CHAPTER IV

ITEM ANALYSIS

4.1 Introduction

The item analysis was planned for all the tests of the DAT Battery except the Clerical Speed and Accuracy test, which is a pure speed test and consists of simple items (combination of letters and /or digits), so simple that a research has indicated "that errors are rarely made in a task as simple as this one."[1] The unnecessariness of a complete item analysis procedure in case of speed tests has been emphasized by several writers.[2]

For remaining seven tests the first step was to write down the directions in simple Hindi and translate the verbal portions of the four non-verbal tests-two entirely non-verbal (AR and SR) and two partially non-verbal (MR and NA). In case of these four tests it was planned only to find difficulty

1. Bennett et al, Manual, p. 8.
2. e.g. J.P.Guilford, Psychometric Methods, p. 418, H.Gulliksen, Theory of Mental Tests, P. 385, and R.L.Thorndike, Personnel Selection, p. 53.

Indiced in the Indian context and to arrange the items in the revised order of difficulty. The reliabilities of these tests were quite high for the original American study and (as reported later) also found in the present investigation. Guilford suggests that an item-total correlation is not necessary in cases of tests which are highly reliable, but "difficulty indices would still be useful for achieving other goals, and possibly also for increasing reliability a bit."[1]

One of the major considerations, for not obtaining Discrimination indices for these four tests, therefore, was the experience and knowledge that these tests have been and are used in various parts of India, as they are, for the purposes of guidance. They have proved very useful for the purpose. A report from Bombay, referred earlier,[2] also presents norms for the AR, and suggests (with the help of several studies) that the AR has high predictive validity with several technical and non-technical courses. Likewise, in a Calcutta study in Anglo-Indian Schools, it was established that the distributions of all tests are quite adequate and that these tests had a good value for prediction of success in some school subjects.[3] In Bihar, according to the information obtained by the present

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1. Guilford, loc. cit.
2. see footnote p. 55.
3. Bureau of Vocational and Educational Guidance, Calcutta, "A Study of the Predictive Value of the DAT for the Cambridge School Certificate Examination," (unpublished).

investigator,[1] MR was used for guidance with satisfactory results.

Thus it was decided to obtain only difficulty indices for these four tests, except for 4 items of MR, which, as found from the experience of scholars and users, were culturally biassed. These 4 items, along with 4 more items (which were the modified version of the original 4 items) were fully item analysed to see which four of these were to be finally retained. In case of three verbal tests-LU-sp, LU-g, and VR- however, it was decided to prepare parallel tests in Hindi which, while retaining the original format, would consist of items selected after complete item analysis.[2]

4.2 Hindi language

A brief description of the nature of Hindi language, and a short historical sketch of the development of the language would not be out of place here. Such developmental and historical sketch would be useful, for the correct appreciation of the language used and problems involved in the 3 verbal tests; especially the Language Usage tests where the syntactic properties of the language were utilised.

Hindi is indirect descent from Sanskrit. Its present form was evolved after much temporal and regional variations.

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1. from unpublished records of Manasayan, publisher of DAT battery in India; also referred in S.M.Mohsin, Practical Handbook of Guidance in Secondary Schools, p. 149.

2. i.e. finding both Difficulty and Discrimination indices.

Hindi, as non exists, is the mother tongue of the majority of the population and is the medium of instruction in 4 states of India. In several other areas of Northern India, such as in Gujarat, Punjab and Bengal respective regional languages origin from the same parental stock. In this sense, Hindi is akin to many other languages of the Northern Indian and is usually the principal language after the regional one. According to the relevant census figures recently released,[1] Hindi is the mother tongue of about 1/3 of the total population of India.[2] The entire population of 4 states and 2 Union territories (Delhi and Himachal Pradesh), where Hindi is the principal language and is the medium of instruction, is 176 million. The Wide Hindi area where the present tests may be used can very well be imagined.

Hindi is written in Devnagari script, which is phonetic. This means that every spoken word is represented by a sumbol (character) and vice versa. As will be seen later in an appropriate section, this property of the script may probably be the reason why, according to the results obtained in the present study, the performance in the spelling test, is an indication of one's intelligence. Hindi in various forms is used in various shades in different regions. The language

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1. Released to the press on 5th Feb., 1965, as reported in Patriot, Delhi, 6th Feb., 1964.
2. 163 million out of the total population of 440 million.

has been medium of communication between people of different regions, especially in the North.

This allembracing nature of Hindi has given it a peculiar character. It has become highly flexible; the lattitude around its correct use is very wide. Hindi has assimilated much from other languages. A number of peculiar expressions, phrases, words have found their way in Hindi. Although some of these are still confined to the respective regions, many have been absorbed into the standard language, viz, the Khari Boli.

This has resulted in some enigmatic situations from a test constructor's view. He has to be careful, for example, to avoid expressions, phrases or words, which, though are correct according to standard Hindi grammar and vocubulary, are also correct regional expressions. The test constructor has to be cautious in that, in his desire to use the standard language, he does not penalize a student whose only fault may be that he comes from a specific region and is rather close to it. A common example is the use of gender. Hindi has no neuter gender; all nouns of otherwise neuter gender, are given a masculine or faminine gender. Though there is always a desirable standard use which follows certain rules. The use of the regional form is also accepted. Few examples are: Truck, the hour of the day etc. These are variously used both as masculine and feminine, and both forms are correct. Thus, we may say ट्रक चली गई and also ट्रक चला गया or घड़ी में आठ बजी है and also

घड़ी में आठ बजा है. To a lesser extent, different usages are prevalent for other grammatical constructions, such as spelling, though not so much as in respect to the gender.

The above, however, should not lead the readers to think that Hindi has no definite form; far from it, Hindi has a standard uniform grammar and has a highly standardised form of correct language. The source of correct usages in grammar, spelling and vocabulary is Sanskrit which follows a rigorous grammatical discipline. The difficulty mentioned is not due to the immaturity of the language, but exactly for the opposite reason: that Hindi in its earlier forms was spoken in a vast area; some of the distinct dialects emerged as seperate languages, but still the Hindi area comprises of several dialects. This may pose certain difficulties from the view point of a test constructor, but from the national point of view, it is the flexibility and the power to assimilate which has given the status which Hindi enjoys today as the national link language. This purpose Hindi has served very well since long time in the past when the Hindi was first known as भाषा. The Language.[1]

4.3 Preparation of items

Abstract Reasoning.-- Directions were written in Hindi. There are two examples, in the original Form A, (and also L), but two more were added to give the students a clearer under-

1. Kamata Prasad Guru, Hindi Vyakaran, p. 20.

standing of the problems expected in the test. This was done to meet the practical experience that students had difficulty in grasping fully the import of problems in this test.[1] The present revision in Hindi also gives four examples.

