CHAPTER III

DESIGNING THE TESTS

Psychological tests of intelligence, whether based upon the theory of "general ability" or upon one of relatively independent factors, and tests of specific aptitudes and skills are now at a reasonably advanced stage of development. This is so because they have been in the process of evolution. Another reason is the fact that determination of the mental functions, or operations to be tested, though not simple, has not been as difficult as the determination by testing of non-intellective traits of personality.

Frank S. Freeman gives the definition of psychological tests which runs as follows:

A psychological test is a standardized instrument designed to measure objectively one or more aspects of total personality by means of samples of verbal or nonverbal responses or by means of other behaviours.

(Freeman, F. S., p. 46)

In the definition the words "standardized", "objectively" and "samples" are important. The philosopher Kant once said that it would not be possible to have a science of psychology because the basic data could not be observed and measured (Bhatt, C.L., p. 37). Modern psychologists agree in part with Kant, agree to the extent that only certain kinds of psychological phenomena are
open to observation and measurement. The slowness of the development of psychological measurements is due to the complexity of human mind.

Man can see the things in the outside world very well. He could prepare the microscope to observe micro-organisms, and the telescope to observe things very far but he is not able to understand his own mind so easily. All the physical measurements can be taken up directly and hence most minutely, objectively and in the most scientific way. The psychological measurements are indirect; one has to observe the behaviour of a person when put to different situations, to study his mind. Hence if the generalizations are done from observations they must be very objective and accurate. All possible precautions, so as to minimize the measurement errors, should be taken.

The purpose of standardizing a test is to give it objectivity. The measuring instrument should be free from subjective judgements regarding the ability. There are several elements, or aspects that make the test objective. These are:

1. Everyone who administers the test does so according to a uniform and specified set of instructions.

2. The responses to test items are uniformly scored according to specific answers, or specimen
answers, provided in the manual.

3 Norms of performance are based upon a population sample that has been scientifically selected for the purpose of a particular test.

4 The mental activities or the traits to be tested are defined and specified.

5 The content of the test under construction is subjected to analysis by means of established techniques of test standardization.

Thus it is necessary for a test maker to be very definite and accurate in defining the range of applicability of the test in determining the testing procedures and the scoring scheme as well as in establishing the norms and predictions drawn from test results.

The Range of Applicability

Every test is designed for use with specified population or group. "The test must be standardized on a group that is a representative sample of the total population for which it is intended. The author of the test must decide with which group and what segment of the population the test is to be standardized" (Freeman, F.S., p. 48).
In fixing the range of applicability the following four factors should be considered.

1. Sex
2. Schooling
3. Age
4. Cultural background

**Sex:**

It was decided to make the test applicable to both boys and girls and establish separate norms for each if the sex difference was found to be significant.

**Schooling:**

Mental tests are defined as instruments for the measurement of individual abilities or types of behaviour, with maximum emphasis on differences due to original nature rather than to training or environment (Freeman, F. N., p. 2). As we have already seen, mental abilities cannot be measured directly but in its manifestations or behaviours towards the stimulus. These behavioural patterns are always changing depending upon the retention of experiences. The school is the media where arranged experiences are given in methodical ways. Hence schooling has great effect on a child's mind and the problem before an experimenter is to avoid the effect of schooling if he wants to measure native inborn capacity. This is quite
a difficult task. The test maker must find activities in which previous experiences is a negligible factor. But such activities are not manifestations of complex mental abilities. The test maker solves the problem by limiting the variety of individuals to be tested and by selecting activities which are largely common to their experiences.

The problem of schooling in the present test was tackled by limiting the application to school going population and by designing test items in view of their schooling.

**Age:**

It is necessary to fix an age range to which the test is to be applied. Such range is rather limited in case of group tests which are fully and uniformly administered to all the individuals in the population. But individual tests do not have to face this handicap. It is possible to score qualitatively as well as delimit the administration of test items. Hence it was decided to prepare the tests for the entire school going population i.e. all the age groups from 5 + to 15 + were thought to be included.

