l, f, r the second is less "singable".) Hence it would be reasonable to expect that the number of "4" responses would be greater than the number of "2" responses. This is what was found. It is obvious that there is considerable speculation in these attempts at explaining the experimental results, yet the processes involved in perception in these tests are complex, doubtless varying greatly both in degree and kind. It would be rather surprising if a simple explanation could be obtained.

<u>Tests 56 to 62.</u>

Tests 56 to 62.

Test 56 (5 groups). Mode is 5 (31·1); 1 (14·6).
Test 57 (2 groups). Mode is 2 (47·6); 4 (23·3); 1 (6·8).
Test 58 (2 groups). Mode is 2 (45·6); 4 (25·2); 1 (3·9).
Test 59 (2 groups). Mode is 2 (49·5); 4 (20·4); 1 (5·8).
Test 60 (2 groups). Mode is 2 (62·1); 4 (15·5); 1 (3·9).
Test 61 (2 groups). Mode is 2 (59·2); 4 (19·4); 1 (7·8).
Test 62 (3 groups). Mode is 3 (58·2); 2 (4·9); 1 (8·7).

The success of the subjects in these tests is in strong contrast to the weakness shown in other tests. Each group of notes consisted of four notes so the length of each test is fairly long (varying from 8 to 20 notes). Lest much emphasis is laid on the objection that the superiority of the subjects in these tests is due to practice effects, it is as well to remember that these calculations are derived from the last of three attempts so that all except a few special tests were subject to a form of practice, a procedure which by practice in a given test tends to eliminate the effects of practice from test to test.

In all the above tests the counting of single notes was almost entirely absent. The grouping of pairs was quite marked, except in tests 56 and 62. It is difficult to see why this should be, unless the latter tests, being longer than the others, set up the 4-note pattern more clearly; also, the other tests have the four notes of the first chord, the dominant 7th chord, spaced fairly widely. In test 57, for example, the low G and D (an interval of a fifth) may appear to form one group (e.g., as a kind of bass of the Musette type) while the B and D (a diminished fifth) form another group. This may influence the subjects to adopt a 2-note response in this and the other tests. It may be significant that the test with the fewest 2-note responses is the one which has the leading note in the highest position, test 60, whereas tests 57, 58, 59 and 61 have the 7th in the highest position. The latter form of the dominant 7th., chord seems to lack the stability or unity of the former, a result borne out by the number of 4-note groups. This is highest for test 60. Test 61 is not much less than test 60, with respect to this response, but test 61 is test 60 with the 7th raised an octave from the lowest to the highest position, so it is likely that the resemblance of structure is a reason for the resemblance of the responses. There is certainly a marked difference between the number of 4-note groups when test 60 is compared with tests 57, 58 and 59.

These results suggest strongly that arpeggio chords have a quality which may be called 'stability', that is, stability of image pattern. A very stable arpeggio would be one which all or most members of an unselected group judged to form one unit or group, only a small fraction of the group responding two, three, etc. A less stable arpeggio would be one which a larger fraction of that group of individuals judged to consist of two groups, (or more than two), and so on. It seems very likely that the distribution of notes in the arpeggio is a major factor in determining its stability, and it is extremely obvious that if G and B are played at the bottom of the piano and D and F at the top, one hears two groups which few, if any, individuals would recognise as forming one group, namely the dominant 7th chord. This would be a very extreme case, and the notes could be arranged in several ways without affecting the high instability of this arpeggio (e.g., low F and D followed by high G and F). Thinking of the typical arpeggios of music, the above experimental results suggest strongly that these vary in stability according to the placing of the notes. For example, the leading note at the top of the arpeggio gives increased stability, while the 7th at the top gives decreased stability. The property of stability is based on the judgments of a set of individuals as to the number of groups in the arpeggio. Further, if the notes of an arpeggio are sounded simultaneously one hears a chord and one could expect the chord to possess something of the stability quality of the arpeggio. 'Stability' is possibly an Ehrenfels quality of arpeggios, and perhaps chords, and the experimental results above form a little contributory evidence towards such a view.

The order of increasing difficulty in this set of tests is 60, 61, 62, 59, 57, 58, 56. The first six of these are various forms of the dominant 7th resolving on to the tonic chord, and probably the familiarity of this resolution (e.g., in varieties of cadences as well as in other harmonic uses) accounts for the ease of the tests. The success of the subjects with test 56 as compared with other tests of a comparable length is due to harmonic segregation. The 'chords of the seventh' used in this test do not follow each other naturally; none is the resolution of the preceding chord so the chords lack harmonic relations. Nevertheless, success in this test is relative, about 30% of the group being correct. The failures must not be overlooked. Here about 60% of the group appear to lack the 'harmonic sense' which would make the test suitable for their powers.

Tests 63 to 67.

These use the whole tone scale in various forms so that the subjects are hearing notes which lack the usual relations between one and another such as occur in the major or minor scales. As a result of this, the responses should depend more on pitch movement than do the other tests.

Test 63 (7 notes of the whole tone scale).

Mode is 1 (31·1); 2 (19·4); 7 (17·5); 3 (14·6); 4(13·6).

In this test the interest centres on what the subjects do respond, rather than on what one might expect them to respond. The answer which is most to be expected is '1' and the percentage of the group giving this response is certainly high; in fact, of the highest order compared with the results of other tests. The tendency to count single notes is present, but not marked. The surprising responses are 2, 3 and 4 which receive substantial support. These, however, are capable of simple explanations. For the "two" responses, the subjects have probably taken the first three notes to be one group (doh, ray, me) and the rests of the scale as another. For the "three" responses, the classification has probably been of the form "doh, ray, me; doh, ray, me" with the final note, which does not "fit" well, as a third group, or perhaps the form "doh, ray, me; doh, ray; doh, ray" while the "four" classification is of the form "doh, ray; doh, ray; doh, ray;" with the final note as a fourth group. (It is not supposed that the subjects used sol-fa. Some of them may have done so, although the writer does not think that they would have this initiative.) Sol-fa is used here as a convenient method of expressing relations. If the results for this test are compared with those for Test 50, the ascending major scale, it will be seen that, relative to test 50, the whole tone scale receives responses which include slightly fewer '1' responses, a marked reduction in the counting of single notes (about one-half), more '2' responses, a substantial increase in "3" responses, and a reduction in "4" responses. The two latter observations are in keeping with the fact that the whole tone scale has 7 notes instead of 8, but the number of "2" responses is unexpected. The observations on the "1" responses and the counting of single notes are the most surprising ones. Taken in conjunction they suggest that, on the whole, the subjects perceive more unity in the whole tone scale than in the major scale.

Test 64 (4 groups or 2 groups). The mode is 6 (33·0); 1 (15·5); 4 (20·4), 12(9·7); 2 (6·8).

The result for the "6" response is strange, since grouping in pairs has not a reasonable foundation. However, there are 12 notes and this method of grouping gives a mathematical fit. It is natural to think that the lack of semitones may account for the subjects falling back on this crude response. Again there is little tendency to count single notes. The support for the response "4" is substantial and is greater than that for groups of three notes in other tests, even ones which are longer than test 64. For example, the percentages for the correct number of groups in other tests are:- Test 43 (12·6%); 44 (2·9%); 45 (15·5%); 52 (8·7); 53 (18·4); 54 (2·9). It is reasonable to suppose that the use of the whole tone scale eliminates, or reduces, the melodic and harmonic relations existing in a melodic progression, so that these appear to hinder the perception of groups based on pitch movement, or, to put it in another way, these suggest groups which can conflict with the number of groups determined by pitch movement. This is contributory evidence to the suggested explanations on previous pages about the effects of melodic and harmonic relations as a contributory factor in group perception.

Test 65 (6 groups or 3 or 2). Mode 6 (26·2); 1 (15·5); 2 (4·9); 3 (4·9); 18 (3·9).

Test 66 (5 groups). Mode 5 (36·9); 1 (10·7); 15 (3·9).

Test 67 (6 groups or 3 or 2). Mode 6 (39·8); 1 (8·7); 3 (5·8); 2 (2·9); 18 (1·9).

The subjects are superior in these three tests as compared with other tests (except tests 56 to 62, where strong harmonic bonds are evident), which serves to verify the above results. Again, note-counting is slight. The order of decreasing difficulty in this last set is 67, 66, 65, 63, 64. This order appears to be independent of the length of the test, but to depend directly on the size of interval between the first and second notes of a group - the wider the interval the easier the test.

The order of difficulty of tests 43 to 67, in which grouping is effected by the perception of pitch movement, without accent or rest, is shown overleaf.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66

The subjects who gave the response '1' to tests 43-67.

(1) This point has been considered before for tests 26 to 42 (page 181). It is considered again for tests 43 to 67 for these tests have no accent or rest to aid the subjects to perceive groups, but have to be performed by observing the 'shape' of the test items; that is, the subjects have to perceive groups on the basis of the melodic and harmonic relations existing between notes. It might be the case that the subjects who give the response '1', the U response, are those whose perceptual powers are so highly developed that they tend to perceive one 'long' group rather than a few 'short' groups. As before, 1 mark was given for each U response so as to form a U score for each subject of the group of age 13 to 14. It was found that there were 222 of these responses, derived from 34 subjects. All of these subjects occurred in the group of 43 subjects which gave U responses for tests 26 to 42 (page 182), so one could expect results from these resembling the previous results. The number of U responses given by one individual ranged from 1 to 24. Correlations were worked out as in the previous enquiry, and are shown below.

U and M.	-	$r = \cdot 01 \pm \cdot 10$
U and P.	-	$r = -\cdot 26 \pm \cdot 09$
U and g.	-	$r = \cdot 22 \pm \cdot 09$
U and S_1	-	$r = -\cdot 00 \pm \cdot 10$
U and S_2	-	$r = -\cdot 04 \pm \cdot 10$
U and S_3	-	$r = -\cdot 04 \pm \cdot 10$
U and S_4	-	$r = \cdot 04 \pm \cdot 10$
U and S_5	-	$r = \cdot 14 \pm \cdot 10$
U and S_6	-	$r = \cdot 34 \pm \cdot 09$

A mean square contingency coefficient was worked out between categories obtained from the teacher's estimate and categories obtained from the U scores. The coefficient must be interpreted as the relation between decreasing values of the teacher's estimate and an increasing tendency to give U responses. The coefficient was $C = \cdot 33$, and the corrected value is $C = \cdot 41$. There is, therefore, a significant and fairly low relation between the variates, so it can be concluded that those judged to be 'musical' by the teacher tend to give few U responses. With the exception of the coefficient between

U and S_6, none of the other correlation coefficients is significant. This is probably due to the fact that these tests are more difficult than the previous tests and that chance factors are more operative in leading subjects to give the response '1'. It is interesting to notice that the correlations for S_1 and S_2 are less numerically than those for the previous tests where accent was either present or readily suggested. The signs of the coefficients derived from these two tests are both negative, giving a very tentative hint that those who are superior in Pitch and Intensity discrimination tend to give low U responses. It might be thought that these correlations ought to be considerable in size, since those who had superior abilities in Pitch and Intensity discrimination would be highly successful, especially those who added accents in imaginal activity. The results show that these particular tests do not evoke such activity; at least there is exceedingly little basis for supposing so. This is not very strange.

Tests 43 to 67 have more 'flow', by reason of the use of equal notes, than the preceding tests, and there is less to suggest pitch, time or intensity accents. The value of r for U and S_6 is significant and unexpectedly large. It shows that there is a significant and fairly low relation between the ability to perceive rhythmic patterns and the tendency to give U responses. It is rather perplexing to see why this should be so, because tests 43 to 67 have no overt rhythmic structure. Of course, the interpretation of the correlation coefficient may be put in another way, namely, that those who are good in rhythmic ability will tend somewhat to be unsuccessful in the tests, (by virtue of giving large U scores), which is a reasonable enough result, (since the tests have little of the essential qualities of rhythm), yet hardly satisfying. Another explanation could be that the Seashore test is a test of the ability to perceive, as an organised whole, a given rhythmic pattern. (Seashore, who appears to be an 'elementarist', would probably question this view.) Those who are most successful in the Seashore test will possess, on the whole, most power in perceiving 'long' groups - hence the overlap between the tendency to give U responses and success in the rhythm test. Some little support is given to this speculation by the sign of r for U and S_5.

Another question also arises. Is the observed correlation to be accepted, or is partial correlation present? The correlation becomes ·29 when the effect of intelligence is partialled out and ·27 when P (the test of group perception) is partialled out. The former coefficient is just a little above the level for significance and the latter is on the border line. This gives a little support to the view that the correlation is due to the tendency to perceive 'long' groups but it is clearly by no means complete.

The correlation between U and mental age is positive in this set of tests (negative in the preceding set) but is not significant.

The result for U and P is below the level of significance, but the size and relative magnitude of the correlation is roughly in agreement with the preceding results. It appears that there is less tendency in these tests, as compared with the previous ones, for superior subjects in the P test to give few U responses.

The low value of the correlation between U and S_1 is very surprising. The relation between Sense of Pitch and the tendency to give U responses appears to be a chance one, although the sign of the correlation gives a very slight hint that those superior in pitch sense give few U responses. This is not altogether strange if we agree that the subjects are perceiving not pitch levels, but change in pitch levels, that is, melodic flow. If the correlation were large and negative it would show that ability in perceiving pitch level from note to note prevented the subjects from giving U responses. The low value suggests that this does not occur to an appreciable extent and forms an argument against this 'elementaristic' point of view. In general, the results of this section show that, on the whole, superior subjects tend not to give the response '1'.