No change was made in the test contents which consist of 50 non-verbal problems except that the 5 answer figures were indicated by Hindi letters क, ख, ग, घ, ङ , instead of English A, B, C, D, E. The order of the items for item analysis administration remained the same as in Form L.

Numerical Ability.-- Directions were written in Hindi. Two original examples were retained without any change.

There are 40 items in the Indian revision, based on Form A. The Form L remains the same as Form A in this case. In the present revision no change was made in the items except that the operational instructions (add, substract etc.) were written in Hindi (e.g. जोड़ो, घटाओ etc.). The five alternatives were indicated by the Hindi alphabets क, ख, ग, घ, ङ. The fifth alternative which is "none of these" was translated in Hindi as

Three problems were rewritten as under. The item numbers refer to the corresponding numbers in the Form L.

1. Item no. 18.-- This is a problem about weights. In Form L (and Form A) and also in current Indian edition, English prevalent weight of lb. and ounces is given, while in the

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1. from unpublished records of Manasayan,

present revision, these were changed to the metric weights, i.e. of kgms. and gms. At the time of the preparation of the Indian edition in 1960, the metric weights were introduced but were not obligatory. There was also much confusion in conversion as lbs and ounces were the usual British weights in vogue, and were quite familiar. At the time of preparation of this revision, however, the metric weights were in force and obligatory. It was deemed proper that the metric weights be used instead of the original British weights.

2. Item no. 17.-- This is a problem about the linear scale. Here, too, the current linear scale is metric, but it was experienced that the old system of expressing measures in fact etc. was very much ingrained and even now the practice has not become extinct. It was felt that British linear scale still commands a wide familiarity and also popularity. This is probably because of the fact that use of linear scale, unlike Indian weights (which were only confined to India and were differently used in different regions) was uniform and widespread throughout India.

3. Item no. 34.-- The question was rewritten in Hindi, with expression of money in Indian currency, viz, Rs. (₹.)

Space Relations.-- Directions were written in Hindi. Two original examples were retained. The five alternatives were denoted by Hindi letters.

The Form L differs from Form A (and its Indian edition)

in that it has 60 problems and only one figure is correct, while in the Form A, there were 40 problems, and one or more than one figures could be right. This is a major change in format, and the present Indian revision retains the format of Form L, except that 4 alternatives have been denoted by Hindi letters.

Clerical Speed and Accuracy.-- Directions were written in Hindi with the original examples as in Form L.

The Form L, as the Form A (and its Indian edition) has two parts, each consisting of 100 items. The present revision retained the test as it is without any change; the English alphabets and international numerals were also retained.

It was originally thought that the English characters and numerals could be replaced by Hindi characters or numerals, or both. But this idea was not implemented in the light of the present situation. The following considerations led the writer to the original content and format:

1. English is still the most important language for study in Indian Schools from lower grades onwards. From the stage it is introduced, it, becomes a compulsory language. The student, by the time he or she reaches 8th grade gains a sufficient familiarity with English characters and ease in handling them, even though the knowledge of English language and of its correct usage may not be complete. The ease in handling English characters at this stage, may be comparable

to the ease in handling Devnagari (Hindi) characters.

2. The knowledge of English characters and the facility in handling them (including a general familiarity with the language) is still an essential qualification for all clerical applicants. Even in respect to the lowest level of a skilled employee, a familiarity with English characters is a desirable qualification for employment. This is because even now almost everywhere the main office records are mostly kept in English and the suitability of a clerk or even a skilled employee depends upon his familiarity with the usage and knowledge of English language.

In view of the above, it was thought proper not to make any change in this test at all, which aims to explore clerical aptitude.

Mechanical Reasoning.-- The directions were written in Hindi, and two more examples were added. The two original examples did not cover important test items. It was felt that this might cause a lack of proper understanding of instructions.

Form L (which is the same as Form A) consists of 68 items. Of these 4 pictures depicted objects which were not familiar to most of the students of this age level. As the comprehension of the situation and questions depended largely upon the familiarity of the objects illustrated, it was decided, to modify and if necessary to replace, these four pictures. Discussions with experienced teachers and workers in the

field, however, led to the decision to modify them and to add the four as subtitudes and to retain the original four. The total number of pictures and questions, therefore in the tryout form was 72, 4 more than the original 68.

The changes were as under. The first figures represent the original picture numbers of the Form L:

1. Item no. 67.-- This picture shows a tractor moving on steel track. The question based upon this picture is which chain track would move slow or in turning the tractor in a particular direction? This was changed, as any carriage moving on steel track is not very familiar sight. Caterpillars moving on steel tracks are used, but are not common; moreover, their use is mostly confined to urban constructions or big projects. The modified picture (no. 69) depicts the ordinary tractor with wheels and asks which of the two wheels will move slower when turning.

2. Item no. 39.-- This picture shows a horse-cart which has got friction brakes to stop the running wheel. The question based upon this picture is "which part of the wheel becomes hotter when the brakes are applied?"

The Indian modification of this picture is picture no. 70 which shows a bicycle. A bicycle is probably the most widely used conveyance in India and is equipped with an identical system of brakes. The modified picture, therefore, illustrates the same principle but in a more familiar context.

3. Item no. 59.-- This picture shows a billiard table with

three balls. The player is shown hitting the white ball at the rim of the board and the question, asks "which of the 3 black balls will be hit by the white ball?"

Although the principle is easily comprehensible,[1] the more familiar carrom board was illustrated in the modified picture no. 71. The position of striker and other pieces were the same as in original.

4. Item no. 36.-- This picture again shows a tractorm moving on steel tracks turning in one direction. The question asks "which side of the chain track should be moved faster to turn the tractor in a given direction?"

The Indian modification is item no. 72 and depicts an identical situation in more familiar Indian setting. It shows a boat which is moved in a river with two oars. The question remains the same- "which oar should be moved to turn the boat in a specific direction."

In modifying the four pictures, it was attempted to retain the original items involving identical scientific principles. These four pictures were added to the original 68 pictures for finding out after item analysis procedure how far the substitute situations were appropriate. It was found in the ultimate analysis that where emphasis was more on scientific principles, it did not make much difference whether pictures were in the original setting or modified ones. It was only in the two pictures where the comprehension depended more or less on the

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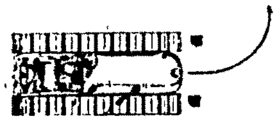
1. as was proved later by the item analysis findings.

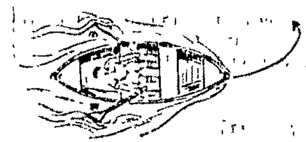
PLATE 2

Showing eight items of MR-4 original and 4 their modified versions.