**Cultural Background:**

Populations are often divided into three types of cultures rural, semiurban and urban. If the tests are to be applied to all the types of cultures, they should be
standardized over the sample representing the three types of cultural backgrounds or different tests should be prepared for different cultures. The three cultures are more or less similar. Urbanization of rural areas is continuously going on. We are not surprised to see radio, tape-recorder, electric motors and movies in the village of 4 thousand population. The rural and urban areas differ mainly in their agricultural and industrial bias. The semi-urban culture is a curious mixture of the two.

There is no marked difference in the schools in rural, urban and semiurban areas. Urban schools are not always better than and superior to rural schools. Sometimes urban schools are much less equipped and more poorly managed than rural schools. There is no line of demarkation between rural and urban cultures as well. We may give as much precise definition as possible but it is surely subject to various interpretations of the users of the test. Freeman writes:

It would be exceedingly difficult to find a method of grading social environments so as to apply norms to them. Further more, many gradations of environment could be found and the same individual is subject to the influence of more than one environment. For example, his home environment may be of one sort and his school environment another. These complications and difficulties seem to make it inadvisable to create norms for social groups.

(Freeman, F. N., p. 320)
An advice such as the one quoted above would obviously leave no motivation to undergo the trouble of developing norms for different culture groups. At the same time, it was not advisable to draw the sample from the three culture groups for the size of the standardization population had to be limited to about 400 students in view of the scope of the present work. Besides, as this was an individual test to be administered single handed by the investigator herself, it was particularly inevitable to restrict geographically, the area of its administration.

In the light of considerations, such as the ones mentioned above, it was decided to develop only one set of test items and establish norms on a sample of population to be drawn from Ahmedabad city only. However, when this was being done, the investigator was not defendant about the tests being used at places outside Gujarat. In that frame of reference, the present sampling, she thought could be termed as cluster sampling. Besides the norms developed on the urban population of Ahmedabad City could be cross-validated on the sample population selected from the semiurban and rural areas of Gujarat for checking the applicability as suggested by Helmstadter.

To accurately assess the usefulness of the test in a new situation, it is necessary to carry out other forms of Cross-Validation studies. If the additional information is obtained by checking the effectiveness of
the test on a differently defined population, but using the same criterion as in the original study, the process is called Validity generalization.

(Helmstadter, p. 132)

The Types of Tests

The test maker has to think of the following three aspects while selecting the types of tests:

1. Testing in group or individually
2. Sampling the traits and functions
3. Selecting the media for testing the sample behaviour

The first aspect was already decided upon while undertaking the work; the remaining two are discussed in this section.

Sampling the Traits and Functions:

It is essential that the mental functions and traits to be measured should be well defined so that its manifestations could be observed well.

Any given test measures a limited aspect of the person being examined, although some tests are much more restricted in scope than others. It is essential, therefore, that the test builder define the aspects he proposes to measure. After doing this, he must develop a series of test items that will best sample the traits or functions with which his test is concerned.

(Freeman, F. S., p. 51)
It is impossible and impracticable also, to put
the subjects tested to every conceivable situations
involving a given trait or function. There should be
adequate sampling of responses accepting the fact that
sampling is representative of the whole. If the gross
variable is intelligence, the constituent parts in the
test might be: vocabulary, verbal comprehension,
arithmetical problems, reasoning with practical problems,
verbal and other analogies, perceptual organisation and
perception of space relations etc. Then the operational
levels must be selected i.e. which arithmetical processes
and what levels, what kinds and which levels of words,
what types and ranges of situations, which perceptual
figures?

An attempt to define and interpret the general
ability proposed to be measured by the present test has
already been made in the previous chapter. So far as the
sampling of mental functions is concerned, the models
set by veteran test makers in the field of performance
tests were imitated.

Selecting the Media for Testing the Sample Behaviour:

Four main types or media have been made
available by the test makers.

1 Using language and numerical symbols
2 Using pictures, diagrams and non-language symbols, with a view to avoiding the use of language

3 Using manipulation of objects, with a view to avoiding both the language as well as the paper and pencil work

4 Using motion picture film or television, with a view to achieving better standardization

Language, numerical symbols, pictures, diagrams etc. are used in verbal and non-verbal tests. We have already seen that there are different verbal and non-verbal paper-pencil tests available in Gujarat. Right from the days, since Binet constructed his scale, verbal tests are being frowned upon by a large majority of test critics, test users and test makers. They are being severely criticised for the use of language which is mainly the product of schooling. Language seems to be the principle source of the strength of the verbal tests but it is also its weakness which is accepted as necessary evil by the psychologists. Cronbach remarks that a child may do badly on the test because of poor schooling, but that this will also cause him to do badly in school in future (Cronbach, P. 114).