(2) The U responses for tests 26 to 67 were then considered. The perception test was based on this range of tests, so that correlations using the results of the perception test should be worked out for U scores based on the same range. Further, the calculated results over this range will provide a survey of the relations existing

between the variates derived from this broad range and will give some extra information about the perception . The correlations obtained are shown below.

U and M	-	r =	$-\cdot 01 \pm \cdot 10$
U and P	-	r =	$-\cdot 42 \pm \cdot 08$
U and g	-	r =	$\cdot 21 \pm \cdot 09$
U and S_1	-	r =	$-\cdot 15 \pm \cdot 10$
U and S_2	-	r =	$-\cdot 11 \pm \cdot 10$
U and S_3	-	r =	$-\cdot 10 \pm \cdot 10$
U and S_4	-	r =	$-\cdot 05 \pm \cdot 10$
U and S_5	-	r =	$\cdot 03 \pm \cdot 01$
U and S_6	-	r =	$\cdot 19 \pm \cdot 09$

It will be seen that the values for the Seashore tests cast doubt on the significance of the corresponding values on pages 183 and 500 , but, of course, the U responses are derived in different ways for each set of correlations.

Mean square contingency coefficient for teacher's estimate and U responses is C = ·30, corrected C = ·37. As before, this coefficient is significant and shows that there is a fairly low relationship between the teacher's estimate and U responses, so that those judged by the teacher to be 'musical' tend to give low U responses and conversely.

The group test (M)

r is not significant, but tends to a negative value. It can be said therefore that those judged to be musical by the group test will tend to give low U responses. This is not definitely proved, but the correlation in any case will be small.

The perception test (P)

The correlation is significant and negative, hence there is a fairly marked tendency for those who are superior in group perception to give few U responses.

Intelligence.

r is not significant. The positive sign suggests that there may be a relation between intelligence and the tendency to give U responses. As was mentioned before, the low value of r is evidence against the view that intelligence serves to integrate perception of the 'musical' groups used in the tests.

The Seashore tests.

None of the correlations are significant, so no definite conclusions can be drawn, except that the relations between these tests and the tendency to give U responses are small. Hence those who are musically 'talented', as judged by the Seashore tests, are likely to give few U responses. The positive signs for S_5 and S_6 may have meaning, as suggestive pointers. Both the Tonal Memory test and the Rhythm test involve comparison judgments and therefore the subjects require to remember patterns which have been heard, so that those tending to perceive 'long' groups rather than 'short' ones will tend to be successful in S_5 and S_6. This is a speculation without adequate evidence, but even if it were true it would only be a partial explanation.

Considerable space has been devoted to examining in detail the U responses, but it was considered to be important to see if these responses were due to superiority of perceptual organisation or to inferiority. The results show that the latter alternative is much more likely.

Some special responses.

(a) U responses in tests 57 to 62 (dominant to tonic resolution with arpeggio chords.) Only 6 individuals gave U responses, namely 5,2,1,1,1 and 1 per person. The individual (McA.) giving 5 responses, had a score of 6 in the perception test which was not due merely to his tendency to give U responses. This score would give him a percentile rank of 8 and a scrutiny of all his responses verifies this lack of ability in perception. His score in the M test coincides with the mean, his I.Q. is 113 and he is graded 'average' by the teacher. His teacher reported that he is not particularly interested in music and the boy reported that he rarely hums, sings or whistles. He said that he found difficulty in remembering tunes. All these observations contribute to the view that there is a specific ability or set of abilities which may be called 'ability for group perception' which is probably related to imagery and remembering. The subject (McQ) with response 2 was below average a little in the M test, had P.R. of 30 in the perception test (a disability not accounted for by the number of U responses), his I.Q. was 101 and he was accounted 'superior' by his teacher. He was weak in Pitch Sense, the Seashore rank being 38, and in the Rhythm test. The other subjects giving U responses are summarised below.

(A) Average in M test; P.R. 20 in P test; I.Q. 95;average in teacher's estimate; P.R. 32 in Pitch; P.R. 38 in Tonal Memory.(Rather weak in the other Seashore tests also.)

(D) Average in M test; P.R. 60 in P test; I.Q. 100; superior in teacher's estimate. Superior in Pitch and Intensity but inferior in Tonal Memory.

(P) Below average in M test; P.R. 60 in P test; I.Q. 102; superior in teacher's estimate; very weak in Pitch (P.R. 18); superior in Time.

(B. McA) Average in M test; P.R. 20 in P test; I.Q. 128; inferior in teacher's estimate. Seashore results quite average.

Subject D is quite average in the number of her U responses; the occurrence of the subject in this list might be regarded as due to chance factors unless the result in the Tonal Memory test was regarded as a causal factor. Subject P is not so exceptional a case as the results might suggest. She is a keen choir singer, but is rather more enthusiastic than able. Her zeal tends to overcome her Pitch deficiency. The number of her U responses over all the tests is well above average. In none of the above cases is the score in the perception test accounted for by the number of U responses, so it is likely that a genuine deficiency of ability in group perception exists. In all cases some weakness is revealed by the tests; nevertheless it is interesting to note how few subjects giving U responses occur in this section.

(b) U responses in tests 63 to 67 (whole tone scale used.) 17 subjects gave these responses totalling 30 responses. Of these 11 were given in test 63 and constitute acceptable answers; yet only 4 of these came from subjects who were below the average in the U responses for tests 26--67. These were superior subjects in most of the other tests, but it is clear from the results that even in test 63 a U response is indicative more of inferiority than of superiority. There are left 19 responses distributed over 4 tests using 54 subjects. This is surprisingly little, and of the 11 subjects giving U responses only 2 could be regarded as superior in the other tests.

(c) Scale passages. The tests using a complete scale passage are 5, 11, 50 and 51. In group B (i.e. age 13) the responses were examined to see what type of subjects gave the response 1, 2 or 4. The object was to see if there was any 'natural' grouping of the major scale chosen by superior subjects or alternatively by inferior subjects.

<u>Test 5</u>.

One subject gave the response 1. He was below average in the M, P, intelligence and Seashore tests, judged inferior by the teacher, but was a little above average in <u>not</u> giving U scores in tests 26 - 67. One subject gave the response 4. She was inferior in all measures except the intelligence test (I.Q. 100) and the teacher's estimate, being judged to be above average. No one gave the response 2.

<u>Test 11</u>.

One boy (the same as in test 5) gave the response 2. (The responses 1 and 4 did not occur.)

<u>Test 50</u> (ascending major scale)
<u>Test 51</u> (descending major scale)

These two gave results tabulated below.

TEST 50 AVERAGE SCORES.

No. of subjects	Response	M	P	I.Q.	T.E.	S_1	S_2	S_3	S_4	S_5	S_6	U
10	1	18·9	11·4	104·3	1:1	62·8	79·0	82·0	62·8	47·0	68·8	15·0
5	2	20·0	19·1	89·2	7:3	81·6	82·8	89·2	62·8	47·2	68·0	4·8
12	4	20·9	17·0	99·6	5:3	60·5	55·0	81·7	60·7	43·2	64·7	4·1
21	Others	18·2	12·1	100·1	11:1	56·4	82·3	84·8	61·8	49·6	65·9	6·8

TEST 51 AVERAGES

No. of subjects	Response	M	P	I.Q.	T.E.	S_1	S_2	S_3	S_4	S_5	S_6	U
12	1	19·4	12·2	101·7	5:3	69·2	81·8	82·0	62·2	43·0	66·4	15·4
7	2	21·0	14·4	102·0	5:2	58·6	82·0	88·0	61·7	54·0	71·4	9·6
12	4	20·1	18·8	98·2	5:3	61·5	85·0	84·5	61·2	41·5	65·7	3·6
17	Others	17·7	11·5	98·5	7:10	57·5	81·5	73·3	62·0	49·9	64·7	4·1

TESTS 50 AND 51. POOLED RESULTS.

No. of subjects	Response	M	P	I.Q.	T.E.	S_1	S_2	S_3	S_4	S_5	S_6	U
22	1	19·1	11·8	102·8	25:19	66·3	80·6	82·0	62·4	47·6	67·4	15·2
12	2	20·6	16·3	96·7	17:7	68·2	82·3	88·5	62·2	51·2	70·0	7·6
24	4	20·5	17·9	98·8	5:3	61·0	85·0	83·1	60·9	42·3	65·2	3·8
38	Others	18·0	11·8	99·3	9:10	56·9	82·0	84·1	61·9	48·7	65·4	5·6

The group test in music.

In test 50, test 51 and the pooled result (which will tend to neutralise any effect due to the direction of the scale movement) the subjects giving responses other than 1, 2 or 4 tend to be inferior in the M test, while those giving the response 1 tend to be inferior to those giving the response 2 or 4.

The test of group perception.

In the pooled result those giving the response 4 tend to be superior in group perception to those giving the response 2 and these in turn tend to be superior to those giving the response 1 or other responses. When the groups giving the response 2 are compared for test 50 and test 51, the group giving the response in test 50 appears to be superior in group perception to the group giving this response in test 51. In test 50 the response 2 comes from a group with a higher level of ability in group perception than the group giving the response 4. The reverse is the case in test 51. Putting it another way, those possessing superior ability in group perception tend to give the response 2 for the ascending scale, but the response 4 for the descending scale. This may be represented diagrammatically in the drawings below.

Ascending scale:- $\underline{d\ r\ m\ f}\ \ \underline{s\ l\ t\ d'}$

Descending scale:- d' t l s f m r d

The result for the ascending scale recalls the tetrachord structure of the scale (i.e. two groups with tones and semitones bearing a similar relation in the group structure. The second gives a formation which recalls the major chord, d' s m d.)

The I.Q. results.

It has been shown already that intelligence plays little part in these tests, but the results suggest that the more intelligent subjects tend to give the response 1, so it is possible that this response indicates reasoning or some form of logical activity on the part of those giving the response.

The teacher's estimate.

This has been expressed in the form of a ratio. The estimate of the teacher gave three categories. In making the table the middle category number was halved and shared with the extreme categories and the resulting two numbers expressed as a ratio. For example, if the category numbers were 4, 4, 2 the sharing produces two category numbers 6 and 4, giving a ratio 3:2. This means that superior subjects are to inferior subjects in the ratio 3 to 2. By making the second term the same in all ratios which have to be compared, it is possible to note which ratio represents a greater 'concentration' of superior pupils. Superiority in the teacher's estimate is largely dependent on superiority of reading ability. (i.e. sol-fa). When the ratios are compared in this way, it is seen that those giving 'other' responses are most inferior, those giving the response 1 come next, those giving the response 4 are superior, and those giving the response 2 are most superior. This is true in all the above tables with a very small modification for test 50; one which is so very small that it could certainly occur by chance. It is natural to believe that reading ability develops and accompanies superiority in powers of imagery and hence in powers of perceiving broad groups, so the above results are comprehensible and a tribute to sol-fa methods.

The U scores.

/The U scores.

In all tables the subjects giving the response 1 tend to have the highest U scores which shows that the incidence of 1 in tests 50 and 51 is not a specific occurrence but part of a wider manifestation. Those giving the response 4 tend to have fewest U scores. Those giving the response 2 and other responses are intermediate, and the result for the pooled table suggests that those giving the response 2 are more likely to give U responses than those recording 'other' responses.

The Seashore tests.

The results for tests 50 and 51 are much the same in magnitude, but the result for the response 2 in the Pitch test shows a considerable difference. Hence it appears that the subjects who give the response 2 for the ascending scale tend to be superior in pitch discrimination to those giving this response in the descending scale. This result corresponds to a similar result with the P test.

It is most satisfactory to examine the table of the pooled results. The subjects giving the response 2 are most superior, on the whole, in the Seashore tests, those giving 1 come next, those giving 'other' responses third, and those giving the response 4 come last.

In S_2 , the test of Sense of Intensity, we may look for the effect of accent. The group giving the response 4 tends to be superior in S_2 to those giving the response 2. These are superior to those giving 'other' responses, and they in turn are superior to those giving the response 1. This is quite comprehensible if, as is very likely, the subjects 'project' accents on to the melody which is played in the test.

In almost all the above results the differences between the means which have been considered are small; and consequently the conclusions which have been drawn are tentative, since the differences between the means may have occurred by chance. However, in many cases a similarity between both tables, a resemblance between certain conclusions and the fact that the conclusions seemed acceptable, consistent or reasonable were borne in mind to help raise the discussion above the level of the merely speculative.

It is seen that the subjects giving the response 1 or 'other' responses are generally inferior, whilst those giving the response 2 or 4 are generally superior. Of the latter, those giving the response 2 tend to be a little superior to those giving the response 4. The results on page 490 can now be qualified. It was seen there that the response 1 and the response 8 were most common in the scale tests, that the response 4 came next and the response 2 obtained little support. It is now possible to say that this reduction in the frequency of responses is accompanied by an increase in the superiority of the subjects giving these responses. It cannot be said that groups of 2 or 4 are 'natural' groups for children of this age to perceive, since the majority of the children do not give either of these responses, but they are 'natural', in a sense, for superior children or 'musical' children.

(d) <u>Harmony tests. (57 - 61)</u>

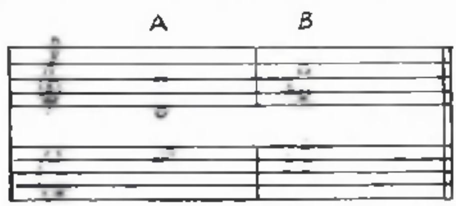
A few subjects gave the response 1 in these tests but these were individuals who were inferior in the various measures which were scrutinised. A list was made of those who gave the response 2 or 4 in the tests. From this the individuals who gave four responses of '2' out of the five tests (a measure of superiority) were selected, and the means for this group worked out as shown below. This is called the '2' group and the remaining subjects in the whole group (i.e. of age 13) form the 'Others' group. The means are shown below.