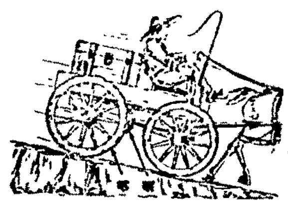
30

ट्रैक्टर को तीसरी दिशा में घुमाने के लिए कौन सी दांतेदार पट्टी को अधिक तेजी से चलाना चाहिए ?
(यदि दोनों में से कोई भी नहीं, तो ग पर चिह्न करो)



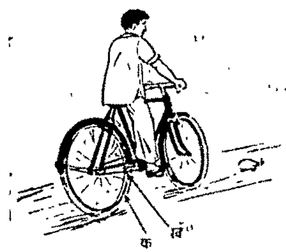
73

नाव को तीर की दिशा में घुमाने के लिये कौनसी पतवार अधिक तेज़ी से चलानी चाहिये ?
(यदि कोई भी नहीं, तो ग पर चिह्न करो)



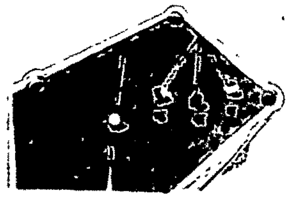
39

जब ब्रेक (गाड़ी रोकने के लिए) लगाया जाएगा, तो क या ख में कौन सा भाग अधिक गर्म हो जाएगा ?
(यदि दोनों समान गर्म होंगे, तो ग पर चिह्न करो)



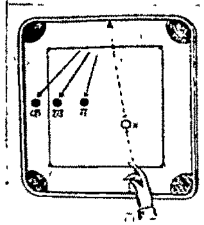
70

जब ब्रेक (साईकिल रोकने के लिए) लगाया जायगा तो क या ख में कौन-सा भाग अधिक गर्म हो जायगा ?
(यदि दोनों समान गर्म होंगे, तो ग पर चिह्न करो)



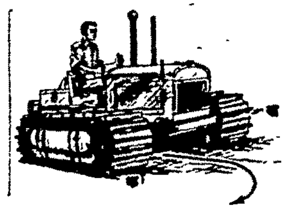
59

स्ट्राइकर गोटी X तीर की दिशा में मारने पर, वापसी में कौन सी गोट से टकराएगी ?



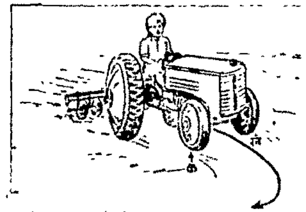
71

स्ट्राइकर तीर की दिशा में मारने पर वापस आई किस गोट से टकराएगा ?



67

ट्रैक्टर को तीर की दिशा में चलाने के लिए किस ओर की दांतेदार पट्टी अधिक धीरे चलेगी ?
(यदि दोनों में से कोई भी धीरे नहीं चलेगी, तो ग पर चिह्न करो।)



69

ट्रैक्टर को तीर की दिशा में घुमाने पर कौनसा पहिया दूसरे से धीरे चलेगा ?
(यदि कोई भी नहीं, तो ग पर चिह्न करो)

form and the shape of the main objects used in pictures, that the more familiar Indian situations proved to be better.

Plate II shows the four pairs of items-the first original and the other modified.

Verbal Reasoning.-- The original test has 50 items. The item is a analogy statement in which two pairs of words are given having identical relationship. The first word of first pair and the last word of the second pair are not given but are to be found out from one of the five alternatives (with pairs of words). The Hindi adaptation of this test was also attempted on this pattern. Insofar as this was to be an entirely new Hindi test, a complete item analysis was planned.

The investigator selected 70 analogy statements for final item analysis tryout. The statements included, items from various spheres-such as geography, history, physics and daily life. In addition to the simple concrete items of analogy, e.g."dog is to howl, as lion is to roar"(item no. 1), the statements included items showing abstract and complex relationship e.g. "Past is to Present, as Present is to Future" (item no. 18) or "Life is to growth as Death is to destruction" (item no. 47).

Language Usage-spelling.-- This test consists of 100 words, with correct or uncorrect spelling. The pupil has to recognise them and mark accordingly. For item analysis purposes, it was decided to add some more items so that after rejection 100 words may be retained. In all, 160 words were chosen for the item

analysis. It was kept in view that (1) no word having two accepted spellings was selected and (2) all selected words were generally known to Higher Secondary children of Hindi schools.

Common words and common errors were chosen from the several standard publications about vocabulary, and Hindi usage.[1] Grammar and composition books were also consulted; a study by Himkar[2] was useful in this connection. Besides these, examination of some papers and consultations with language teachers also helped the investigator to arrive at a tentative list of common, correct and mis-spelt words.

Language Usage-gr.-- The original test in English has 60 sentences. The investigator also decided to retain 60 sentences in the final test on the same pattern but to put more sentences for item analysis purposes. Actually 100 sentences were chosen for tryout.

The rendering of these two Language Usage tests in Hindi involved some difficulties, resulting from the inherent characteristics of the language. Whereas the English language is more or less standardised and only slight deviation is observed in differences due to dialect, a wide divergence is possible in Hindi due to dialectical differences.[3]

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1. Ministry of Education, Government of India, Basic Hindi Vocabularies (500 and 2000 words), and Ramchandra Verma, Hindi Prayog.

2. C.M.Himkar, " A New Light on Spelling errors in Hindi" Naya Shikshak, Bikaner, (Jan.-April 1962), pp. 78-88.

3. e.g. while 'has been' is a standardised form for indefinite tense in English; words Hua and Bhaya both are grammatically correct, though the former is usually preferred.

The difficulty was enhanced due to the fact that the same word (or a similar construction of a sentence) might have slightly or more different meaning in different dialects. Care was, therefore, kept that no work (or sentence) was chosen which would be perceived differently by any student, just because he or she happens to come from a particular dialectical region.

All 100 sentences were written, each having 4 parts, denoted by four characters of Hindi alphabet viz, क, ख, ग, घ. The students were to find out whether the sentence was grammatically correct. If not, they were further required to locate the part of the sentence which contained the error, (The error was only in one of the four divisions).[1] The student was then to mark in the appropriate space on the seperate answersheet. In case the sentence was grammatically correct, the student was required to mark the fifth alternative on the answersheet, denoted by the fifth character ङ of the Devnagari alphabet.

4.4 Sampling

After the items were prepared and the procedure was decided, a schedule was planned for the administration of tests to the classes IX, X and XI of 5 Higher Secondary Schools in Delhi.[2]

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1. In earlier Form A, the error could have been in one or more divisions.

2. The region of Delhi, as used here, includes New Delhi and the entire territory under Delhi administration.

The schools were selected after several considerations, mainly that (1) they should be average as regards performance of the students and the socio-economic status of their parents, and (2) they did not represent any specific regional characteristic in respect of the dialect, culture, language etc. It was also planned to include some sample of students from a comparatively rural population, as this is an important stratum in India.