R. E. Learning in the Psychological Clinic has made classification of children in which he finds the following four types:
1. The superior children who do well in both the performance tests and intellectual tests.
2. The children who do poorly in both the performance tests and the intellectual tests.
3. The children who do well in the intellectual tests, but make indifferent or even poor records in the performance tests.
4. The children who give excellent, sometimes even remarkable exhibitions in the performance tests and yet do very badly with the intellectual tests.

(Reading as quoted by Drever and Collins, p. 13)

The fourth type of children should be detected as early as possible and should be made ready quickly, with a minimum of efficient training.

Performance tests were first developed in connection with the training of mental defectives. The first attempt is that of Itard who endeavoured to train by means of coloured shapes and forms, "The Wild Boy of Aveyron". He was followed about by his pupil Siguin, who devised a number of form-boards for retarded in mental development.

The Uses of Performance Tests

In verbal tests language is used both in
administering the test and in responding to test items. Any illiterate or foreigner will suffer from a severe handicap if examined by such verbal tests. Again, any individual with a speech disability will not appear to the best advantage in a series of verbal tests.

Performance tests are also used in examining those suffering from some physical abnormality such as aphasia or deafness. Performance tests are used in detecting the so called verbalists who score much higher than they deserve on a verbal scale. Any one individual's mental ability can be very well judged by both verbal scale and non-verbal scale.

"The question has been raised as to how far a performance test can take the place of verbal test of intelligence. The general finding is that a performance scale in which language is excluded can never take the place of a scale dependent upon the use of language" (Drever and Collins, p. 16).

They further remark:

We think indeed that verbal and performance tests should be regarded not as rivals, but as allies. Moreover performance tests would appear to have one distinct advantage over mental tests of the Binet type, as regards the measure of native intelligence, in that their results are less affected by schooling than are the results of tests of a more verbal nature.

(Drever and Collins, p.17)
Freeman also supports the idea. He says, "Originally, then, individual performance scales were devised as substitutes for the Stanford Binet scale. At present, however, the more general view is that they should be regarded as supplements to scales employing largely verbal and numerical materials" (Freeman, F. S., p. 281).

Cattell in the 1936 edition of his Guide to Mental testing, said, "Unfortunately the great majority of performance tests have quite low and negligible correlations with intelligence. So great is the attraction of performance tests, however, alike to the subjects and examiner that the performance tests are widely used." (Cattell as quoted by Bhatia, p. 16).

Bhatia, however, contradicts the idea. It can be seen from the following:

Now, although we do not quite agree with the vehemence of this onslaught on the general body of performance tests, as such, we are quite in agreement with the principle of this criticism. It appears to us, however, that it is not performance tests which have often been, so far, put forward for different age groups. If a performance test of intelligence is applied to an age group where it is obviously not suitable it certainly cannot provide any valid assessment of intelligence.

(Bhatia, p. 16)

He pleads for the uses of performance tests and says, "If the performance tests however are devised so
that they are appropriate in nature and difficulty to age range for which they are meant, there seems to be no fundamental reason why a performance test should not be as successful in measuring intelligence as a verbal test" (Bhatia, p. 16).

Terman in his introduction to Kohs' book on Intelligence Measurement says, "In the upper ranges of intelligence especially, most performance test have but little differentiating value, simply because they do not draw heavily enough upon the higher mental processes" (Terman as quoted by Bhatia, p. 17).

On the basis of the comments quoted above, it can be said that performance tests have their assets as well as limitations. Yet they were chosen as a media for testing in view of the need for such tests discussed at length in the introductory chapter.

**Selection of the Tests for the Battery**

The above discussion clarified the reasons and principles of test construction which have guided the test maker. The principles of test construction could be summarized as follows:

1. The test should demand mental activities which are within limits of the schooling which is the criterion of sample selection.
The test material should be based upon the common life experiences of the pupils coming from all the three cultures.

The tests should sample the behaviour to be tested.

There should be variety in the test material.

Each test should be saturated with 'g'.