	M	P	I.Q.	S_1	S_2	S_3	S_4	S_5	S_6	U
"2" GROUP	20·2	16·6	105·6	72·9	84·8	85·8	61·4	51·7	69·2	9·6
OTHERS	18·8	12·8	97·3	55·8	81·5	83·2	62·0	45·2	65·0	6·8

There were 14 subjects in the '2' group and 34 in the 'Others' group. The means for the former group were greater than those for the <u>whole</u> group with the exception of test S_4, in which a difference of ·4 in the means, in the opposite direction, occurred; but it is more accurate to use the comparison of the table on previous page. With the exception of S_4 again, the means in the '2' group are greater in every measure than the means for the 'Others' group. This range of superiority justifies the conclusion that the tendency to give the response '2', which involves the perception of a 'dominant' group resolving on a 'tonic' group (a perception which is hardly likely to be associated with sol-fa naming, or any other form of naming, at this age of subjects) is correlated with superiority of ability, including intelligence. As this perception of resolution involves what might be called harmonic sense (i.e. the ability to be aware of harmonic progression) it is quite reasonable to find that the superior subjects are those who possess this complex and essentially musicianly ability. The Seashore results in the table justify attention. The perception tests are played without accent and the notes are of equal duration, so one would expect that S_2 (Intensity) and S_3 (Time) should give almost the same means when the two groups are considered. This is so in the table. A similar consideration applies to S_5 (Rhythm). But one would expect a marked difference in the means for S_1 (Pitch) because, generally, harmony is a function of melody, or, to put it another way, those subjects who can most accurately perceive the rise and fall in pitch level of the test progressions will have an advantage in educing harmonic unities. The difference in means is the greatest for all the Seashore results so this expectation is fulfilled.

It is as well to remember that although the view that harmony is a function of melody is an accepted one, it is accepted as an opinion and not a demonstration. That is, a vague statement like this may depend for its acceptance on written examples, or examples played and heard by musicians. It is always important to consider just how far such a statement is true for untrained adults and children. The above result is of special interest as a demonstration when these sides of the question are considered. In the Tonal Memory test (S_5), the table justifies expectations, since the subjects who can remember themes in order to be successful in the Tonal Memory Test would be expected to be those who can remember the musical passages of these harmony tests and consequently become aware of harmonic unities. (By 'remembering' is here meant the retention of certain auditory images recognised as being in relation one with another. It is not supposed that this remembering is the remembering merely of entities or elements.) The test S_4 (Sense of Consonance) appears to give a negative result. Success in S_4 would appear to depend on harmonic ability. ("Which of two chords is the more consonant?") yet it is a weakness of the test that a person with a highly developed harmonic ability can give an answer different to the answer expected by Seashore because his ability leads him to perceive a harmonic relationship <u>between</u> the chords which disturbs his judgment of the harmonic relationships <u>within</u> each chord, e.g. he may judge chord A to be more consonant than chord B when these are separated by an adequate interval of time but if they are played with only a brief interval between and if he considers, for any reason, that B is the resolution of A, then there will arise a tendency for him to regard A as being less consonant than B.

For example:-



Again, if chords C and D are used in one test and chords E and F in the succeeding test, chord E may be more consonant than chord F, but if C and D establish a certain key and chord E is discordant in that key then a subject with a well developed harmonic ability may say that chord E is less consonant than chord F.

It is quite possible for a group of trained musicians, reacting in the above anomalous ways, to obtain scores in S_4 which are of much the same mean size as those of untrained subjects, so that the apparent discrepancy in the means for S_4 in the table is not necessarily contra-indicative of the general conclusion which has been drawn already. (The writer justifies this statement from reports made by various musical persons who have been tested, certain class results, and comments by Markham Lee in 'The Musical Times.')

(d) The variability of the responses in tests which were allowed successive attempts./

(d) The variability of the responses in tests which were allowed successive attempts.

It may be asked if the subjects vacillated much in their responses to those tests which permit three attempts. If this did occur, it would cast doubt on the reliability of the tests. The results on tendency to variability of response (page 169) show that the number of variable 'triads' is about $\frac{2}{5}$ of the total number written. This is a strict criterion, for it counts as a variation any change whatever in the triad of responses. There is therefore little tendency to vacillation. A survey of the tables of response categories and the distribution of the responses verifies this and suggests strongly that the repetition of the test consolidates and confirms the first response.

[See text, page 192]

THE SENIOR QUESTIONNAIRE.

Indicate by the figures 1,2,3,4, etc., the order of your preference for the following things. If you are equally interested in some of them use equal figures to show this where necessary. For example, you may wish to use several 1's, 2's, 3's, etc.

If you wish to add to the list, write out extra items at the end.

NAME	NUMBER
Games or Sports	____
Serious Literature	____
Light Literature	____
Psychology	____
Philosophy	____
Mathematics	____
Biology	____
Physical Science	____
Chemistry	____
Music	____
[redacted]	____
Paintings or Drawings	____
Theatre	____
Cinema	____
Dancing	____
Card Playing	____
Poetry	____

Draw a line under the word that is true for you:-

1. Have you a wireless set? YES NO
2. Have you a gramophone? YES NO
3. Do you sing in a choir? YES NO
4. Do you sing songs by yourself in public? YES NO
5. Do you hum, sing or whistle when alone? A lot, A little, NO.
6. Do you play a musical instrument? YES NO
7. If so, state the instrument and time you have played it. ....
....

8. Have you heard music in church or chapel? YES NO
9. Have you heard a large orchestra playing in a large hall? YES NO

10. Have you heard a singer or a choir at a concert?
YES NO

11. Does any other person at home play or sing?
YES NO

12. If so, write a short note about it ....
....
....
....

Draw a line under the figure that is true for you:-

1. How many people at home, including yourself, hear your wireless set? 0 1 2 3 4 5 6 7 8 9 10 11 12
2. How many people at home, including yourself, hear your gramophone? 0 1 2 3 4 5 6 7 8 9 10 11 12

Score out four of the following five lines, leaving the one which is most true for you:-

1. I like very much to hear music.
2. I rather like to hear music.
3. I am not at all keen about hearing music and yet I don't dislike it.
4. I rather dislike hearing music.
5. I very much dislike hearing music.

Put 1 in the square before the thing you like best (Use several 1's if there are several you like best.) Put 2 in the square before the thing you like second best. (Use several 2's if there are several you like second best), and so on for the others. Remember you can use several 1's, 2's, 3's, 4's, etc.

☐ Large orchestra ☐ Theatre orchestra

☐ Dance band ☐ Brass band

☐ Pipe band ☐ Piano

☐ Violin ☐ Pipe organ

☐ Cinema organ ☐ String quartet

☐ A choir

☐ A singer

☐ A crooner

Do the same for this list:-

☐ Operas

☐ Classical music

☐ Light music

☐ Dance or jazz music

☐ Modern music.

Do the same for this list:-

☐ Songs

☐ Sonatas

☐ Symphonies

☐ Waltzes

☐ Modern dances

☐ Marches

☐ Overtures

☐ Operas

☐ Hymns.

Do the same for this list :-

☐ A soprano singer

☐ A contralto singer

☐ A tenor singer

☐ A bass singer

Do the same for this list:-

A singer alone

A duet for singers.

A quartet for singers

A choir of men and wom en

A choir of men

Put 1 in the square before the thing you hear most. (Use several 1's if there are several you hear equally often.) Put 2 in the square before the thing you hear not quite so often. (Use several 2's if there are several like this), and so on for the others. Remember you can use several 1's, 2's, 3's, 4's, etc.

Large orchestra

Theatre orchestra

Dance band

Brass band

Pipe band

Piano

Violin

Pipe organ

Cinema organ

String quartet

A choir

A singer

A crooner

Do the same for this list:-

Gramophone music

Wireless broadcast music

Concerts

Your own performance

☐ School music ☐ Church music

☐ The performance of friends or other amateurs.

Show the effect of wireless broadcast music on your interest in music by scoring out four of the following five lines:-

1. My interest in music has definitely become less.
2. My interest in music has become slightly less.
3. My interest in music has not become less nor has it become greater.
4. My interest in music has slightly increased.
5. My interest in music has definitely increased.

Put 1 in front of the statement below that is usually most true for you. (Use several 1's if there are several like this.) Put 2 in front of the statement that you think comes next, and so on for the others. Remember you can use several 1's, 2's, 3's, etc.

☐ Music produces in me feelings of activity or striving that make me want to tap, dance, march or move in some way.

☐ Music produces in me feelings of activity or striving without making me want to move.

☐ Music produces in me feelings of peace or rest.

☐ Music brightens me up by giving me a feeling of pleasure without any other special effect.

☐ Music produces in my mind pictures and imaginations.

☐ Music produces in me thoughts of my own without pictures.

☐ Music produces in me vague thoughts of noble or deep things that the composer is trying to express.

☐ Music makes me attend to the instruments, the notes or chords, or the composer's intentions, so that I may understand, appreciate, or criticise the music.

Draw a line under the answer you think is most correct for each of the following statements:-

Sad music is music that actually makes me feel sad
Answer:- TRUE FALSE DOUBTFUL

Sad music is music in which the composer tries to suggest sadness by some thought, picture or imagination in my mind without actually making me feel sad.
Answer:- TRUE FALSE DOUBTFUL.

[See text, page 195] JUNIOR QUESTIONNAIRE.

Exercise.

Put 1 in the square before the thing you like best. (Use several 1's if there are several you like best.) Put 2 in the square before the thing you like second best. (Use several 2's if there are several you like second best.) And so on. Remember you can use several 1's, 2's, 3's, etc.

Begin here:-

☐ Going to the pictures ☐ Toothache

☐ Going messages. ☐ Games.

Put 1 before the statement that is most true for you. (Use several 1's if there are several like this.) Put 2 before the statement that you think comes next, and so on. Remember you can use several 1's, 2's, 3's, etc.

Begin here:-

☐ I like to be sad ☐ I like to be crying.

☐ I like to be happy ☐ I like to be peaceful.

Test 1

Put 1 in the square before the statement that is most true for you. (Use several 1's if there are several like this.) Put 2 before the statement that you think comes next, and so on for the others. Remember you can use several 1's, 2's, 3's, etc.

Begin here:-

☐ I like loud music. ☐ I like soft music.

☐ I like slow music. ☐ I like quick music.

Test 2.

Do the same for this list:-

☐ I like music that makes me march or want to march/

☐ /I like music that makes me march or want to march.

☐ I like music that makes me dance or want to dance.

☐ I like music that makes me see pictures in my head or imagine things.

Test 3.

Do the same for this list:-

☐ I like sad music.

☐ I like peaceful music.

☐ I like happy music.

Test 4.

Put 1 in the square before the thing you like best. (Use several 1's if there are several you like best.) Put 2 in the square before the thing you like second best. (Use several 2's if there are several you like second best) And so on for the others. Remember you can use several 1's, 2's, 3's, etc.

☐ Gramophone music

☐ Concerts

☐ School music

☐ Wireless broadcast music.

☐ Your own performance.

☐ Church music.

☐ The performance of friends or other amateurs.

[See text, page 207]

INTERESTS

GROUP	GAMES OR SPORTS	SERIOUS LITERATURE	LIGHT LIT.	PSYCHOLOGY	PHILOSOPHY	MATHS.	BIOLOGY	PHYSICAL SCIENCE
BOYS 9 & 11+	73·1	14·6	43·2	3·7	3·6	15·1	2·2	4·9
GIRLS, 9 & 11+	73·6	11·8	39·3	3·6	3·0	23·5	7·2	3·9
BOYS 12 & 14+	79·5	26·6	38·1	16·3	17·6	31·3	17·9	38·3
GIRLS 12 & 14+	75·9	25·4	35·5	17·6	15·9	30·3	22·0	26·2
ALL BOYS	75·2	18·5	41·5	7·8	8·1	20·4	7·3	15·8
ALL GIRLS	74·2	15·4	38·3	7·3	6·4	25·3	11·1	9·7
ALL, 9 & 11+	73·4	13·2	41·2	3·7	3·3	19·4	4·7	4·4
ALL, 12 & 14+	78·0	26·1	37·0	16·8	16·9	30·9	19·6	33·2
WHOLE GROUP	76·7	17·0	40·0	7·5	7·3	22·7	9·1	12·8

INTERESTS (continued)

GROUP	CHEMISTRY	MUSIC	PAINTINGS or DRAWINGS	THEATRE	CINEMA	DANCING	CARDS	POETRY
BOYS, 9 & 11+	3·4	36·9	36·5	38·4	68·9	16·7	46·7	28·5
GIRLS, 9 & 11+	1·1	27·4	29·6	32·0	39·3	28·0	11·1	26·2
BOYS, 12 & 14+	37·6	55·2	59·1	71·3	77·6	37·2	54·3	38·1
GIRLS, 12 & 14+	21·7	66·1	62·7	64·3	60·5	64·6	30·3	50·8
ALL BOYS	14·5	62·9	43·8	49·1	71·6	22·0	49·2	31·6
ALL GIRLS	6·5	37·5	38·2	40·4	44·8	37·5	16·1	32·6
ALL, 9 & 11+	2·2	32·1	33·0	35·2	54·0	21·4	28·5	27·4
ALL, 12 & 14+	30·5	59·9	60·6	68·3	70·2	48·9	44·1	43·5
WHOLE GROUP	10·6	40·3	61·1	44·9	58·8	29·4	33·3	32·1