Delhi does not have a pure rural area, though territory includes 258 villages.[1] Due to the proximity to the capital, most of the villages have developed a semi-urban character.[2] A fair representation of this semi-urban population was also included in the sample to extend the usefulness of the tests.

It was originally intended to take a sample of 370 students of both sexes, from few representative schools, drawn from all the three classes of Higher Secondary Schools i.e. class IX, X and XI, as the tests were ultimately meant for the entire range of the Higher Secondary School. But this plan was modified in view of some practical difficulties. An important reason was the reluctance of school authorities to,

1. allow the administration of the entire battery, which was to be administered without time limit, and to lose 2 or

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1. Review of Education, p. 693.
2. ibid.,

3 days of teaching, and

2. to allow testing of class XI, which was the final class and was preparing for the Board examination. The authorities, however, generally agreed about the usefulness of the tests.

These practical difficulties, therefore, necessitated the investigator to modify his sampling design and testing plans so that while the essential purpose of the test administration programme was adequately met, there was a minimum inconvenience to the school authorities whose difficulties were also genuine. A compromise plan was, therefore, worked out as under:

1. There was to be no administration of clerical speed and accuracy test. As already referred earlier, the speed test was neither intended nor essential.

2. All the other seven tests, were to be administered to the students of classes IX and X, consisting of pupils of both sexes, if possible. It was decided to include students of class XI also, whenever possible.

The plan was discussed with several psychologists. An important procedure decided was that while the usual number of 370 pupils was considered essential for the complete item analysis of three newly prepared verbal tests-VR, Lu-sp, LU-g-a lesser number could adequately meet the requirement where arrangement of items according to revised difficulty order

was the primary consideration. Moreover, it was deemed appropriate that all the 3 classes should be adequately represented in the items analysis sample for the three verbal tests, while the other four tests could be tried only on the sample drawn from classes IX and X.[1] The investigator was afraid that insistence on inclusion of class XI for all tests, (which would take away 2-3 days of total teaching time) would probably arouse an unsympathetic attitude and the authorities would not allow even the administration of 3 verbal tests, which was absolutely essential.

Therefore, after much persuation and planning, it was decided to work according to the above mentioned plan and to prepare adequate sampling design out of the schools preliminarily selected for this tryout. The Table 3 on the next page, describes the number of students to whom the tests were administered.

Of the two schools, shown in the Table 3 on the next page, school 'a' was a pure urban school and 'b' was a semi-urban one. Both consisted of students mostly from middle classes and none of the two schools was considered either a top grade or a low grade one. Both the schools consisted of students whose mother tongue was Hindi, but were exposed to

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1. The classes IX and X were the first two of the three classes of the 3 year Higher Secondary Course, and these constituted the only two classes of the usual High School courses of 2 year duration.

the total Delhi culture which is a cosmopolitan one. The semi-urban school was also one where students were drawn from several surrounding villages and, therefore, represented the general population of Delhi villages.

TABLE 3

Schoolwise Sample for the 4 non-verbal tests- MR, AR, SR, and NA

School* / Tests	(a) IX	(a) X	(b) IX	(b) X	N
Abstract Reasoning	70	28	55	26	179
Mechanical Reasoning	70	28	55	25	178
Space Relations	72	44	55	26	197
Numerical Ability	72	44	55	26	197

* School (a) : Matasundari Govt. Higher Secondary School, New Delhi.

" (b) : Rampura Govt. Higher Secondary Schoo, Rampura- this semi-urban school included 10 girls.

As mentioned earlier, a further sample was drawn for the 3 verbal tests, to complete the requirement for a proper item analysis procedure, which is 370. This sample included some number from either sex from class XI. These additional schools were also selected on the basis of the same general consideration, i.e. they represented the general middle class population, neither too bright nor too dull. The Table 4 on the next page shows the total number of students who were included in this administration.

TABLE 4

Item Analysis Sample for 3 Non-verbal Tests- VR, LU sp., LU g.

Class	School (a)	(b)	(c)	(d)	(e)	N
IX	72	55	-	20	-	147
X	44	24	25	28	30	151
XI	-	-	30	30	12	72
	116	79	55+	78	42	370

* School (a) Matasundari Govt. H.S.School, New Delhi.
(b) Govt. H.S.School for boys, Rampura.
(c) " " " " " New Rajinder Nagar, New Delhi.
(d) " " " " girls, New Rajinder Nagar, New Delhi.
(e) Salwan H.S. School, New Delhi.
+ This semi-urban sample consisted of 10 girls.

4.5 Procedure

The tests were administered in about 20 days during August-September 1963. The tests were administered in the following order:

Verbal Reasoning
Abstract Reasoning
Mechanical Reasoning
Space Relations
Numerical Ability and
Language Usage

The tests were administered without time limit in accordance with the accepted procedure for item analysis (as advocated by several writers). The pupils were instructed to finish the tests, guess as little as possible but mar all. Time was

noted when the student began to work on a particular test. As each pupil finished the test and returned the answersheet, time taken to complete the test was noted on each answersheet returned. This process of noting the time taken to complete the test was followed during the entire testing programme. It was noted that almost all completed the answersheets.

Nature of test in general was carefully explained to the pupils and then specific directions for each test were read. It was ensured that the pupils fully understood the directions. The entire administration was spread in 2, 3, or 4 days, depending upon the school's convenience. Most of the pupil's who took the tests were present for all tests, except some who could not attend the school on any particular day. In one instance only when MR and AR[1] were administered to school 'a', there was a large absenteeism as some students were required for participation in some physical activity conducted by the school.

After the administration of tests, and collection of booklets and answersheets, next step was to score all the answersheets. Before scoring, some answersheets which were either not marked at all or marked very sparsely were rejected as invalid. Answersheets where students had regularly marked more than one alternative were also likewise rejected. Such

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1. these two tests were generally given one after the another and to the same group as both answersheets were printed on the two sides of the same sheet. The other such printed answersheets were those of SR and NA and two parts of the LU.

cases, however, were very few. In case of 3 verbal tests, the answersheets finally retained for item analysis after such rejection was 370 (the number initially tested was about 400 for each test).

Scoring.-- The answersheets were all scored by the investigator himself by specially prepared punched scoring stencils showing correct answers. As all the questions were attempted by all the students, and tests were administered without time limit, no correction for guessing was necessary and the score was simply the number of correct answers.

For the sake of convenience, the discussion that follows is arranged in following three sections:

1. for the 3 non-verbal tests (except MR) where the items were only rearranged without any change in the test-content,

2. for MR, where a complete item analysis was done for the 8 items-4 original and 4 additional, and

3. for the 3 verbal tests which were subjected to a complete item analysis in order to find out both the Diff. and Disc. indices.