The item should be such that its response is based on analysis and synthesis.

The number of tests should be sufficient to test the mental ability proposed to be measured.

The suitability of the tests should be carefully kept in view.

All the above principles were kept in view while designing the tests. Thus tests are:

1. as varied as possible,
2. selected from the most common experiences of the children and
3. not measures of achievement but of higher mental abilities.

The first problem that confronts any one attempting to devise an intelligence scale is that of selecting the types of tests that should be included in
the battery. This is not a simple task, for, in addition to the necessity for fulfilling certain statistical criteria, there are a number of general considerations which, independent of all other factors restrict one's choice to a greater or lesser degree. One of these is the author's defined or implied view as to the nature of intelligence. The choice of tests also depends upon the various types of scales themselves. So if the author wants to prepare a point scale he will have to select the tests accordingly. Apart from the matter of age, suitability, interest or appeal and power to discriminate at different levels of ability, the most important fact about any test is its over-all merit as a good measure of intelligence.

Before a final choice was made about the tests to be included in the initial standardization of the present scale, the following procedures were followed:

1. A careful analysis was made of the various standardized tests of intelligence already in use. These were studied with special attention to authors' comments with reference to the type of functions measured, the characters of the population on which the scales were originally standardized and evidence of the tests' reliability.
An attempt was made to evaluate each test's claim to validity on the basis of correlations with (a) other recognized tests and (b) empirical ratings of intelligence.

An attempt was made to rate the tests on both the basis of the investigator's experience and that of others.

So in order to make the better selection of tests, the following different performance scales were studied.

(A) Wechsler Performance tests include:

(1) Picture Arrangement (2) Picture Completion
(3) Object Assembly (4) Block Design and
(5) Digit symbol

(B) The Pintner - Paterson Scale includes:

(1) Mare and Foal Form Board (2) Seguin Form Board (3) Five Figure Board (4) Two Figure Board
(5) Casuit Board (6) Triangle Test (7) Diagonal Test (8) Healy Puzzle (9) Manikin (10) Feature Profile Test (11) Ship Test (12) Healy Picture Completion Test-1 (13) Substitution Test
(14) Adaptation Board (15) Cube Test

(C) The Cornell-Coxe Scale includes:

(1) Block Designs (2) Picture Arrangement
(3) Memory for digits (4) Cube construction
(5) Picture Completion

(D) The Arthur Point Scale includes:
(1) Knox Cube (2) Seguin, Two-figure and Casuit Form Boards (3) Manikin (4) Feature Profile
(5) Mare and Foal (6) Healy Picture Completion-1
(7) Porteous Maze (8) Kohs' Block Design

(E) Drever and Collins Scale includes:
(1) Block Design (2) Knox Cube Test (3) Domino Test (4) Size and Weight Test (5) Manikin and Profile Test (6) Form Boards (7) Cube Construction
(8) Picture Completion

(F) Bhatia Performance Scale includes:
(1) Köhs' Block Design Test (2) Alexander's Passalong Test (3) Pattern Drawing Test
(4) Immediate Memory Test for Digits (5) Picture Construction Test

This exhaustive list of different types of tests included in the well-known performance tests of intelligence reveals the fact that such tests do not go beyond the following seven main varieties.

1. Form Boards
2. Block Design
3. Picture Completion
4. Picture Arrangement
Object Assembly
Maze
Digit Symbol

The subtests are different measures of intelligence, not measures of different kinds of intelligence and the dichotomy into Verbal and Performance areas is only one of several ways in which the tests could be grouped.

Apart from all other considerations, the final selection of tests was based primarily on three considerations:

1. That previous studies should have shown that the tests correlated reasonably well with composite measures of intelligence.

2. That the tests as a group encompassed sufficient diversity of function so as not to favour or penalize subjects with special abilities or disabilities.

3. That the nature and character of subjects' failures on the tests have some diagnostic implications. The last criterion seeks to take into account the fact that, though subjects may obtain identical scores, they may arrive at them in quite different ways, and that this difference may be important.
On the basis of the data obtained with all the above procedures 6 tests were selected. It was decided to include all the tests except the digit symbol though it measures rote memory, as the results of this test are highly affected by the mood of the testees, specially in the low age ranges.

All the items included were originally designed and constructed keeping in mind that the following mental functions must be measured.