INTERESTS (continued). ADDITIONS

GROUP	PRIVATE READING	DRILL	HISTORY	TOURS	GEOGRAPHY	COOKING	COMPOSITION	ENGLISH	SEWING
BOYS 9 & 11+	1·0	4·4	5·4	1·2	1·3				
GIRLS 9 & 11+	1·1		0·1		0·2		1·2	2·6	3·4
BOYS 12 & 14+	6·9	11·7	0·7	2·2	2·1				
GIRLS 12 & 14+		3·0	3·2			13·0	0·2		
ALL BOYS	2·9	6·9	3·9	1·5	1·6				
ALL GIRLS	0·8	0·8	0·9		0·1	3·4	0·9	1·9	2·5
ALL, 9 & 11+	1·1	2·3	2·7	0·6	0·8		0·6	1·3	
ALL, 12 & 14+	4·0	8·0	1·7	1·3	1·2	5·6	0·1		
WHOLE GROUP	1·9	4·0	2·4	0·8	0·9	1·6	0·4	0·9	1·2

INSTRUMENTAL COMBINATIONS PREFERRED

GROUP	LARGE ORCHESTRA	THEATRE ORCHESTRA	DANCE BAND	BRASS BAND	PIPE BAND	PIANO	VIOLIN	PIPE ORGAN	CINEMA ORGAN	STRING QUARTET	CHOIR	SINGER	CROONER
BOYS 9 & 11+	28·6	33·6	39·6	30·4	49·4	42·1	19·9	35·4	33·8	16·5	23·5	31·1	39·7
GIRLS 9 & 11+	22·0	28·2	48·5	22·9	34·2	57·6	28·3	34·0	29·3	11·8	23·0	35·5	24·8
BOYS 12 & 14+	62·5	51·4	65·7	47·3	61·9	46·2	31·7	40·6	41·9	28·8	34·5	56·0	67·2
GIRLS 12 & 14+	47·4	46·5	66·1	39·1	48·2	63·8	49·1	50·3	39·0	20·6	38·7	56·1	76·8
ALL BOYS	33·1	39·4	43·0	35·9	53·4	43·4	30·5	37·1	36·5	20·5	27·1	39·2	48·7
ALL GIRLS	28·6	33·0	53·3	27·1	37·8	59·2	33·7	38·2	31·8	14·1	27·1	40·9	38·3
ALL, 9 & 11+	25·3	30·9	44·1	26·6	41·7	49·9	29·1	34·7	31·6	14·1	23·3	33·3	32·2
ALL, 12 & 14+	44·6	49·3	66·1	43·8	56·0	53·7	39·1	44·7	40·7	25·3	36·3	56·1	71·3
WHOLE GP.	30·9	36·3	50·5	31·7	45·9	51·0	32·0	37·6	34·2	17·4	27·1	40·0	43·7

PREFERENCES

GROUP	OPERAS	CLASSICAL MUSIC	LIGHT MUSIC	DANCE or JAZZ MUSIC	MODERN MUSIC
BOYS 9 & 11+	22.8	25.7	33.4	59.0	38.0
GIRLS 9 & 11+	20.0	25.9	30.2	53.0	38.5
BOYS 12 & 14+	31.8	34.4	42.6	70.2	52.4
GIRLS 12 & 14+	28.1	41.2	43.2	57.8	56.8
ALL BOYS	25.8	28.6	36.4	62.7	42.8
ALL GIRLS	22.2	30.0	33.7	54.2	43.8
ALL, 9 & 11+	21.4	25.8	31.8	56.0	38.3
ALL, 12 & 14+	30.2	37.3	42.8	64.9	54.3
WHOLE GROUP	26.1	19.3	35.1	58.6	43.1

PREFERENCES

GROUP	SONGS	SONATAS	SYMPHONIES	WALTZES	MODERN DANCES	MARCHES	OVERTURES	OPERAS	HYMNS
BOYS 9 & 11+	57.8	14.1	24.1	27.4	29.4	34.8	15.0	18.1	53.2
GIRLS 9 & 11+	56.3	2.8	9.7	29.4	27.7	26.0	7.8	17.3	66.5
BOYS 12 & 14+	58.3	26.2	37.3	47.6	46.5	65.3	32.1	32.9	57.6
GIRLS 12 & 14+	65.3	23.2	22.2	56.6	50.0	56.4	29.3	32.7	63.7
ALL BOYS	58.0	18.0	28.3	33.9	34.8	44.0	20.5	22.9	54.6
ALL GIRLS	58.7	7.1	13.0	36.0	33.5	33.9	13.4	21.3	65.8
ALL, 9 & 11+	57.1	8.4	16.9	28.4	28.6	30.4	11.4	17.7	59.8
ALL, 12 & 14+	61.3	25.3	30.9	50.6	48.0	60.4	30.9	32.8	60.1
WHOLE GROUP	58.3	13.3	21.0	34.9	34.2	39.2	17.1	22.1	59.9

PREFERENCES

GROUP	SOPRANO	CONTRALTO	TENOR	BASS
BOYS 9 to 11+	49·6	29·3	55·7	30·2
GIRLS 9 to 11+	56·6	31·9	47·5	18·8
BOYS 12 to 14+	46·2	43·9	67·4	38·2
GIRLS 12 to 14+	58·0	43·9	65·6	28·7
ALL BOYS	48·5	34·0	59·4	32·8
ALL GIRLS	57·0	35·1	52·3	21·4
ALL, 9 to 11+	53·1	30·6	51·7	24·6
ALL, 12 to 14+	51·2	43·9	66·6	34·2
WHOLE GP.	52·5	34·5	56·1	27·4

PREFERENCES

GROUP	SINGER ALONE	DUET FOR SINGERS	QUARTET	MIXED CHOIR	MALE CHOIR
BOYS 9 to 11+	60·4	37·2	27·9	31·9	39·2
GIRLS 9 to 11+	67·4	37·0	32·6	31·4	20·5
BOYS 12 to 14+	71·5	52·9	42·9	37·6	34·6
GIRLS, 12 to 14+	73·0	51·4	41·5	42·8	37·4
ALL BOYS	64·0	42·3	32·7	34·4	37·7
ALL GIRLS	68·9	40·8	34·9	34·4	24·9
ALL, 9 to 11+	63·9	37·1	30·2	31·6	29·9
ALL, 12 to 14+	72·1	52·3	42·3	40·9	35·8
WHOLE GP.	66·3	41·6	33·8	34·4	31·6

HEARD MOST

GROUP	LARGE ORCHESTRA	THEATRE ORCH	DANCE BAND	BRASS BAND	PIPE BAND	PIANO	VIOLIN	PIPE ORGAN	CINEMA ORGAN	STRING QUARTET	CHOIR	SINGER	CROONER
BOYS 9 & 11+	16·9	20·8	39·2	36·5	40·4	33·4	24·2	40·4	27·7	14·7	36·8	41·1	27·8
GIRLS 9 & 11+	12·6	20·1	41·4	32·4	33·7	42·5	16·0	35·8	27·8	5·9	31·5	44·9	21·9
BOYS 12 & 14+	26·5	43·4	64·0	40·9	58·5	51·1	38·7	41·2	38·3	24·5	52·1	63·1	51·2
GIRLS 12 & 14+	20·3	35·4	61·2	37·7	51·5	59·5	31·2	44·2	35·5	18·2	52·5	62·2	34·3
ALL BOYS	20·0	28·1	47·2	38·0	46·3	39·1	28·9	40·7	31·1	17·9	41·7	48·2	35·4
ALL GIRLS	14·6	24·1	46·5	33·8	38·3	46·9	20·0	38·0	29·8	9·1	37·0	49·4	25·1
ALL, 9 & 11+	14·7	20·4	40·3	34·4	37·0	38·0	20·0	38·1	27·7	10·3	34·1	43·0	24·8
ALL, 12 & 14+	23·8	40·0	62·8	39·5	55·5	54·7	35·5	42·5	37·1	21·8	52·3	62·7	44·0
WHOLE GP.	17·4	26·2	46·9	35·9	42·4	42·9	24·6	39·4	30·5	13·6	39·4	48·8	30·5

HEARD MOST

GROUP	GRAMOPHONE MUSIC	WIRELESS BROADCAST MUSIC	CONCERTS	OWN PERFORMANCE	SCHOOL MUSIC	CHURCH MUSIC	PERFORMANCE OF FRIENDS OR OTHER AMATEURS
BOYS 9 & 11+	45·7	42·1	29·1	21·6	32·2	54·3	13·3
GIRLS 9 & 11+	39·8	45·4	32·5	20·7	30·6	53·5	7·7
BOYS 12 & 14+	67·6	60·5	41·6	32·3	46·3	59·3	26·6
GIRLS 12 & 14+	46·9	55·3	44·6	37·2	48·2	71·4	32·8
ALL BOYS	52·8	48·0	33·2	25·0	36·7	55·9	17·6
ALL GIRLS	41·6	48·0	35·7	25·0	35·2	58·1	14·3
ALL, 9 & 11+	42·7	43·7	30·8	21·2	31·4	53·9	10·5
ALL, 12 & 14+	58·8	58·3	42·9	34·4	47·1	64·4	29·3
WHOLE GP.	47·4	48·0	34·4	25·0	36·0	57·0	16·0

EFFECTS OF LISTENING TO MUSIC

GROUP	MOVEMENT-ACTIVITY	NON-MOVEMENT-ACTIVITY	PEACE	PLEASURE	IMAGES	THOUGHTS	VAGUE THOUGHTS	ANALYTICAL ATTITUDE
BOYS, 9 & 11+	52·3	38·0	49·7	49·9	46·1	26·8	28·9	40·7
GIRLS 9 & 11+	52·6	26·9	41·1	51·6	40·7	23·7	23·3	38·5
BOYS, 12 & 14+	77·8	41·7	43·0	58·5	48·3	39·5	36·1	35·1
GIRLS, 12 & 14+	74·6	39·3	49·5	49·3	58·5	41·0	34·2	38·4
ALL BOYS	60·6	39·2	47·5	52·7	46·8	30·9	31·2	39·0
ALL GIRLS	58·3	30·2	43·3	51·0	45·3	28·2	26·2	38·5
ALL, 9 & 11+	52·4	32·4	45·4	50·8	43·4	25·3	26·1	39·7
ALL, 12 & 14+	76·4	40·7	45·8	56·6	52·6	40·1	35·3	36·5
WHOLE GP.	59·5	34·8	45·5	51·9	46·1	29·6	28·8	38·8

[See text, page 225]

INTERESTS

GROUP	GAMES	SERIOUS LITERATURE	LIGHT LIT.	PSYCHOLOGY	PHILOSOPHY	MATHS.	BIOLOGY	PHYSICAL SCIENCE	CHEMISTRY
BOYS, 4th. yr.	84·5	36·1	66·1	28·9	25·6	41·2	30·5	35·3	66·8
GIRLS, 4th. yr.	76·7	41·4	58·1	19·8	18·7	30·5	19·9	23·6	28·6
ALL, 4th. yr.	81·3	38·4	62·2	25·9	23·3	37·7	27·0	31·6	40·8
ALL, 5th. yr.	82·8	34·1	66·3	26·9	24·2	31·6	17·6	38·3	46·2
WHOLE GP.	81·6	37·5	63·0	26·1	23·5	36·4	25·1	33·1	41·5

INTERESTS (continued)

GROUP	MUSIC	PAINTINGS or DRAWINGS	THEATRE	CINEMA	DANCING	CARDS	POETRY
BOYS, 4th. yr.	59·6	45·8	59·8	69·7	47·3	40·9	35·7
GIRLS 4th. yr.	66·7	47·6	72·1	72·6	67·7	33·7	45·5
ALL, 4th yr.	61·9	46·4	63·8	70·7	56·0	38·5	38·9
ALL, 5th. yr.	72·4	37·9	65·8	75·8	45·2	36·5	31·3
WHOLE GP.	64·0	44·7	64·3	71·7	52·2	38·1	37·4

ADDITIONS. 1 ALL, 4th year

SWIMMING, 5·6; CYCLING, 5·5; CAMPING, 4·5; HIKING, 4·4; BILLIARDS, 2·7; PHOTOGRAPHY, 2·6; SKATING, 1·4; BOTANY, 1·3; HISTORY, 1·2; PHILATELY, 1·1; THEOLOGY, 0·8; WIRELESS AND ELECTRICITY, 0·7; MECHANICS, 0·7; AERONAUTICS, 0·7; ZOOLOGY, 0·7; ORNITHOLOGY, 0·7; ENGLISH, 0·7; SEWING, 0·7; ATHLETICS, 0·7; BAGPIPES, 0·7; MOUNTAINEERING, 0·6; TECHNICAL DRAWING AND BENCHWORK, 0·6; FOOTBALL, 0·6; MODEL MAKING, 0·5; DEBATES, 0·5; ELEMENTARY POLITICS, 0·5; KNITTING, 0·5.