I. In this category are included four tests, viz, AR, MR, SR, and NA. Here total number of correct responses for each item was ascertained by adding the correct responses for all the students tested. The revised order was fixed by putting the items in order of difficulty-easiest the first and most

difficult item, the last. Table 5, 6 and 7 show the revised order of the items in the three tests.

TABLE 5

Items of NA in Revised Order of Difficulty

Item no.			Item no.		
Revised	Original*	p.**	Revised	Original*	p.**
1	1	170	21	25	75
2	2	169	22	22	72
3	19	158	23	34	64
4	3	154	24	17	62
5	13	154	25	40	62
6	14	154	26	12	61
7	5	132	27	29	61
8	4	125	28	30	61
9	15	115	29	7	55
10	24	113	30	26	53
11	23	102	31	37	51
12	16	99	32	36	44
13	18	98	33	9	43
14	32	94	34	20	41
15	10	91	35	6	39
16	33	88	36	38	39
17	21	84	37	8	33
18	31	84	38	27	25
19	28	81	39	35	24
20	11	77	40	39	12

* These are the nos. in the original Form L.

** proportion of pupils who correctly answered the item, out of the total of 197 pupils, who took the test.

TABLE 6

Items of SR in Revised Order of Difficulty

Item no. Revised	Item no. Original*	p.**	Item no. Revised	Item no. Original*	p.**
1	1	165	31	30	45
2	10	123	32	11	44
3	16	114	33	31	44
4	8	104	34	33	42
5	15	104	35	27	41
6	2	102	36	53	39
7	17	107	37	21	38
8	3	99	38	59	36
9	7	97	39	28	35
10	23	93	40	50	35
11	12	90	41	58	35
12	14	90	42	29	34
13	30	87	43	45	34
14	5	81	44	48	34
15	25	80	45	22	32
16	19	76	46	55	32
17	9	74	47	49	31
18	6	69	48	32	31
19	37	62	49	56	30
20	20	60	50	41	29
21	32	60	51	44	28
22	34	60	52	60	27
23	24	59	53	39	26
24	13	57	54	42	26
25	43	56	55	46	24
26	18	52	56	51	24
27	35	51	57	57	24
28	26	47	58	40	23
29	4	45	59	47	23
30	36	45	60	54	13

* These are the nos. in the original Form L.

** Proportion of pupils who correctly answered the item, out of the total of 197 pupils, who took the test.

TABLE 7

Items of AR in Revised Order of Difficulty

Item no. Revised	Item no. Original*	p.**	Item no. Revised	Item no. Original	p.**
1	1	121	26	33	51
2	12	82	27	7	49
3	29	72	28	9	49
4	18	70	29	28	49
5	3	69	30	14	47
6	4	69	31	22	47
7	13	69	32	37	47
8	30	69	33	25	46
9	17	68	34	32	44
10	10	68	35	21	42
11	8	67	36	46	42
12	5	65	37	35	42
13	19	65	38	36	40
14	40	63	39	16	38
15	23	62	40	43	36
16	11	60	41	31	35
17	34	59	42	47	35
18	24	58	43	38	34
19	15	57	44	44	34
20	2	56	45	41	33
21	10	56	46	45	31
22	42	56	47	50	30
23	26	54	48	39	23
24	27	54	49	48	23
25	6	52	50	49	20

* These are the nos. in the original Form L.

** proportion of pupils who correctly answered the item, out of the total of 179 pupils, who took the test.

2. In case of MR, besides finding the difficulty order of the items, Disc. indices were also obtained for eight items- four original drawings nos. 36, 39, 59, 67 and four modified drawings of the same items, i.e. nos. 69, 70, 71 and 72. This was done to see which four of the eight items were more easily comprehensible to the Indian sample, so that the four items showing better discrimination, may be retained.

Table 8 shows the two indices of the eight items.[1] The encircled items are the four items finally retained.

TABLE 8

Diff. and Disc. Indices of eight (four Pairs of) MR Items

Pairs	S.No.of Items*	Indices Diff.	Disc.	S.No.of Items*	Indices Diff.	Disc.
1	36	45	25	(72)	45	30
2	(39)	45	45	70	42	25
3	(59)	31	20	71	42	5
4	67	45	35	(69)	55	45

* The nos. are the original nos. of the test as prepared for item analysis purposes.

After selecting four items on basis of good indices, all 68 items were re-arranged according to the difficulty order. Table 9 shows the revised arrangement.

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1. obtained by the aid of Harper et al, Item Analysis Chart.

TABLE 9

Items of MR in Revised Order of Difficulty

Item no. Revised	Item no. Original*	p.**	Item no. Revised	Item no. Original*	p.**
1	21	149	35	15	81
2	10	144	36	19	81
3	7	144	37	48	81
4	1	142	38	2	80
5	6	141	39	68	80
6	35	140	40	45	78
7	5	128	41	37	77
8	62	124	42	14	76
9	28	120	43	30	75
10	9	117	44	52	75
11	13	115	45	57	75
12	4	113	46	32	73
13	11	113	47	64	73
14	69	111	48	18	70
15	24	103	49	41	69
16	72	103	50	27	68
17	23	98	51	59	68
18	38	97	52	20	67
19	42	97	53	47	67
20	16	96	54	60	67
21	8	95	55	49	64
22	54	93	56	3	62
23	65	92	57	22	61
24	39	92	58	44	59
25	29	91	59	31	58
26	26	90	60	58	58
27	50	89	61	66	56
28	43	88	62	46	55
29	12	86	63	56	50
30	51	85	64	25	45
31	33	84	65	53	43
32	34	84	66	55	38
33	17	83	67	61	39
34	40	82	68	63	37

* nos. of the modified Indian edition of Form A. This was followed as there was no change in the pictures of Form A or Form L, except a revised order.

** proportion of pupils who correctly answered the item, out of the total of 178 pupils, who took the test.

3. In case of 3 verbal tests-VR, LU-sp, and LU-g, complete item analysis was planned by finding both Diff. and Disc. indices of all items (used for item analysis procedure) and then selecting the needed number (50 for VR, 100 for LU-sp and 60 for LU-g) on basis of satisfactory indices. For this purpose, as already mentioned in the appropriate section, about 60% more items were tested for item analysis.

After scoring, the answersheets were arranged in a serial order of scores. The first 27% and last 27% were then taken for item analyses. As the N was 370, the 27% was equal to 100, hence, the two extreme groups consisted of 100 students each. To ensure that the top and bottom 27% each (or 100) consisted of a fair obtained proportion of students from all the three classes, proportionate number was taken (to make up top or bottom 100) from (the top or bottom of) each class. This further ensured that the schooling did not affect the item analysis. Without a proportionate representation of all the three classes in the final composition of extreme groups, the top 27% would consist of a majority of class XI students, some of class X and probably none of class IX. Vice versa, the bottom 27% would consist of a majority of class IX students, some of class X and probably none of class XI.[1] The composition of the top and bottom 100 was 40, 40 and 20 students of class

1. The investigator is grateful to Dr.A.E.Harper, Jr. who helped him much in finalizing this procedure.

IX, X and XI respectively, in accordance with their proportion in thetotal sample, shown in table 4.