<table>
<thead>
<tr>
<th>Type of Test</th>
<th>Mental Functions Involved</th>
<th>Influencing Factors</th>
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<tbody>
<tr>
<td>Form Boards</td>
<td>Visual Perception analysis</td>
<td>Rate of motor activity</td>
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<tr>
<td>Block Designs</td>
<td>Perception of Form analysis</td>
<td>Rate of motor activity</td>
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<td></td>
<td>Visual perception:</td>
<td>Minimum of colour Vision</td>
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<tr>
<td></td>
<td>visual analysis</td>
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<td></td>
<td>Visual-motor integration</td>
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<tr>
<td>Picture Arrangement</td>
<td>Visual perception of relationships:</td>
<td>A minimum of cultural opportunity</td>
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<td></td>
<td>Synthesis of non verbal material</td>
<td>Visual acuity at times</td>
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<td></td>
<td>Visual perception :</td>
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<td></td>
<td>Analysis</td>
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<tr>
<td>Block Building</td>
<td>Visual perception:</td>
<td>Rate of motor activity</td>
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<td></td>
<td>Synthesis</td>
<td>Precision of motor activity</td>
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<td></td>
<td>Visual-motor integration</td>
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<tr>
<td>Mazes</td>
<td>Visual perception:</td>
<td>Visual acuity rate of motor activity</td>
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<td>Analysis</td>
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<td></td>
<td>Motor co-ordination</td>
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<td>Immediate recall :</td>
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<td></td>
<td>Social foresight</td>
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<tr>
<td>Picture Completion</td>
<td>Visual perception:</td>
<td>Environmental experience</td>
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<td></td>
<td>analysis</td>
<td>Visual acuity at times</td>
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<td></td>
<td>Visual imagery</td>
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</tbody>
</table>
Description of the Tests

Form Boards:

There are two Form Boards used in this test. One is named Form Board A which consists of five items, the other one named Form Board B, consists of eleven items and is divided into two parts one of which consists of items 1 to 5 and the other one consists of items 6 to 11. All the three Form Boards are of different sizes.

Form Board A: This board is prepared in two layers. The two layers are screwed together from underneath. The upper board measures 31 cms. by 23.4 cms. by 1.8 cms. Six figures are cut out of the upper board in different forms. The insets are of different shapes and sizes. The thickness of the pieces is the same and is 2.2 cms.

Form Board B: To introduce the diminution of size the test constructor had to divide the Form Board B in two parts. The first one measures 31 cms. by 22 cms. by 1.6 cms. and the other one measures 45 cms. by 27.1 cms. by 1.7 cms. Both the boards are made in two layers and screwed together from underneath. Five figures in board 1 and 6 figures in board 2 are cut out of the upper board in different forms.

The insets are common for both the boards and are of different shapes and sizes. The thickness of all the pieces is the same and is 2.2 cms.
All the insets are coloured blue on one side. The blue coloured portion is to be kept on the upper side while arranging the insets in the cut out portions of the Form Boards.

This test involves visual perception and analysis. The subject has to see the situation, then analyse the form and then find out the pieces which will fit in those forms. This test is believed to be having high 'g' loading and also other special abilities. The rate of motor activity is the important influential factor in this test. The items are of different difficulty values and hence the test is applicable to higher age ranges. The children of all ages are interested in this type of tests. Thus this test is applicable to lower age ranges as well as higher age ranges and has a high ceiling of ability.

Block Designs:

The block designs test was originated by Kohs, who offered it as a comprehensive measure of non-verbal intelligence. Adaptations of Kohs Test now appear in a number of intelligence scales. According to Kohs view, "it is essentially a test involving mental analysis and synthesis, which are the fundamental characteristics of all intelligence. In testing intelligence by means of the 'block design' test, he holds we are testing analytic-synthetic ability at ever higher levels as the designs
increase in difficulty and complexity" (Drever and Collins, p. 22). It correlates well with a variety of criterion measures, with total scale score and with most of the subtests of the scale. Individuals who do best on the test are necessarily those who are able to break it up into small portions.