2 ALL, 5th year. BILLIARDS, 4·5; PHILATELY, 4·1; AERONAUTICS, 2·7; GOLF, 2·0; FRENCH, 2·0; NEEDLEWORK, 1·7.

PREFERENCES

GROUP	LARGE ORCHESTRA	THEATRE ORCHESTRA	DANCE BAND	BRASS BAND	PIPE BAND	PIANO	VIOLIN	PIPE ORGAN	CINEMA ORGAN	STRING QUARTET	CHOIR	SINGER	CROONER
BOYS 4th yr	40·8	53·1	77·0	55·2	56·0	56·9	39·8	35·3	74·1	24·2	34·6	46·7	47·8
GIRLS 4th yr	40·8	50·0	65·8	36·2	43·0	67·5	44·5	38·9	73·7	23·6	42·6	56·4	38·1
ALL, 4th yr.	40·8	52·1	73·3	49·0	51·8	60·4	41·4	36·5	74·0	24·0	37·2	49·9	44·6
ALL, 5th yr.	50·0	56·7	66·9	56·3	50·4	56·6	37·1	43·1	65·0	22·5	38·2	45·9	39·9
WHOLE GP.	42·7	53·0	72·0	50·1	51·5	59·6	40·5	37·8	72·1	23·7	37·4	49·1	43·6

PREFERENCES

GROUP	OPERAS	CLASSICAL MUSIC	LIGHT MUSIC	DANCE OR JAZZ MUSIC	MODERN MUSIC
BOYS 4th yr.	31·8	32·3	59·9	65·7	60·4
GIRLS 4th yr	54·2	37·8	54·8	55·6	45·1
ALL, 4th yr.	39·1	34·1	58·2	62·4	55·4
ALL, 5th yr	39·8	32·3	67·2	55·7	50·5
WHOLE GP.	39·8	33·7	60·0	64·8	54·4

PREFERENCES

GROUP	SONGS	SONATAS	SYMPHONIES	WALTZES	MODERN DANCES	MARCHES	OVERTURES	OPERAS	HYMNS
BOYS, 4th yr	63·5	25·9	33·1	71·7	69·9	73·5	39·2	32·8	38·4
GIRLS 4th yr.	60·3	32·7	25·6	76·0	61·5	62·5	35·0	53·1	31·5
ALL, 4th yr	62·4	28·1	30·7	72·4	67·1	70·1	36·5	39·5	36·1
ALL, 5th yr	58·8	23·5	30·1	71·3	58·1	66·4	44·0	42·9	31·4
WHOLE GP.	61·7	27·2	30·5	72·2	65·3	69·3	38·0	40·2	35·1

PREFERENCES

GROUP	SOPRANO	CONTRALTO	TENOR	BASS
BOYS, 4th. yr.	36·0	36·3	73·7	54·0
GIRLS, 4th. yr.	54·3	50·3	62·8	32·6
ALL, 4th. yr.	42·0	40·9	70·1	47·0
ALL, 5th. yr.	39·6	39·3	62·1	50·7
WHOLE GP.	41·5	40·6	67·3	47·7

PREFERENCES

GROUP	SINGER ALONE	DUET	QUARTET	MIXED CHOIR	MALE CHOIR
BOYS, 4th. yr.	63·5	43·0	33·6	44·8	65·5
GIRLS, 4th. yr.	71·2	48·5	31·5	41·9	53·2
ALL, 4th. yr.	66·0	44·8	32·9	43·8	61·4
ALL, 5th. yr.	61·5	35·6	33·4	54·8	54·9
WHOLE GP.	65·1	42·9	33·0	46·1	60·1

HEARD MOST

GROUP	LARGE ORCHESTRA	THEATRE ORCHESTRA	DANCE BAND	BRASS BAND	PIPE BAND	PIANO	VIOLIN	PIPE ORGAN	CINEMA ORGAN	STRING QUARTET	CHOIR	SINGER	CROONER
BOYS, 4th. yr.	33·6	46·9	81·2	45·4	44·6	61·6	32·1	31·9	67·9	25·3	37·0	57·0	44·8
GIRLS, 4th. yr.	37·7	52·0	73·9	33·6	27·4	64·1	33·6	37·0	64·7	22·9	43·7	65·9	53·4
ALL, 4th. yr.	34·9	48·6	78·8	41·6	39·0	62·5	32·6	33·6	66·7	24·5	39·2	59·9	61·1
ALL, 5th. yr.	41·4	56·5	76·7	46·0	35·9	52·3	33·5	43·8	68·3	23·8	36·4	63·6	59·2
WHOLE GP.	36·3	50·2	78·4	42·5	38·3	60·6	32·8	35·7	67·0	24·4	38·2	58·6	60·7

HEARD MOST

GROUP	GRAMOPHONE MUSIC	WIRELESS BROADCAST MUSIC	CONCERTS	OWN PERFORMANCE	SCHOOL MUSIC	CHURCH MUSIC	PERFORMANCE OF FRIENDS OR OTHER AMATEURS
BOYS, 4th yr.	45·7	86·1	51·8	35·1	41·1	48·2	35·0
GIRLS, 4th yr.	35·9	76·8	47·6	38·6	43·5	46·3	42·4
ALL, 4th yr.	42·5	83·1	50·5	36·2	41·9	47·6	37·4
ALL, 5th yr.	48·1	76·9	41·3	44·3	37·3	41·3	34·0
WHOLE GROUP	43·7	81·8	48·6	37·9	40·9	46·3	36·7

EFFECTS OF LISTENING TO MUSIC

GROUP	MOVEMENT-ACTIVITY	NON-MOVEMENT-ACTIVITY	PEACE	PLEASURE	IMAGES	THOUGHTS	VAGUE THOUGHTS	ANALYTICAL ATTITUDE
BOYS, 4th yr.	74·9	45·3	52·4	59·0	47·0	43·9	32·2	25·2
GIRLS, 4th yr.	80·3	37·8	48·7	53·3	59·8	42·9	38·2	21·8
ALL, 4th yr.	76·7	42·8	51·2	57·1	51·3	43·6	34·2	24·1
ALL, 5th yr.	67·5	52·6	55·1	56·4	43·3	36·2	36·9	24·9
WHOLE GROUP	74·8	44·8	52·0	56·5	49·6	42·1	34·7	24·3

[See text, page 240]

INTERESTS

GROUP	GAMES	SERIOUS LITERATURE	LIGHT LIT.	PSYCHOLOGY	PHILOSOPHY	MATHS.	BIOLOGY	PHYSICAL SCIENCE	CHEMISTRY
A, men	42·0	67·5	45·7	49·8	40·6	29·0	26·2	21·9	22·1
A, women	44·3	56·9	62·6	30·8	24·9	9·9	16·8	13·8	7·4
All A	42·9	63·5	52·0	40·2	34·7	21·9	21·4	18·8	17·0
B, men	64·5	63·6	47·5	56·5	45·4	41·8	37·0	50·8	28·6
B, women	51·6	44·9	61·3	32·8	14·5	24·1	14·1	14·8	8·8
All B	58·5	54·9	53·9	45·4	31·0	33·6	26·3	34·0	19·3
C, men	36·6	58·3	36·6	49·4	27·8	22·5	25·2	19·8	24·4
C, women	37·3	40·8	33·0	40·8	19·3	1·5	1·5	22·8	19·3
All C	36·8	53·9	35·7	47·3	25·7	17·3	19·3	20·5	23·1
All men	41·9	63·5	43·8	50·8	38·8	32·0	29·2	32·0	25·1
All women	47·0	48·3	57·5	33·3	18·7	16·1	13·1	15·6	10·2
Whole group	45·2	57·6	49·1	44·0	31·0	25·8	23·0	25·7	19·4

INTERESTS (continued)

GROUP	MUSIC	PAINTINGS or DRAWINGS	THEATRE	CINEMA	DANCING	CARDS	POETRY
A, men	81·3	42·3	57·2	36·1	16·3	19·9	61·5
A, women	87·8	45·6	66·8	56·7	49·9	20·0	47·8
All A	83·8	43·5	60·8	43·8	28·9	19·9	56·3
B, men	72·5	55·3	46·7	50·6	33·4	21·9	42·4
B, women	87·1	39·8	54·5	60·1	52·5	27·2	33·2
All B	79·3	48·1	50·3	53·2	42·3	24·4	38·1
C, men	40·8	31·8	35·5	30·7	17·8	4·3	26·3
C, women	57·3	45·0	32·9	40·8	22·8	28·1	29·7
All C	44·9	35·1	34·8	33·2	19·1	10·2	27·1
All men	66·7	44·2	47·2	40·0	23·1	16·3	44·5
All women	82·9	42·5	53·4	56·1	47·2	24·9	37·6
Whole group	73·0	43·6	50·4	46·3	32·4	19·6	41·8

ADDITIONS

A, men — LITERARY CRITICISM, 5·7; AESTHETICS, 5·7; CHESS, 4·9;

A, women — DOMESTIC WORK, 10·8.

B, men — POLITICS, 13·6; RELIGION, 3·8; ECONOMICS, 3·8; PHOTOGRAPHY, 13·8; TOWN PLANNING AND ARCHITECTURE, 6·1;

C, women — HISTORY, 19·3; GYMNASTICS, 19·3.

PREFERENCES

GROUP	LARGE ORCHESTRA	THEATRE ORCHESTRA	DANCE BAND	BRASS BAND	PIPE BAND	PIANO	VIOLIN	PIPE ORGAN	CINEMA ORGAN	STRING QUARTET	CHOIR	SINGER	CROONER
A, men	86·7	51·5	18·9	37·9	17·9	58·6	50·0	55·8	23·9	59·8	67·5	56·4	4·1
A, women	75·6	46·2	20·8	15·8	12·6	72·7	60·2	50·0	33·7	34·7	53·4	63·4	10·4
All A	82·5	49·5	19·6	29·6	15·9	63·9	53·8	53·6	27·6	50·4	62·3	59·0	6·5
B, men	73·9	58·2	41·8	34·8	28·6	59·0	70·9	46·7	39·6	49·4	51·6	48·4	5·4
B, women	70·1	55·5	42·6	24·1	17·7	64·5	54·0	38·9	41·6	35·0	25·9	59·4	12·4
All B	72·2	56·9	42·1	29·8	23·5	61·7	63·0	43·1	40·5	42·7	39·6	53·6	8·6
C, men	52·0	63·8	37·1	40·0	29·3	30·3	29·0	35·4	37·1	22·4	42·7	45·1	18·8
C, women	45·3	35·3	13·0	10·5	32·8	47·8	26·0	25·5	38·0	16·3	45·3	35·5	3·8
All C	50·3	56·7	31·1	32·6	30·1	34·6	28·3	32·9	37·3	20·9	43·3	42·7	15·1
All men	72·3	57·4	32·5	37·3	25·0	50·9	51·9	46·7	33·4	45·5	54·7	50·3	8·7
All women	68·3	49·4	30·7	19·3	18·2	64·7	51·9	40·6	38·4	32·1	37·9	57·2	10·4
Whole group	70·7	54·3	31·9	30·4	22·4	56·3	51·9	44·4	35·3	40·3	48·2	53·0	9·4

PREFERENCES

GROUP	OPERAS	CLASSICAL MUSIC	LIGHT MUSIC	DANCE OR JAZZ MUSIC	MODERN MUSIC
A, men	60·2	81·2	45·3	11·5	31·7
A, women	63·3	79·7	57·8	20·0	23·6
All A	61·4	80·7	50·0	14·7	28·6
B, men	53·1	62·7	63·6	29·4	25·6
B, women	50·1	53·1	60·6	27·5	26·4
All B	51·9	58·2	62·2	28·5	26·0
C, men	48·3	50·8	46·1	36·2	22·7
C, women	51·3	66·3	26·3	2·5	16·3
All C	49·1	54·7	41·1	27·8	21·1
All men	54·3	65·8	52·3	25·0	26·9
All women	54·7	63·9	54·6	21·3	24·0
Whole group	54·4	65·1	53·2	23·6	25·8

PREFERENCES

GROUP	SONGS	SONATAS	SYMPHONIES	WALTZES	MODERN DANCES	MARCHES	OVERTURES	OPERAS	HYMNS
A, men	52.0	56.6	75.1	41.1	5.9	33.9	60.5	60.6	29.2
A, women	64.1	48.0	66.7	54.7	13.2	29.0	49.1	56.3	29.1
All A	57.3	53.4	71.9	46.2	8.7	32.1	56.2	59.0	29.2
B, men	54.8	40.9	53.6	58.6	25.8	50.3	50.3	41.1	29.9
B, women	58.1	27.9	40.4	58.4	35.9	38.1	46.0	54.8	39.4
All B	56.4	34.8	47.3	58.5	30.5	44.6	48.3	47.5	34.3
C, men	52.8	30.1	38.0	55.9	23.0	44.2	40.3	53.4	25.7
C, women	48.0	18.8	16.8	27.0	12.5	25.0	4.3	33.3	64.5
All C	51.5	27.1	32.3	48.2	20.2	39.1	30.7	48.0	36.1
All men	53.6	43.7	57.1	51.6	18.0	42.8	51.3	51.3	28.5
All women	58.7	33.2	45.6	52.5	24.9	33.1	40.8	52.1	39.7
Whole group	55.6	39.6	52.6	52.0	20.7	39.1	47.2	51.6	32.9

PREFERENCES

GROUP	SOPRANO	CONTRALTO	TENOR	BASS
A, men	53·3	35·8	53·3	57·5
A, women	59·7	45·8	50·0	44·4
All A	55·7	39·6	52·1	52·6
B, men	44·5	46·1	60·9	48·4
B, women	53·3	50·3	56·2	33·0
All B	48·6	48·0	58·7	41·3
C, men	33·3	40·0	69·8	44·4
C, women	34·4	46·9	36·4	46·9
All C	33·6	41·7	60·9	45·3
All men	46·5	40·8	60·8	50·5
All women	52·6	48·3	50·9	38·9
Whole group	47·6	43·7	57·0	46·0

PREFERENCES.

GROUP	SINGER ALONE	DUET	QUARTET	MIXED CHOIR	MALE CHOIR
A, men	54·7	23·3	45·3	58·7	61·3
A, women	78·6	45·6	36·9	37·5	29·2
All A	63·6	31·7	42·2	50·7	49·3
B, men	56·4	42·7	37·7	56·9	52·0
B, women	66·3	36·9	40·8	38·0	46·3
All B	61·0	40·0	39·8	48·1	49·3
C, men	70·4	27·5	23·8	47·3	43·5
C, women	55·0	17·5	30·0	42·5	42·5
All C	66·6	25·0	25·3	46·1	43·3
All men	59·7	31·7	36·9	54·8	52·9
All women	68·7	36·9	38·0	38·5	40·0
Whole gp.	63·2	33·7	37·3	48·5	47·9

HEARD MOST.