Simultaneously, with the scoring of the answer papers, the responses to each alternatives for every item were also analysed. This was done (i) to study the item by inspection, (ii) to edit properly the alternate responses to each item, and (iii) to enable the investigator to apply Horst's Correction for chance to the proportion who correctly answered the item. Of the two most well-known 'Corrections for chance' formulas, the one by Guilford, is based on the assumption that all alternatives are of equally attractive. Horst's formula on the other hand, takes a realistic view and allows for the differences in attractiveness of each alternative. His formula requires the tabulation of number of responses to the most attractive (incorrect) alternative next to the correct one.[1]

The P_H and P_L (proportions of students who correctly answered the item in high and low groups respectively) were obtained for each item, for the two extreme groups. These obtained P_H and P_L were corrected for chance by Guilford's formula and the table of corrected proportions.[2] Diff. and Disc. indices were obtained by the aid of item analysis Chart and instructions by Harper et al,[3] which is based on the indices by Davis.

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1. Gulliksen, Theory, p.372.
2. Guilford, Psychometric Methods, pp. 420-421.
3. Harper et al, Item Analysis Chart.

In selection of the final items, the following considerations were kept under view:

(a) Difficulty Index.-- The average difficulty index should be, ideally, 50 or close to it, for each item. As it is not possible (nor desirable) to have all the items in a test of identical difficulty level, generally the accepted range of the difficulty indices of various items is between 75 and 25, with an average index of 50.

(b) Discrimination Index.-- There is no hard and fast rule about a minimum Disc. index, except the recognition of the too obvious fact that higher the index (and therefore the item-total correlation), better is the discrimination power of the item. However, after discussion, it was decided that the minimum acceptable Disc. index should be around 20. For final acceptance, therefore, evidently a good item must be of acceptable difficulty level and be as highly discriminative as possible.

After deciding about the criterion on which the final acceptance of the items will be based, the investigator selected the items-50, 100 and 60 for VR, LU-sp and LU-g respectively. The Table 10 shows the number of items in the 3 verbal tests, which were finally retained, the average difficulty level and the range of the Disc. indices.

TABLE 10

Number of Items finally retained in the 3 Verbal Tests and the Range and Median of the Diff. and Disc. Indices

Tests	No. of items Before*	No. of items After*	Diff. Index Range	Diff. Index Mdn.	Diff. Index M	Disc. Index** Range	Disc. Index** Mdn.
VR	70	50	63-17	40	40.4	70-15	37.5
LU-sp	160	100	80-21	61	57.5	80-20	40.0
LU-gr	100	60	69-32	52	49.2	55-17.5	37.5

* i.e. before and after Item Analysis.

** only 2 values were 15; all others were 20 or above.

Table 11, 12 and 13 show the Diff. and Disc. indices of the items finally retained in VR, LU-sp and LU-gr respectively.

TABLE 11

Diff. and Disc. Indices of finally selected 50 Items of Verbal Reasoning Test

N = 370
P = 100
P = 100

Item No. Rev.[1]	Item No. Orig.[2]	According to Guilford[3] Corrected P_H	Corrected P_L	Indices Diff.	Indices Disc.	According to Horst[3] Corrected P_H	Corrected P_L	Indices Diff.	Indices Disc.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	37	96	45	63	45	95	39	61	50
2	18	92.5	40	61	45	91	31	58	45
3	19	92.5	30	58	50	89	29	55	40
4	32	90	32.5	58	45	87	29	55	45
5	50	88	41	58	35	85	38	58	32.5
6	27	84	30	55	40	84	25	52	40
7	44	80	39	55	30	75	34	52	25
8	1	84	34	55	35	80	27	52	35
9	2	71	40	52	20	60	31	48	17.5
10	5	81	26	52	40	79	14	48	45
11	30	79	22.5	50	40	75	21	48	35
12	16	71	31	50	25	61	22	45	22
13	92	76	25	50	35	70	21	48	30
14	15	70	25	48	30	52	16	40	25
15	46	70	21	48	30	69	12	42	30

Table 11 contd.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
16	6	59	20	45	20	48	15	43	40
17	45	69	22.5	48	30	58	15	39	25
18	47	67.5	20	45	30	63	12	42	35
19	22	70	14	45	40	67	10	42	45
20	55	71	14	45	40	67	7	40	45
21	54	49	28	43.5	15	29	26	37.5	5
22	13	52.5	22.5	42	20	46	10	35	30
23	52	80	2.5	42	70	78	-4	43	70+
24	3	60	16	42	30	56	6	38	40
25	36	52.5	10	40	35	49	2	33	47.5
26	68	50	16	40	25	43	5	33	35
27	33	60	9	39	40	54	1	33	55
28	38	41	11	36	25	21	-12	14	40+
29	12	60	-5	37.5	60+	71	-12	38	62.5+
30	10	55	6	37	45	-6	-29	-29	25
31	17	54	-4	35	55+	46	-11	30	50+
32	40	66	0	35	60	57	-12	35	55+
33	62	51	7.5	35	40	42	0	31	50
34	69	40	10	35	25	33	3	28	35
35	23	32.5	10	32	20	24	-3	24	35+
36	39	36	7.5	31	25	27	-2	25	40+
37	49	50	0	31	55	45	-13	25	30+
38	56	39	5	31	35	27	-3	25	40+
39	58	35	6	31	30	6	-3	2.5	25+
40	60	35	1	31	40	19	-8	16	40+
41	63	45	0	31	55	26	-8	22	40+
42	8	29	11	31	55	12	0	17	30
43	65	36	-5	29	45+	23	-10	18	40+
44	4	24	11	30	15	7	5	18	10
45	48	30	0	25	45	22	-19	2.5	40+

Table 11 contd.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
46	67	32.5	-10	24	45+	24	-18	10	45+
47	53	19	4	24	25	11	- 2	15	25+
48	14	30	-12.5	22	45+	-4	-30	-28	30
49	43	19	0	20	35	8	-12	- 7	30+
50	25	19	- 6	17	35+	2	-20	-22	40+

+ After disc. indices indicate, that the index is an under estimate, (Harper et al, Item Analysis Chart and Instructions, p. 6).