The test material consists of sixteen coloured inch cubes. All the cubes have their faces painted in the same way: white, yellow, blue, red, red and white divided longitudinally and yellow and blue divided longitudinally. In addition to these sixteen painted cubes there are sixteen coloured designs painted in the same colours: red, blue, yellow, white on cardboard oblongs, 8 cms. by 10 cms. The designs are arranged in order of increasing difficulty. For the construction of the first five designs four cubes only are necessary, for the construction of the next five, nine cubes and for the construction of the remaining six designs, sixteen cubes are required.

In administering and scoring the tests, Kohs advocates the counting of the moves required in the case of each design as well as the time taken. This becomes a very complicated task of combining two variables to get the score. In the present series the scoring is done on the basis of pass or fail and the time taken for correct response.
The Block Design Test is not only an excellent test of general intelligence but one that lends itself admirably to qualitative analysis. The tester can learn much by observing how the testee takes to the task set to him. There is also the difference of attitude and emotional reaction on the part of the subject. Hasty and impulsive individuals can be differentiated from the one who persists and keeps on working even after his time is up.

The diagnostic value of the test is particularly worth mentioning. Patients with mental deterioration and seniles have particular difficulty in managing the test and often cannot complete the simple design. Thus the inclusion of this test in the battery, is likely to add to the clinical use of the test in future.

**Picture Arrangement :**

The Picture Arrangement Test consists of seven series of pictures. The number of pictures in each series are different. The pictures of each series when placed in the right sequence, tell a little story. The pictures are presented to the subject in a definite disarranged order, and the testee is asked to put them together in the right order so that they make a sensible story. The correct order is decided by the tryouts.

A test of this type was first used by Decroly.
In 1917, Several Picture Arrangement series were tried out by the Army psychologists, as subtests on a group examination and found inadequate but another set ultimately found its way into the Army Performance Scale.

The present picture series consists of entirely new and originally prepared, seven series. As can be seen from the test material, the series are, in sequence as follows:

1. Morning activities ... 4 pictures
2. Playing child ... 5 pictures
3. Farming ... 7 pictures
4. Railway station ... 4 pictures
5. Mango Tree ... 6 pictures
6. Bringing water from well ... 5 pictures
7. An accident ... 5 pictures

In spite of certain definite limitations, the Picture Arrangement Test has some very worthwhile merits. In the first place, it is the type of test which effectively measures a subject's ability to comprehend and size up a total situation. The subject must understand the whole, must get the "idea" of the story, before he is able to set himself effectively to the task. There is, of course, some trial and error experimentation, but the subject has to call upon to attempt appraisal of the total situation more than in most other tests. Secondly, the subject matter of the test nearly always involves
some human or practical situation. Understanding this situation corresponds to what other writers have referred to as social intelligence. The present investigator believes that social intelligence is the intelligence applied to social situations. So the persons who do well on a Picture Arrangement Test, seldom turn out to be mentally defectives even when they do badly on other tests.

The scoring is done only for correct responses and is based upon the time taken to complete each test item. No credit is given for partially correct arrangement.

Block Building:

This test has some similarity with the Cube Construction Test in Drever and Collin's Performance Scale which consists of three parts, for each of which different material is used. The model is given and the same type of model is to be constructed from the given inch cubes. These model cubes were simple so it was thought to give some meaningful situation to this test and as a result of it the present test items were prepared.

All the three cubes were coloured bluish green and were painted in such a way that each cube was given a definite meaningful situation. The inch cubes were also coloured bluish green and painted in such a way that each inch cube gains its definite position in the arrangement of the model.
The first item-model is to be prepared from the
four inch cubes and 2 trapeziums. The second item-model
is to be prepared from seven inch cubes and two trapeziums
and the third item-model is to be prepared from 24 inch
cubes and four trapeziums. The inch cubes are different
for different items.

This test involves visual perception, analytic-
synthetic ability and also motor co-ordination. As the
subject matter involves practical situation, it becomes
most interesting. The testee's attitudes and emotional
behaviours are well observed during the administration of
the test. Persistent work will be carried out by some
while some will lose their patience and give up the work
if they cannot work on the right lines or do not find the
clue to work.

These tests are thus better measures of 'g',
have a high ceiling and work better at higher age levels.