GROUP	LARGE ORCHESTRA	THEATRE ORCH.	DANCE BAND	BRASS BAND	PIPE BAND	PIANO	VIOLIN	PIPE ORGAN	CINEMA ORGAN	STRING QUARTET	CHOIR	SINGER	CROONER
A, men	60·2	52·7	37·7	27·3	13·2	70·7	43·6	51·7	46·9	31·2	66·8	60·9	20·1
A, women	46·3	62·3	37·7	20·3	10·6	67·0	45·9	45·0	40·1	20·0	44·6	64·4	30·9
All A	55·8	55·8	37·7	25·0	12·3	69·5	44·2	49·6	43·4	27·6	59·7	62·0	23·5
B, men	46·0	58·9	66·3	36·8	27·8	67·9	45·6	34·3	42·1	37·3	44·1	59·0	30·3
B, women	59·6	51·6	66·1	26·7	16·6	69·2	35·3	45·5	45·2	18·1	46·6	50·0	29·4
All B	52·4	55·5	66·2	32·1	22·6	68·5	40·7	39·5	43·6	28·4	45·3	54·8	29·8
C, men	45·5	54·8	60·7	26·5	17·4	35·1	20·3	12·5	58·9	17·9	29·5	51·5	28·6
C, women	39·5	35·3	58·3	10·5	10·5	35·3	18·8	0	46·8	10·5	37·5	31·3	17·8
All C	43·9	49·6	60·1	22·3	15·5	35·1	19·9	9·1	55·7	15·9	31·5	46·1	26·7
All men	50·9	55·6	54·6	30·7	19·8	60·3	38·1	34·8	47·5	30·0	48·4	57·7	26·2
All women	52·7	52·0	56·9	22·3	13·9	65·1	35·6	38·1	44·0	17·4	46·5	57·1	27·9
All groups	51·6	54·3	56·4	27·6	17·6	61·6	37·2	36·0	46·2	25·3	46·9	55·2	26·9

HEARD MOST

GROUP	GRAMOPHONE MUSIC	WIRELESS BROADCAST MUSIC	CONCERTS	OWN PERFORMANCE	SCHOOL MUSIC	CHURCH MUSIC	PERFORMANCE OF FRIENDS OR OTHER AMATEURS
A, men	32·3	78·5	48·2	51·9	33·1	49·2	27·1
A, women	25·5	74·2	31·1	52·3	15·1	55·1	40·2
All A	30·0	77·0	42·3	52·0	26·9	51·3	31·7
B, men	30·5	78·2	36·1	42·1	16·8	37·8	36·8
B, women	27·0	77·4	29·7	56·6	22·1	41·5	30·5
All B	28·9	77·8	33·2	48·7	19·2	39·5	33·9
C, men	43·5	78·4	28·3	9·1	13·6	14·5	16·8
C, women	38·0	69·3	69·3	11·7	35·7	69·3	40·3
All C	42·4	76·6	36·5	9·6	18·0	25·5	21·5
All men	34·7	78·3	38·2	36·3	21·6	35·3	27·8
All women	27·9	75·3	35·1	49·6	21·5	49·5	34·9
Whole group	32·3	77·3	37·1	41·1	21·5	40·4	30·4

EFFECTS OF LISTENING TO MUSIC

GROUP	MOVEMENT ACTIVITY	NON-MOVEMENT ACTIVITY	PEACE	PLEASURE	IMAGES	THOUGHTS	VAGUE THOUGHTS	ANALYTICAL ATTITUDE
A, men	39·0	41·3	49·7	26·4	27·5	31·3	50·6	57·2
A, women	47·1	36·4	35·9	33·3	43·2	44·1	56·8	54·1
All A	42·0	39·5	44·1	29·0	33·4	36·1	52·9	56·0
B, men	60·9	44·4	51·0	62·6	30·9	53·1	42·5	38·8
B, women	39·9	37·9	57·7	59·9	22·3	34·2	31·6	35·2
All B	51·1	41·4	54·1	61·0	26·9	44·3	37·4	37·1
C, men	29·4	20·2	31·4	36·3	51·2	18·3	34·0	12·8
C, women	11·0	35·0	62·7	52·3	55·7	23·0	72·3	38·0
All C	25·7	23·1	37·7	39·5	52·1	19·2	41·7	17·9
All men	44·5	36·6	45·1	42·6	35·4	35·8	43·0	38·0
All women	39·0	37·1	50·3	49·5	33·4	36·3	45·0	42·1
Whole gp.	42·4	36·8	47·1	45·2	34·6	36·0	43·7	39·5

[See text, page 249]

GROUP A

		ACTUAL SADNESS		
		TRUE	DOUBTFUL	FALSE
DESCRIPTIVE	TRUE	1	2	8
SADNESS	DOUBTFUL	6	1	0
	FALSE	5	0	1

GROUP B

		ACTUAL SADNESS		
		TRUE	DOUBTFUL	FALSE
DESCRIPTIVE	TRUE	4	2	7
SADNESS	DOUBTFUL	7	7	1
	FALSE	2	0	0

GROUP C

		ACTUAL SADNESS		
		TRUE	DOUBTFUL	FALSE
	TRUE	3	3	1
DESCRIPTIVE	DOUBTFUL	2	3	1
SADNESS	FALSE	3	0	0

ALL MEN

		ACTUAL SADNESS		
		TRUE	DOUBTFUL	FALSE
	TRUE	4	4	13
DESCRIPTIVE	DOUBTFUL	7	6	2
SADNESS	FALSE	7	0	0

ALL WOMEN

		ACTUAL SADNESS		
		TRUE	DOUBTFUL	FALSE
	TRUE	4	3	3
DESCRIPTIVE	DOUBTFUL	8	5	0
SADNESS	FALSE	3	0	1

WHOLE GROUP

		ACTUAL SADNESS		
		TRUE	DOUBTFUL	FALSE
	TRUE	8	7	16
DESCRIPTIVE	DOUBTFUL	15	11	2
SADNESS	FALSE	10	0	1

THE VALUES OF THE MEAN SQUARE CONTINGENCY COEFFICIENT WERE WORKED OUT FOR EACH OF THESE TABLES AND ARE SHOWN BELOW.

GROUP	VALUE OF C	PE for C=0
A	·65	·14
B	·52	·12
C	·44	·17
ALL MEN	·57	·10
ALL WOMEN	·41	·13
WHOLE GROUP	·51	·08

[See text, page 267]

QUESTIONNAIRE.

Have you ever found that some kinds of music produced an actual thrill in your body?

YES NO

If so, write a line about the kinds of music that produced this effect.

....
....
....

Write also a line to show whether this effect increased, decreased or changed in any way at different ages.

....
....
....

Draw lines under the names of the different parts of the body in which this effect was present.

HEAD CHEST STOMACH ARMS LEGS.

State the part of your body in which this effect seemed to begin:- ....

Describe how this effect travelled from one part of your body to another:- ....
....
....

Have you ever had this experience, or any experience like it, in reading, watching a film or theatre performance, or in some other way? Answer this by writing a line to describe the experience:- ....
....
....
....

and another line to describe the cause of it (reading, film, theatre or whatever it was):- ....
....
....

[See text, page 267]

QUESTIONNAIRE RESULTS FOR THE FIRST GROUP.

This group consisted of 287 children in the first, second and third year secondary school course, including advanced division pupils. The results are shown below:-

'Have you ever found that some kinds of music produced an actual thrill in your body?'

86·4% of the group said 'Yes' and 13·6% said 'No'.

'Write a line to show how this effect increased, decreased or changed in any way at different ages.'

72·8% of the group stated that the effect had increased with increasing age, 13·6% stated that the effect was steady, and 13·6% stated that the effect had decreased. The distribution of the actual responses differs significantly from a chance distribution of the 1:1:1 form. Yet clearly this type of question has inherent difficulties. If people were asked: 'Has your intelligence increased, decreased or changed in any way at different ages?' probably most people would say it had increased, partly from reasons of amour propre, partly from ignorance of the nature of intelligence and partly from a lack of objective data, and similarly for other questions of a similar nature. The present question is concerned with phenomena more open to observation certainly than intelligence, but similar difficulties are in the way, though doubtless they are less strong.

'Draw lines under the different parts of the body in which this effect was present.'

The percentages are:- Head, 21·8%; Chest, 15·9%; Stomach, 17·5%; Arms, 20·3%; Legs, 24·5%. (The percentages are expressed as percentages of the total number of responses and, of course, some individuals had more than one part of the body underlined.) The average number of responses per individual are:- Head, ·53; Chest, ·38; Stomach, ·42; Arms, ·49; Legs, ·59.

'State the part of your body in which this effect seemed to begin.'

Head, 18·9%; Chest, 14·3%; Stomach, 27·0%; Arms, 6·6%; Legs, 26·5%; Brain, ·5%; Hands, 1·5%; Heart, 1·0%;

Throat, ·5%; Feet, 1·0%; Shoulder, ·5%; Back of arms, ·5%; Spine, 1·0%.

This distribution may be reduced by combining some of these categories yielding the table below.

Head	Chest	Stomach	Arms	Legs	Spine
19·9%	15·3	27·0	9·1	27·5	1·0

'Describe how this effect travelled from one part of your body to another.'

The responses have been classified in the table below:-

Type	Percentage of group
Subjects unable to describe phenomenon	34·3
Stationary	25·4 (Head, 7 cases; Chest, 6 cases; Stomach, 14 cases; Legs, 9 cases; Heart, 1 case; Arms, 1 case; Unclassified, 16 cases.)
Movement upwards from stomach	10·8
Movement upwards and downwards from stomach (radiating movement)	4·2 (1 subject calls movement quick, 1 calls it slow)
Movement from stomach to head and then to legs	·9
Movement from chest to stomach	·5
Movement from chest to legs	·5
Movement from stomach to legs	1·4
Movement from legs to body	7·0
Movement from head downwards	8·5
Movement from arms to body	1·9
Movement from finger tips to elbow	·5

Type	Percentage of group
Vibratory movement in spine	5
Diffuse tingle with little movement	3·8 (Body, 2 cases; Chest, 4 cases; Shoulders, 1 case; Back, 1 case)

<u>'Write a line about the kinds of music that produced this effect.'</u>

The following grouping was found in the notes given in answer to this question.

Marches	-	57 cases
Dance or jazz music	-	48 "
Waltzes	-	32 "
Opera	-	29 "
Songs (or Singer)	-	22 "
Sad or eerie music	-	17 "
Quick music	-	16 "
Light music	-	15 "
Slow music	-	14 "
Dramatic music	-	11 "
Scottish music	-	10 "
Good melodies	-	9 "
Bagpipes or Pipe band	-	9 "
National anthems	-	8 "
Thrilling music	-	7 "
Classical music	-	6 "
"Hungarian Rhapsody"	-	5 "
Patriotic music	-	4 "
Overtures	-	4 "
Folk music	-	4 "
Dreamy music	-	4 "
Hawaian music	-	3 "
Hymns	-	3 "
Symphonies	-	2 "
Orchestral music	-	2 "
Soft music	-	2 "
Violin	-	2 " (Violin playing 'Unfinished Symphony'; violin playing high note)
Piano	-	2 cases
Clash of cymbals	-	2 "
Anthems	-	2 "
Love music	-	2 "
High pitched music	-	2 "

Messiah music	-	2 cases
Guitar music	-	2 cases
Cinema organ	-	2 cases
Stirring music	-	1 case
Gypsy music	-	1 case
Chinese music	-	1 case
Russian music	-	1 case
Oriental music	-	1 case
Loud music	-	1 case
Film music	-	1 case
Ballet and folk dancing music	-	1 case
Reminiscence music	-	1 case
Tom-tom music	-	1 case
Bugle music	-	1 case.
Psalm tunes	-	1 case.

Some special notes were:- The music of Strauss, Bach, Handel, Mozart, Schubert, Wagner, Grieg, Beethoven, D minor Symphony (Mendelssohn), Intermezzo from Cavalleria Rusticana, Beethoven's Sonatas, Liszt's Hungarian Rhapsody, No.2., Blue Danube Waltzes, Tales from the Vienna Woods, Liebestraum, William Tell Overture, Finlandia, Handel's Largo, Fingal's Cave Overture, Invitation to the Dance, good music played on the piano, organ or banjo, guitar music, a quick tune played on the piano at a high pitch, a low note on a brass instrument, the music of birds, music which is played on a high note - a slow wavering music, the drone of bagpipes, a pipe band playing a march and a brass band playing a hymn, music which starts softly, becoming gradually louder and dying away, music which starts softly, becoming quickly louder and dying away.

'Have you ever had this experience, or any experience like it?' etc.

The answers to this question and the final question about the cause were often not clearly discriminated, but the answers to these questions could be considered in conjunction. It may be objected that the reference in the questionnaire to reading, film or theatre performance was unsound because it would suggest these answers to the subject, but it is a little difficult to make the question clear without giving some examples, and, besides, these examples were quoted by many people who were questioned by the writer before the questionnaire was drafted. Hence these examples are 'natural' and likely to occur to the subject who understands the question, so it is likely that 'suggestion' does not greatly influence the results.

The following classification of the responses was made, being drawn from those individuals who agreed that they experienced the thrill mentioned in the first question.