1. Revised no. of items = 50.

2. Original no. of items = 70.

3. Harper et al, Item Analysis Chart and Instructions.

TABLE 12

Diff. and Disc. Indices of finally selected 100 Items of Language Usage-spelling Test

N = 370
P = 100
P = 100

Item No. Revised (1)	Item No. Original (2)	Corrected P_H (3)	Corrected P_L (4)	Indices Diff. (5)	Indices Disc. (6)
1	159	98	84	80	25
2	35	96	72	75	30
3	28	100	62	75	48
4	43	100	76	75	40
5	48	100	68	75	45
6	58	100	70	75	45
7	66	98	78	75	30
8	82	96	78	75	25
9	118	98	72	75	40
10	6	92	66	69	25
11	44	92	66	69	25
12	34	96	80	75	25
13	14	98	66	69	38
14	19	100	54	69	555
15	49	98	60	69	40
16	52	98	66	69	38
17	60	98	66	69	38
18	67	98	68	69	40
19	69	94	70	69	25
20	76	94	64	69	30

Table 12 contd.

(1)	(2)	(3)	(4)	(5)	(6)
21	79	96	70	69	30
22	81	98	60	69	40
23	92	92	70	68	25
24	95	92	68	69	25
25	129	96	66	69	30
26	132	98	68	69	35
27	135	96	74	69	25
28	139	94	72	69	25
29	140	96	68	69	30
30	150	96	60	69	35
31	33	96	54	65	40
32	38	94	58	65	35
33	51	94	58	65	35
34	54	96	56	65	40
35	70	35	96	60	65
36	73	96	48	65	45
37	75	92	70	65	25
38	88	94	52	65	35
39	102	100	66	69	45
40	127	92	58	65	30
41	131	92	64	65	25
42	10	90	44	61	35
43	22	92	46	61	38
44	26	92	48	61	35
45	32	96	44	61	45
46	50	92	52	61	35
47	55	90	50	61	30
48	78	96	42	61	50
49	99	94	42	61	45
50	117	86	52	61	25

Table 12 contd.

(1)	(2)	(3)	(4)	(5)	(6)
51	136	96	44	61	45
52	142	86	50	61	25
53	151	92	46	61	40
54	152	92	46	61	40
55	4	90	40	58	40
56	5	86	42	58	30
57	20	90	36	58	45
58	36	92	28	58	50
59	80	84	44	58	30
60	91	86	42	58	30
61	113	98	16	58	70
62	121	90	42	58	35
63	148	92	38	58	45
64	154	86	40	58	35
65	158	82	48	58	25
66	45	58	28	45	20
67	16	92	20	55	55
68	21	90	24	55	50
69	30	84	34	55	35
70	41	88	32	55	40
71	138	84	30	55	40
72	160	88	24	54	45
73	141	80	28	52	35
74	46	84	26	52	40
75	9	88	16	51	52.5
76	24	76	26	50	32.5
77	39	72	30	50	25
78	40	94	6	50	70
79	96	78	26	50	35
80	59	82	10	48	55

Table 12 contd.

(1)	(2)	(3)	(4)	(5)	(6)
81	85	78	16	48	45
82	87	76	16	48	40
83	128	56	24	45	20
84	137	64	24	45	25
85	11	70	12	42	40
86	106	86	0	42	80
87	122	84	-8	38	80
88	110	-8	-64	39	45
89	12	-2	-60	35	55
90	17	64	0	35	60
91	143	48	6	35	40
92	147	44	10	35	30
93	112	56	0	33	60
94	2	40	-4	31	50
95	23	-2	-50	31	45
96	98	70	-40	28	62
97	125	58	- 2	27	55
98	1	28	0	25	40
99	15	62	-20	21	60
100	27	60	-18	21	60

* As there are True-False items, the correction according to Guilford's and Hort's formulae are identical.

\+ As obtained by the aid of Harper et al, Item Analysis Chart.

TABLE 13

Diff. and Disc. Indices of finally selected 60 Items of Language Usage-grammar Test

N = 370
P = 100
P = 100

Item No.		According to Guilford[3]				According to Horst[3]			
		Corrected		Indices		Corrected		Indices	
Rev.	Orig.	P_H	P_L	Diff.	Disc.	P_H	P_L	Diff.	Disc.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	24	92.50	70	69	25	91	69	69	25
2	47	100	56.25	69	55	100	53	69	55
3	15	98.75	56.25	69	50	98	52	69	50
4	1	95	63.75	69	32.5	94	61	65	30
5	19	93.75	63.75	69	30	91	57	65	30
6	22	92.5	65	68	30	91	60	65	30
7	55	93.75	53.75	65	35	93	51	63	35
8	31	95	53.75	65	40	94	46	61	40
9	21	93.75	53.75	65	35	75	21	48	35
10	52	96.25	42.5	61	50	95	35	60	50
11	92	96.25	40	61	50	95	38	60	50
12	69	90	47.5	61	35	90	40	59	40
13	29	95	43.75	61	50	94	26	58	55
14	39	93.75	37.5	61	45	92	33	58	33
15	40	92.5	41.25	61.1	40	91	35	58	45

Table 13 contd.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
16	80	90	37.5	58	40	88	34	57	40
17	16	85	50	58	25	78	40	55	25
18	84	92.5	26.25	58	52.5	90	23	55	50
19	65	86.25	42.5	58	30	80	38	55	30
20	59	82.5	40	57	30	76	33	52	27.5
21	85	90	26.25	55	50	88	20	53	50
22	83	86.25	28.75	55	40	84	20	52	45
23	97	75	46.25	55	20	76	17	48	40
24	5	90	22.5	55	50	85	7	45	60
25	13	80	41.25	55	25	71	27	50	30
26	95	83.75	28.75	54	40	80	21	50	40
27	96	87.5	23.75	54	45	84	9	48	55
28	99	91.25	18.75	52	55	89	12	50	60
29	25	85	25	52	45	78	20	50	40
30	43	82.5	27.5	52	40	75	25	50	32.5
31	56	75	36.25	52	25	65	27	48	25
32	67	83.75	21.25	52	45	78	12	45	50
33	88	82.5	26.25	52	40	73	- 4	60	70+
34	89	81.25	21.25	50	40	78	15	48	45
35	45	77.5	23.75	50	35	74	18	48	40
36	72	82.5	16.25	50	47.5	79	11	45	50
37	74	76.25	27.5	50	30	64	21	45	30
38	93	75	26.25	50	30	64	10	42	40
39	12	66.25	32.50	50	20	56	16	42	30
40	18	65	35	50	17.5	55	20	42	25
41	30	71.25	25	48	30	60	17	42	30
42	49	65	25	48	25	60	15	42	32.5
43	57	70	21.25	48	30	66	10	42	42.5
44	66	60	23.75	45	25	54	13	39	30
45	27	61.25	20	45	30	51	12	39	30