Mazes :  

This test was first constructed by Porteus whose
Maze Tests are well-known and used in different fields.
Different Mazes are drawn on different papers in Porteus
Maze Tests. The number of trials are given for each Maze
and scoring is based on the number of trials taken by the
testee for correct response. The well-known Wechsler
Intelligence Scale for children also consists this test.
There the scoring is based on the time taken and errors committed by the testee. The definition of error is given very clearly in the manual.

The present test consists of eleven Mazes of different patterns. Each is printed on different sheets. All sheets are tied up together. The subject is required to trace, with pencil, the path from entrance to exit. The scoring is not done on trials but on time taken in tracing the path from entrance to exit within the maximum time fixed for the item. The no. of errors committed are also taken into consideration and scoring is done up to a fixed limit of errors for each item and the subject is penalized for the errors committed within limits.

This test also involves visual perception, analysis, immediate recall and motor co-ordination. The subject has to see the whole path before he just draws the path and hence foresight is also involved. The motor co-ordination and visual acuity also affect its results.

Picture Completion:

The name "Picture Completion" is usually associated with a test similar to the Healy Picture Completion II, in which the subject is required to complete the sense of a picture by selecting a fitting piece from among several possible choices. Suitable items for Picture Completion Test are hard to find and present a number of difficulties. If one chooses familiar subjects, the test
becomes much too easy; if one turns to unfamiliar ones, the test ceases to be a good test of intelligence because one unavoidably calls upon specialized knowledge.

The material employed is a highly coloured picture of garden in which thirteen separate events or activities are represented. In connection with each of these a square of one inch is cut out from the picture on which a significant object is represented. The test consists in finding the appropriate square for each case and inserting it in its place. Twentyfour squares in all, arranged in haphazard order, among which the subject must choose. Thirteen of them are correct and eleven are put as distractors having on them representations of objects other than the right ones.

From these pieces, the proper pieces are to be inserted in their proper places. That is the subject has to find out the proper piece for each cut out inlet and put it inside it and thus has to complete the whole picture. No assistance is given by the background of the picture which is uniform in colour. The only guidance the subject can rely on is that given by meaning.

This material is quite original and has not been employed by any other investigator. It has proved very useful for younger children. That is the test is particularly good in testing intelligence at the lower levels. It measures the individual's basic perceptual and
conceptual abilities in so far as these are involved in the visual recognition and identification of familiar objects and forms.

To be able to see what is missing from any particular picture, the subject must first know what that picture represents. But, in addition, he must be able to appreciate that the missing part is in some way essential either to the form or to the function of the object or picture. In a broad sense the test measures the ability of the individuals to differentiate essential from nonessential details. From a purely psychometric point of view, the Picture Completion Test has several assets worth noting. It takes relatively little time to administer.

The Sequence of the Tests

These are individual tests to be administered by an expert tester as the tests are to be given with standardized procedures and with great accuracy. An individual test results are highly affected by the mood of the testee and tester both. The effect of fatigue and interest has also high impact and hence the arrangement of the tests needs special care. The first test should help in giving confidence and interest to the testee and hence should be easy as well as interesting. So the Form Board Test is to be given first.
At the end of this test the testee will establish rapport with the tester and the work and he will be engrossed in the different mental operations. So the Block Design Test requiring the use of higher mental functions, should be given second. If the testee is not successful in three consecutive items, the test is to be discontinued. Then Picture Arrangement is given which gives a change in test material and is also easy. Thus in the arrangement of tests, different factors affecting the test results are taken into account so that error variance can be controlled. The tests are to be given in the following sequence.

1. Form Boards
2. Block Designs
3. Picture Arrangement
4. Block Building
5. Mazes
6. Picture Completion

Practice Items

Most of the test makers, of either group or individual tests, have found it necessary to give practice test just to establish rapport, create confidence in the minds of the testees and familiarize the testees with the test material as well as the method of responding. The practice item works as shock absorber also. So each test
except test 4 is provided with a practice item in the begining.

Record Blank

There is no verbal response expected in these tests, so no separate answersheet is required.

The testee's manipulations are to be observed and taken note of by the tester in the form of correctness or incorrectness of the responses and the time taken for the correct response. So a record blank is prepared in which the testee's personal data and test performance are recorded. Scoring is done during the testing itself. However, the process is so simple and automatic that it does not distract the testee's attention.

A complete manual of directions was prepared for the use of the examiners. The tests were thus ready for tryouts.