Response	Frequency of occurrence.
Film performance	140
Reading	35
Theatre performance	22
Radio performance	3
"No"	12
No reply	27
While dancing	2
Watching others dance	2
Watching sports and football	1
Listening to music in ice-cream shop	1
An exciting occurrence	1
Singer singing on a high note	1
"When I made a mistake and got found out"	1
"Seeing cliffs and being quite alone at the time	1
"Seeing land from a great height."	1
Playing football and other sports	1
Going up in lift	5

It was mentioned before that it was likely that 'suggestion' did not influence the subject in a negative sense. The great variety of the responses, for 'film performance' especially, tends to confirm that view. The details are vivid, generally, and appear to be genuine recollections of impressive experiences. These details will be outlined below.

Lift - "I felt a funny sensation in my stomach." (1 case)

Radio - A play with melancholy music (1); the shouts and cheers of the people at the ceremony of Roosevelt meeting the King (1)

Theatre - Musical comedy (1); March (1); exciting play (1); evoked sympathy (1); hearing Irish tune and seeing Highland dance (with <u>real</u> Irish accent and <u>real</u> Highland costumes), (1); opera (3).

Reading - Love story (1); alone in house (1); evoked sympathy (1); true stories or biographies (1); poetry (1); anticipation of dramatic situation (1); approaching climax (1); ghost stories (2); sad stories (4); exciting stories (14)

Film - Mysterious music in jungle film (1); drone of aeroplanes sounding like low note of brass instruments (1); bagpipes playing patriotic music (1); band playing at sports (1); skating music (1); inspiring situation (1); cowboy film (1); boxing situation (1); sound of engines or crash or boom in music in film (1); funny film (1); slowing down of music in film (1); increase in speed of music in film (1); suspense (1); sympathy evoked (1); impressed by acting (2); pursuit (3); eeriness (4); marching or pageantry (4); identification of self with the situation in film (4); war in films (4); songs in film (7) -(old songs, singing with dancing, songs, star sang in a high voice and funny feeling ran up and down spine); sad situation (7); dancing in films (11); exciting film with murder situation (13); exciting film (22).

Some additional comments are of interest :- March past by the Guards; "I was watching a film when my head felt very funny"; the thrill ceases when loud music is played; the thrill makes you like the music when you hear it; "It did *something* to my bones"; "In reading I had a quiet sort of excitement causing a funny feeling in my throat"; "One felt inspired and more confident after the thrill"; the thrills of music could make me a good actor.

<u>Results for the second group.</u>

This group consisted of 157 secondary pupils in the 4th and 5th year classes - the group referred to already on page 225.

<u>'Have you ever found that some kinds of music produced an actual thrill in your body?'</u>

	Percentage of group	
	Yes	No
Boys	93·9	6·1
Girls	88·1	11·9
Whole group	92·4	7·6

<u>'Draw a line to show how the effect increased, decreased or changed in any way at different ages.'</u>

	Percentage.		
	Increased	Steady	Decreased
Boys	79·3	13·0	7·7
Girls	87·1	9·7	3·2
Whole group	81·3	12·2	6·5

The distributions from which these percentages are derived each differ significantly, when the χ^2 test is applied, from a chance distribution of the 1:1:1 form.

'Draw lines under the different parts of the body in which this effect was present.'

Percentage of total responses.

	Head	Chest	Stomach	Arms	Legs
Boys	25·5	15·7	11·9	19·6	27·2
Girls	25·0	8·3	13·3	20·0	33·3
Whole group	25·4	14·2	12·2	19·7	28·5

The average number of responses per individual is shown below:-

	Head	Chest	Stomach	Arms	Legs
Boys	·58	·36	·27	·44	·62
Girls	·50	·17	·27	·40	·67
Whole group	·56	·31	·27	·43	·63

The distributions from which the percentages of the preceding table were derived each differ significantly, when the χ^2 test is used, from a chance distribution of the form 1:1:1:1:1

'State the part of your body in which this effect seems to begin.'

Boys - Head 26·9 ; Chest, 11·8; Stomach, 11·8; Arms, 7.5; Legs, 22.6; Feet, 7.5; Spine, 2.2; Heart, 1.1; Mind 3.2; Brain, 1·1; Shoulders, 1.1; Back of neck, 2·2; Doubtful, 1·1 (1 case).

Girls - Head, 25·0 ; Chest, 10·7; Stomach, 7.1; Arms, 7.1; Legs, 28·6; Feet, 10·7; Spine, 0; Heart,10·7; Mind, 0; Brain, 0; Shoulders, 0; Back of neck, 0; Doubtful, 0.

Whole group - Head, 26·4; Chest, 11·6; Stomach, 10·7; Arms, 7·4; Legs, 24·0; Feet 8·3; Spine, 1·7; Heart, 3·3; Mind, 2·5; Brain, ·8; Shoulders, ·8; Back of neck, 1.7; Doubtful, ·8 (1 case)

By aggregating some of these categories the following table is obtained:-

	Head	Chest	Stomach	Arms	Legs	Spine, neck, shoulders.
Boys	31·2	12·9	11·8	7·5	30·1	5·5
Girls	25·0	21·4	7·1	7·1	39·3	-
Whole group	29·7	14·9	10·7	7·4	32·3	4·2

'Describe how this effect travelled from one part of your body to another.'

Type of Response	Percentage of group
Subjects unable to describe phenomenon	38·3
Stationary	2·1
Movement upwards from stomach	4·3
Movement upwards and downwards from stomach (radiating movement)	7·1
Movement from stomach to head and then to legs	1·4
Movement from chest to stomach	·7
Movement from chest to legs	·7
Movement from legs to body	20·6
Movement from head downwards	11·3
Movement from chest to arms	·7
Movement from arms to body	5·0
Movement from chest to head to stomach	·7
Vibratory movement in spine	1·4
Diffuse tingle with little movement	5·7 (Stomach, 1 case; Brain, 1 case; Chest, 1 case; Body, 3 cases; Head, 2 cases)

'Write a line about the kinds of music that produced this effect.'

The following grouping was found:-

Dance band music	- 54 cases (one refers to the pulsating rhythm of special dances.)
Marches	- 45 cases (one refers to marches played by bugle band)
Military music (including a few cases of 'massed bands')	- 23 cases
Operas	- 19 cases (3 refer to 'light opera'; 1 refers to Gilbert and Sullivan specifically)

Pipe music and pipe bands.	-	18 cases (one refers to 'plaintive music played on bagpipes'.)
Music of large orchestra	-	16 cases (including a few references to 'Symphony', 'Concerto', 'Overture', etc.)
Songs (including singer)	-	13 cases (Emotional arias, 1 case; lively songs, 1 case; sentimental songs, 2 cases; love songs, 1 case; songs known when a child, 1 case; "operatic singer on a high note, very occasionally," 1 case.)

Patriotic music, including National Anthems and songs	-	11 cases	
Loud, quick music	-	6 "	
Waltzes	-	6 "	
Cinema organ	-	6 "	
Classical music	-	4 "	
Piano music	-	3 "	(Beethoven's sonatas, 1 case.)
Theatre orchestra	-	3 "	
Brass band	-	2 "	
Modern music	-	2 "	
Highland dance tunes	-	2 "	
Classical waltzes	-	2 "	
Large choral performance	-	2 "	
Light music	-	2 "	
Sad music	-	2 "	
Descriptive music	-	1 "	
Broadcast music ('on one occasion', unspecified as to type)	-	1 "	
Hawaian music	-	1 "	
Irish folk dances	-	1 "	
Community singing	-	1 "	
Cantatas	-	1 "	
Oriental music	-	1 "	
Spanish music	-	1 "	
Soft sweet music	-	1 "	
Highland airs	-	1 "	
Sentimental melodies	-	1 "	
Some solo instruments	-	1 "	
Bach Prelude or Fugue on organ	-	1 "	
Mystic music, especially with horns	-	1 "	
Pipe organ when crescendo effect occurs in oratorio	-	1 "	
Hearing a tune for the first time	-	1 "	
An unusual chance phrase in music	-	1 "	

Some special notes were:- Mozart's overtures; Beethoven's First, Second, Fifth symphonies and Piano Concerto; a Beethoven symphony; 'Invitation to the Waltz'; 'Ride of the Valkyrie'; 'William Tell'; 'Samson and Delilah'; 'La Bohème; 'Liebestraum', 2 cases; Mendelssohn's 'Songs without words'; 'Lohengrin'; Chopin's Waltzes; Handel's 'Largo', 2 cases; 'Pomp and Circumstance' march; Handel; 'Bolero' by Ravel; 'Pathétique' Symphony; Parts of 'Faust'; "Soldiers' Chorus", from 'Faust'; Sousa's marches, 5 cases; Viennese waltzes; Strauss' waltzes; 'Ave Maria' by Gounod, 3 cases; 'Tales from the Vienna Woods' by Strauss; overtures from operas; orchestra playing eightsome reel; 'The Vagabond King'; 'Rule, Britannia'; 'God Save the King'; 'The Marseillaise'.

'Have you ever had this experience or any experience like it, etc.'

Response	Frequency of occurence.
Film performance	79
Reading	25
Theatre	23
Broadcast play	2
"No"	8
"Hardly ever"	1
No reply	33
Watching dancing	1
A lonely scene	1
A feeling of tension or dread	1
Empty feeling in stomach	1
A mild electric shock	1
Seeing and hearing something beautiful morally	1
Tournament or display when pipe band plays	1

Some details from these classified responses are:-

Theatre - tragic situation (1); with songs (1); tense moment in plot (1); exciting play (1); sad or emotional play, with self-identification with subject (1); ghost or murder situation, with self-identification with subject (1); unqualified, but with self-identification with subject (1); Hamlet (2).

Reading - Macbeth (1); one of Hugo's books (1); battles (1); novels of Conan Doyle (1); light literature, with self-identification with subject (1); poetry (1); clever detective books (1); sad, emotional story, (2 cases, one showing self-identification with subject); adventure stories (2); exciting stories (5 cases, one showing self-identification with subject)

Film - Thrilling aeroplane scene (1); if well acted (1); loud cheering (1); murder (1); eerie (2); tension near climax (2); pursuit or escape (2); self-identification of subject with actors (3); film with marked musical influence (3 - 'singer','musical film', 'large orchestra'); films depicting courage (3 - 'heroic and patriotic', 'hero killed'); films depicting military scenes (4 - 'pageantry,' 'British army', 'film showing soldiers, sailors or cadets', 'soldiers marching'); sad films (7 - 'death scene', 'the sight of a very young deer licking the face of its newly shot mother, the effect being influenced by the sad soft music then being played'); exciting films (13 - 'suspense', 'drama and conflict', 'climax', 'adventurous', 'sudden tension of action'.)

Some additional comments about the thrill are of interest:- A bright thrill that fills me with emotion; probably the synthetic movements of the film and music attracted your subconscious mind while you were relaxing; thrill is caused by admiration and sympathy; the feeling shudders through me; thrill occurs when I am exceedingly happy or sad; thrill makes me sad; thrill spread upwards until my head felt like a balloon; thrill accompanied by slight giddiness, then tightness in chest, then weakness in legs; thrill caused by dramatic tension; sinking feeling; thrill in sad situation makes lump come into throat; energy rushes through whole body; thrill travels up spinal chord to hairs on head; muscles grow tense; tightening in chest; effect more noticeable if music had a definite beat or rhythm; thrill stimulated my feelings; thrill fills me with excitement.

Results for the third group.

This group consisted of the adults used for a previous questionnaire. The notation A group, B group, etc., will be retained. (P. 239)

'Have you ever found that some kinds of music produced an actual thrill in your body?'

Percentage of group.

	Yes	No
A, men	100	0
A, women	100	0
All A	100	0
B, men	100	0
B, women	71·4	28·6
All B	86·2	13·8
All C	93·8	6·2
All men	97·6	2·4
All women	85·2	14·8
Whole group	92·8	7·2

'Write a line to show how the effect increased, decreased or changed in any way at different ages.'

	Percentage.		
	Increased	Steady	Decreased.
All A	54·6	40·9	4·5
All B	47·4	31·6	21·1
All C	33·3	66·7	0
Whole group	47·2	43·4	9·4

The distributions of responses from which these percentages are derived each differ significantly from a chance distribution of the form 1:1:1 when the χ^2 test is applied, with the exception of that for the B group.

'Draw a line under the different parts of the body in which this effect was present.'

	Percentage of total responses.				
	Head	Chest	Stomach	Arms	Legs.
A, men	33·3	24·2	15·2	15·2	12·1
A, women	17·6	23·5	35·3	11·8	11·8
All A	28·0	24·0	22·0	14·0	12·0
B, men	22·2	27·8	19·4	8·3	22·2
B, women	47·1	11·8	17·6	11·8	11·8
All B	30·2	22·6	18·9	9·4	18·9
C, men	30·4	17·4	21·7	13·0	17·4
C, women	25·0	50·0	25·0	0	0
All C	29·6	22·2	22·2	11·1	14·8
All men	28·3	23·9	18·5	12·0	17·4
All women	31·6	21·1	26·3	10·5	10·5
Whole group	29·3	23·1	20·8	11·5	15·4

When the χ^2 test is applied to the distributions from which the above percentages have been obtained, it is found that only the distribution for the whole group differs significantly from a chance distribution of the form 1:1:1:1:1.