Table 13 contd.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
46	34	70	13.75	45	40	58	7	39	40
47	90	68.75	7.5	42	47.5	61	- 6	54	60+
48	20	57.50	15	42	30	53	- 1	37	55+
49	83	62.5	11.25	42	37.5	49	1	31	50
50	54	58.75	16.25	42	30	36	-11	25	45+
51	4	63.75	3.75	39	50	54	- 4	36	55+
52*	60	- 6	- 6	0	0	-47	- 9	-35	-30
53	35	51.25	15	39	25	28	- 2	36	40+
54	38	53.75	13.75	39	30	48	- 2	35	30+
55	44	52.5	13.75	39	30	45	5	35	40
56	70	68.75	2.5	39	60	59	-11	35	60+
57	42	31.25	6.25	35	40	31	- 4	28	40+
58	62	53.75	- 7.5	34	55+	44	-18	25	50+
59	37	40	0	31	50	21	- 8	26	40+
60	100	40	6.25	32	30	24	1	23	35

* chosen as a special case in place of the original item no. 32 (Diff. and Disc. indices being 45 - 30 and 35 - 45 respectively by Guilford's and Horst's correction) to give representation to an item demanding knowledge of punctuation. It would be seen that in this special item, the negative disc. comes only by Horst's correction; by Guilford's correction, its indices are 0 - 0, i.e., at the most ineffective for the present sample.

\+ after disc. indices, indicate that the index is an under estimate; (Harper et al, Item Analysis Chart and Instructions, p. 6).

1. Revised no. of the items = 60. 2. Original no. of items = 100.

3. Harper et at, Item Analysis Chart and Instructions.

The pass percentage in each item was corrected for chance success by Guilford's formula, referred above. The two indices on such corrected proportion were obtained. The investigator also obtained the P and P corrected by Horst's formula (already mentioned). This was done to corroborate the finding that the selected items were rightly chosen as sufficiently discriminative. Such indices, on the basis of Horst's correction formula are also shown in these tables for each item. It is apparent that almost all the items, which were found adequate on the basis of Guilford's correction formula were also found adequate on basis of Horst's correction formula, which is generally considered a very suitable one.[1] The items were arranged according to the Diff. indices obtained on the basis of Guilford's correction, as was the original plan.

4.6 Time limit

As all tests, except the CSA, were primarily power tests, sufficient time limit is allowed in case of the original tests. The procedure in the present investigation was to keep the record of the time (in minutes) taken by each student in completing the test and to see by proper analysis and tabulation, the period in which most of the students, if not all, could complete answering the test.

What should be the basis of the fixation of a time limit for power tests? Different scholars have suggested different

bases. Bean[1] and Ross,[2] for example, suggest that time limit be such that each one of the testee could complete the test. Apparently, however, it is not suggested that this rule be literally and rigidly followed, as otherwise the authors would have to alter the time limits every time the test is administered to a new group. This would be as necessary, especially where the members of group are slower in performance than one on whom the test was administered before.

The import of what Bean and Ross suggested, therefore, was probably that time limit should be sufficient so that most of the students could comfortably complete answering the test. Various writers have specified different percentages of students who must have completed the tests, for fixing the time limit.[3] This percentage varies from 75% to 90%. For an Indian test, Buch[4] fixed his time limit as one in which 90% students could complete. Mehta,[5] on the other hand, fixed the time limit wherein a little more than 50% could complete the test. The present investigator decided that, as a general rule, the time limit finally fixed should be such in which about 80% of the testees could complete answering that particular test. At the same time it was kept in view that:

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1. Bean, quoted in Buch, op. cit. p. 30
2. Ross, op. cit. p. 156.
3. Lindquist and Hawkes, The Construction and Use of Achievement examination, quoted in Buch, op. cit. p. 121 and Ruch, The Objective of New type of Examinations, quoted in Buch, op. cit. p. 121.
4. Buch, op. cit. p. 122.
5. Mehta, op. cit. p. 48.

1. Wherever possible, the original time limit (as applicable in U.S.A. and reported in the manual) should not be changed, unless there are some overwhelming reasons for doing so. Such occasion would arise, for example, if the percentage of students completing the entire test is much less than 80%, and

2. even when the time limit is to be changed it should be as close to the original as possible, under the changed conditions.

For the 3 verbal tests the number of items were about 40-60% more than the number actually needed. The time limit in such cases, was decided by the proportion of the time calculated on basis of time taken to complete the elongated tests. Thus, in case of LU-sp the time in which 80% of the students completed this test of 160 items, was 16 minutes; this time was proportionately reduced and 10 minutes were fixed as the time limit for the 100 items, which were finally retained. There was no change in the time limits for the CSA test, this being a speed test. Table 14 shows the time limits of the original tests (of Form L) and the revised time limits fixed on basis of the present study.

TABLE 14

Original and Revised Time Limits

Tests	Time limits in Minutes	
	Original (Form L)	Revised
AR	25	35
NA	30	35
SR	25	30
MR	30	35
CSA-I	3	3
- II	3	3
VR	30	25
LU-sp	10	10
LU-g	25	20
Total	181 mnts. (3 hrs. 1 mnt.)	196 mnts. (3 hrs. 16 mnts.

It is clear that the actual testing time for the revised battery is 15 minutes more than that for the original Form L tests. This can probably be ascribed to the general (but unverified) impression that average Indian student is comparatively slower in responding to a situation like this involving use of aspects of intelligence. This may be due to the unfamiliarity of an average Indian student to the testing situation in general, at least to the extent his American counterpart has.

It is the experience of the investigator, that the administration of one test can be adjusted, generally, to fit in one school period, which is approximately 55 minutes.

This time includes the explanation, administration and collecting back the copies.

4.7 Summary

The chapter describes in detail the procedure sample and results of item analysis. It was described that for this purpose, tests were divided in two groups, first consisting of 3 verbal tests, viz, VR, LU-sp and LU-g and theother all the rest. The first 3 tests were to be completely prepared in Hindi, and hence a complete item analysis was sought, finding both Diff. and Disc. indices, and also testing a large number of items than actually needed.

In the other category, no item analysis was planned for the CSA, which is a pure speed test. All other tests mostly consist of non-verbal content and are widely used in the country. Hence, for these no change of content was planned, except the MR. It was planned only to find difficulty values and to rearrange items according to the revised order of difficulty. Ofcourse, the verbal portions, i.e. directions etc. were rewritten in Hindi.

In MR it was observed that four items depicted objects which was unfamiliar to most of the Indian students and their responses might be affected by their familiarity with these objects. Such 4 pictures were modified, making minimum necessary alternatives, to suit Indian situation. To test which one of these four pairs was more suitable, these

modified pictures were added as 4 new items. Disc. indices were obtained for these 8 items, and 4 most suitable were retained. The tests were administered without any time limit.

The last portion deals with the final form of the tests, and the time limits fixed for each of them. A brief history of the Hindi language is also given as that would be useful in appreciating the nature of the Language Usage tests, prepared (in Hindi) in the present investigation.