The average responses per individual are shown below:-

	Head	Chest	Stomach	Arms	Legs.
A, men	·79	·57	·36	·36	·29
A, women	·38	·50	·75	·25	·25
All A	·64	·55	·50	·32	·27
B, men	·57	·71	·50	·21	·57
B, women	·89	·22	·33	·22	·22
All B	·70	·52	·43	·22	·43
C, men	·78	·44	·56	·33	·44
C, women	·33	·67	·33	0	0
All C	·67	·50	·50	·25	·33
All men	·70	·59	·46	·30	·43
All women	·60	·40	·50	·20	·20
Whole group	·67	·53	·47	·26	·35

<u>'State the part of your body in which this effect seems to begin.'</u>

A, men - Head, 17·6; Chest 29·4; Stomach, 17·6; Arms, 0; Legs, 0; Heart, 5·9; Blood, 0; Spine, 17·6; Shoulders, 5·9; All over body, 5·9.

A, women - Head, 25·0; Chest 25·0; Stomach, 37·5; Arms, 0; Legs, 0; Heart, 0; Blood, 0; Spine, 12·5; Shoulders, 0; All over body, 0.

All A - Head, 20·0; Chest 28·0; Stomach, 24·0; Arms, 0; Legs, 0; Heart, 4·0; Blood, 0; Spine, 16·0; Shoulders, 4·0; All over body, 4·0.

B, men - Head, 30·8; Chest 38·4; Stomach, 7·7; Arms, 0; Legs, 0; Heart, 15·4; Blood, 0; Spine, 7·7; Shoulders, 0; All over body, 0.

B, women - Head, 42·9; Chest, 0; Stomach, 28·6; Arms, 0; Legs, 0; Heart, 14·3; Blood, 0; Spine, 14·3; Shoulders, 0; All over body, 0.

All B - Head, 35·0; Chest, 25·0; Stomach, 15·0; Arms, 0; Legs, 0; Heart, 15·0; Blood, 0; Spine, 10·0; Shoulders, 0; All over body, 0.

C, men - Head, 0; Chest, 33·3; Stomach, 50·0; Arms, 0; Legs, 0; Heart, 0; Blood, 16·7; Spine, 0; Shoulders, 0; All over body, 0.

C, women	-	Head, 0; Chest, 50·0; Stomach, 50·0; Arms, 0; Legs, 0; Heart, 0; Blood, 0; Spine, 0; Shoulders, 0; All over body, 0.
All C	-	Head, 0; Chest, 37·5; Stomach, 50·0; Arms, 0; Legs, 0; Heart, 0; Blood, 12·5; Spine, 0; Shoulders, 0; All over body, 0.
All men	-	Head, 19·4; Chest, 33·3; Stomach, 19·4; Arms, 0; Legs, 0; Heart, 8·3; Blood, 2·8; Spine, 11·1; Shoulders, 2·8; All over body, 2·8.
All women	-	Head, 29·4; Chest, 17·6; Stomach, 35·3; Arms, 0; Legs, 0; Heart, 5·9; Blood, 0; Spine, 11·8; Shoulders, 0; All over body,0.
Whole group	-	Head, 22·6; Chest, 28·3; Stomach, 24·5; Arms, 0; Legs, 0; Heart, 7·5; Blood, 1·9; Spine, 11·3; Shoulders, 1·9; All over body, 1·9.

'Describe how this effect travelled from one part of your body to another.'

Type of response	Percentage
Subjects unable to describe	30·0
Stationary	12·0
Movement upwards from stomach	4·0
Movement upwards and downwards from stomach (radiating movement)	10·0
Movement from stomach to head and then to legs.	2·0
Movement from head downwards	4·0
Movement from chest to stomach and then to legs.	4·0
Movement from stomach to legs.	2·0
Movement from chest to head.	8·0
Movement from shoulders to stomach	2·0
Vibratory movement in spine.	2·0
Diffuse tingle with little movement	20·0

The details for 'diffuse tingle' are:- Heart (1), Chest (2), Stomach (3), Back (1), Head (1), Blood (1), Whole body (1).

'Write a line about the kinds of music that produced this effect.'

The following grouping was found:-

Large orchestra	-	12 cases (crashing effects, 1 case; crescendo, 1 case; climax, 1 case)
Slow music	-	12 cases (expressive music, 1 case; recurring themes, 1 case.)
Songs	-	8 cases (Hebridean, 2 cases; operatic, 1 case; Border ballads, 1 case; very fine singer, 1 case)
Operas	-	8 cases (Wagner. 2 cases)
Sad music	-	7 cases.
Marches	-	6 cases.
Classical music	-	6 cases.
Large choir	-	6 cases ('Messiah', 2 cases; with orchestra, 1 case).
Dramatic music	-	6 cases ("big climax", 1 case.)
Military music	-	5 cases (Highland music, 1 case)
Overtures	-	5 "
Symphonies	-	4 "
Dances	-	4 " (pulsating rhythm, 1 case).
Expressive music	-	4 "
Bagpipes	-	4 "
Pipe organ	-	4 "
Sonatas	-	3 "
Quick music	-	3 "
Light music	-	3 "
Waltzes	-	3 " ('for large orchestra', 1 case.)
Loud music	-	2 "
Patriotic music	-	2 "
Melody	-	2 " ('well-known melody, 1 case; plaintive melody, 1 case.)
Soft music	-	2 "
Massive effects	-	2 "
Russian music	-	2 "
Norwegian music	-	2 "
Soft unaccompanied choir	-	2 " ('especially for female voices', 1 case.)
Violin	-	2 " ('quick', 1 case)
String quartet	-	2 "
Sacred music	-	1 "
Drums	-	1 "
Sudden change of tempo or intensity	-	1 "
Increase of tempo and intensity as climax approaches	-	1 "
Pedal entry in organ fugue	-	1 "

An unusual modulation	-	1	case
Haunting music	-	1	"
Sentimental music	-	1	"
Descriptive music	-	1	"

Some special notes were:- 'The Barber of Seville,' 'The Bohemian Girl', Organ playing softly 'The Lost Chord', 'One Fine Day' from 'Madame Butterfly', entry of chorus in 'Hallelujah Chorus', opening bars of Mastersingers overture, certain moments in dramatic songs(e.g. Erl King), Elgar's Enigma Variations, Brahms' Second Symphony, National Anthem, Land of Hope and Glory, 'Fingal's Cave', 'Dead March in Saul', Pastoral Symphony in Messiah, William Tell, Chopin's Funeral March, Easter Hymn by Mascagni arranged for organ, Strauss's Waltzes for large orchestra, 'Liebestod' by Wagner, Second Symphony by Elgar, Beethoven's 'Moonlight Sonata', 'Fruhlingrauchen,' Piobaireachd, Casse Noisette, Beethoven's Ninth Symphony (last movement, at first hearing), 'Valse Triste' by Sibelius, Wedding Day in Trollhagen by Grieg, Peer Gynt Suite, Carmen, L'Arlesienne, Passacaille by Chaminade, 'The Kerry Dance', Tschaikowsky's '1812', Chanson Indoue.

The A group, as was explained before, consisted of persons of very high musical qualities so that the answers of members of this group are of special interest. These are given below.

"Massive effects, e.g. the entry of the chorus in 'Hallelujah Chorus' or the opening bars of Mastersingers overture. A beautiful piece of soft unaccompanied choral singing. An unusual modulation. A pedal entry in an organ fugue. Certain moments in dramatic songs, e.g. 'The Erl King' ".

"Only very sad music seems to produce a physical thrill. Stirring music has an elating effect but this would appear to be a mental rather than a physical experience."

"Orchestral music - Elgar's Enigma Variations. Brahm's Second Symphony.
Choral music - Choruses from Handel's Messiah."

"Unaccompanied choral music, especially female voices, string quartet slow movements and symphonic music. About the age of 15, Wagner started these reactions in me.

(Tannhauser, Lohengrin especially. Tristan, etc., bored me. Now, Tannhauser and Lohengrin bore me, but Tristan, Mastersingers, Parsifal and Ring still produce these effects at certain points.) I believe with Pater that all progress in art is achieved through a series of disgusts. There is, however, at each stage of progress something that still kindles the spark. Certain harmonies, e.g. diminished sevenths, used to have a magical effect on me. Now they leave me cold with the coldness of familiarity. Early Wagner, I believe, appeals to the sex emotions and to adolescents. It had an enervating effect on me, although I would not have said so at the time. In adolescence the first effect of music was to set me trying to compose."

"(a) Music (orchestral) building up its resources to a climax.
(b) Music (string quartet) producing great beauty of tone or inevitability of design."

"Various kinds too numerous to mention briefly. Depends to large extent on command of technique and interpretative powers of performers, coupled to quality of music."

"Some of Mozart's music, especially from his operas."

"A particularly strong chorus, e.g. Messiah chorus. Any strongly patriotic or sentimental tune, e.g. National Anthem, 'Land of Hope and Glory.' Any gay, light-hearted, rhythmic music. P.S. Music seems to have a strong emotional effect on me............. I love to dwell on chords, which seem to have a strong emotional effect on me....... Another fascination seems to be the architecture of music. I seem to see the various chords and progressions in a physical sense as they move and deploy. They have a picturesque effect often; e.g. some passages suggest a cascade of water, etc........"

"(1) Orchestral. There are many which produce an actual thrill, e.g. Mozart's Symphony, No.39. 'Oberon', Wagner's Preludes and Dramas, Chopin's music, Beethoven's 8th Symphony. (2) Operatic. The sensual sway of Puccini never fails to uplift me, no doubt because of my youth. (3) Songs. Many English ballads and Schubert lieder."

"'Fingal's Cave' and some other music descriptive of wind and sea produces a raising of the hair at the nape of the neck. The Dead March in Saul produces a feeling of contraction in pit of stomach. Soft music and sad music, such as some Hebridean music, causes me to expand the chest and fill the lungs."

"Music of the heroic type and soft slow passages in the upper register of orchestra and organ."

"Bagpipe music, marches, organ music. Music by large orchestras, especially when violins predominate."

"Almost any kind of music, depending on the attendant circumstances, e.g. the effect depends greatly on emotional conditions. The first hearing of a piece of music has sometimes produced a physical effect not again repeated."

"Border ballads such as the old tune of 'March, march, Ettrick and Teviotdale' and music of Highland regimental bands."

"Pastoral (Messiah). Pastoral in William Tell overture. Such music produces in me a restful state of mind, susceptible to beautiful chordal effects."

"Chopin's Funeral March and the Dead March in Saul. In my early teens all good music affected me intensely to the point of being completely lost to my surroundings. This tendency decreased steadily due to enforced over-analytical listening."

"Usually loud rather than soft music. Music of an expressive nature."

"The climax of a full orchestral work."

"A certain organ solo piece - Easter Hymn, by Mascagni. I have heard the piece only three times to my knowledge, played on different organs by the same organist. The effect on me has never changed."

"Operas. Classical music. Very fine singer."

"Strauss Waltzes arranged for large orchestra. The music of some Russian composers. All Wagner's operatic music."

"Slow music with recurring themes."

"Music of noble thought or high emotions such as Wagner's Liebestod or Elgar's Second Symphony."

"Chorus of mixed voices with orchestra. Vocal soloist."

'<u>Have you ever had this experience or any experience like it, etc.</u>'

Response	Frequency of response.
Film	26
Theatre	25
Reading	24
"No"	7
No reply	16
Anything producing very strongly felt emotions.	1
When about to undergo an operation.	1
Experiencing coldness.	1
Sudden insight into problem	1
Dawning of some stimulating idea	1
Listening alone to bagpipes	1
When singing in a large choir, with feeling of oblivion to surroundings.	1
Watching something exciting	1
Watching something which recalled a moving experience from the past	1
Playing golf or music	1
Radio plays	1
Viewing a painting	1
Viewing good photography	1
Sight of beautiful stage setting	1
Oratory	1
Watching games or sports	4(football, skating, dancing, exciting finish of race.
Vision of landscape	3

Some details from these classified responses were:-

Vision of landscape - Sudden unexpected good view from hill-top; beautiful landscape; first view of some outstanding scene or object, like a great/

- /great mountain.

Reading - gallant acts (1); emotional part (1); part recalling one's past(1); reading history or philosophy (1); great prose (1); sudden change of a word in composition (1); serious (1); identification of self with action (1); tension suddenly removed (1); hearing passages read(1); dramatic (2); exciting (3 - one being 'climax of thriller'); poetry (4 - 'especially Keats and modern poetry).

Theatre - Finely spoken passage in play (1); tension suddenly removed (1); tension before dramatic event (1); if sufficiently interested (1); identification of self with action (1); scene recalling one's past (1); ballet (1); opera (1); serious (1); exciting play (1); Greek tragedy (1); emotional scene or climax in play (2); murder scene in Macbeth (2); dramatic situation (4 - one was "Hamlet's soliloquies")

Film - tension suddenly removed (1); tension before expected dramatic event (1); emotional climax (1); watching small boat fishing (1); identification of self with action (1); serious film (1); if sufficiently interesting (1); recalling one's past (1); climax of thriller (1); marching troops (2); dramatic situation (2); tragic or evoking sympathy (2); exciting (3).

Some comments about the thrill are:- Like palpitation of the heart; gripping feeling in chest, with quickened breathing; tingling feeling in legs; travelled upwards, producing a positive emotional ecstasy; like electric current; more aware of its cessation than of its start; experienced often, usually at a first hearing, e.g. hearing Paderewski; a thrill, allied to fear, is experienced in hearing drum beats; thrill travels outwards from heart to extremities of limbs and to throat, tear ducts and facial muscles; thrill from serious music causes "lump in throat"; legs "turn to water"; a slow tightening sensation in chest with transference to head; travels via tingling of skin; arms and legs became limp; feeling of absolute weakness; vague sensations due to deeper breathing movement extending to visceral sensations in general; stomach contracts with a catch of breath and produces feeling of exhilaration; with a slow electrical feeling to the finger-tips and down the legs; like a cold feeling; surged from chest to head; made all my body tremble.