UNIT 9: INTELLIGENCE TEST AND ITS MEASUREMENT

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9.1 LEARNING OBJECTIVES

After going through this unit, you will be able to:

- understand the meaning and nature of Intelligence
- explain the different theories of Intelligence
- analyse the different types of Intelligence tests
- understand the uses of Intelligence tests
- explain the procedure of Intelligence test construction

9.2 INTRODUCTION

Intelligence is a unique mental faculty that is the source or basis of all other mental abilities of an individual. Success of an individual in any activity or his work efficiency depends largely on intelligence. It is an established fact that the level of intelligence varies from individual to individual. Intelligence is often used as a basis for evaluating the proficiency of an individual required for a particular job. In education, intelligence is the

most important factor causing differences among individuals in terms of their achievement. Therefore, measurement of intelligence is important not only for the psychologists but also for common people. Keeping this importance in view, the field of psychology has been full of researches conducted to understand the nature of intelligence and to develop means and tools to measure intelligence accurately. In this unit a complete picture of measurement of intelligence and its various types of test will be depicted.

9.3 MEANING AND DEFINITIONS OF INTELLIGENCE

Intelligence is a wide-ranging general mental ability which affects all the psycho-physical structure, strength and ability of an individual. This mental faculty is relatively permanent which determines, controls, and directs all mental functioning and behaviour of an individual. Intelligence is the main source or factor of individual difference. Alfred Binet, who conducted extensive research on the nature and measurement of intelligence, wrote, "It seems to us that in intelligence there is a fundamental faculty, the alteration or the lack of which, is of the utmost importance for practical life. This faculty is judgement, otherwise called good sense, practical sense, initiative, the faculty of adapting one's self to circumstances."

Intelligence may be understood as a capacity to adjust with varying and new situations in life and as a capacity to solve problems that people face in every walk of their lives. It is the ability for abstract thinking and learning. Intelligence helps in making satisfactory adjustment with newer needs, conditions or environments. Intelligence may also be understood as a set of unique characteristics in the psycho-physical make-up of an individual that determine and find expression in the behaviour, thinking pattern, habits, and character of an individual.

However, psychologists differ widely in terms of their definition and explanation of intelligence and hence there is no single definition of intelligence accepted by all. Presented below are a few important definitions of intelligence:

According to Anastasi, "Intelligence is not a single, unitary ability,

but rather a composite of several functions. The term denotes that combination of abilities required for survival and advancement within a particular culture."

M. Anderson views intelligence as". . . that facet of mind underlying our capacity to think, to solve novel problems, to reason and to have knowledge of the world."

W. V. Bingham says, "We shall use the term 'intelligence' to mean the ability of an organism to solve new problems . . ."

According to S. S. Colvin, "A person possesses intelligence insofar as he has learned, or can learn, to adjust himself to his environment."

W. Freeman asserts that intelligence is, ". . . adjustment or adaptation of the individual to his total environment, or limited aspects thereof . . . the capacity to reorganize one's behaviour patterns so as to act more effectively and more appropriately in novel situations . . . the ability to learn . . . the extent to which a person is educable . . . the ability to carry on abstract thinking . . . the effective use of concepts and symbols in dealing with a problem to be solved . . ."

H. Gardner, "Intelligence is the ability to solve problems, or to create products, that are valued within one or more cultural settings."

According to Stoddard, intelligence is ". . . the ability to undertake activities that are characterized by (1) difficulty, (2) complexity, (3) abstraction, (4) economy, (5) adaptiveness to a goal, (6) social value, and (7) the emergence of originals, and to maintain such activities under conditions that demand a concentration of energy and a resistance to emotional forces."

Defining intelligence in comprehensive terms, D. Wechsler wrote, "Intelligence is the aggregate or global capacity of the individual to act purposefully, to think rationally, and to deal effectively with his environment."

E. Boring, keeping in view the variety of perspectives in defining intelligence wrote, "Intelligence is what is measured by intelligence tests."

The various definitions of intelligence show that there is no uniformity among psychologists in terms of defining the nature of intelligence. However,

an analysis of the definitions leads us to the conclusion that intelligence is a combination of:

- mental or cognitive capacities
- the ability to adjust with new situations
- the ability to learn
- ability to carry on abstract thinking
- ability to solve problems
- innate as well as acquired capacities

9.4 A BRIEF OVERVIEW OF THE THEORIES OF INTELLIGENCE

There are numerous theories of intelligence, but there is hardly any agreement among the theories about the nature of intelligence. Every theory explains intelligence from a different perspective and often contradicting the views of another theory. We present here a very brief overview of the important theories of intelligence:

Faculty theory: This is the oldest theory explaining the nature of intelligence that was very popular during 18th and 19th century. This theory posits that the mind is composed of different faculties like thinking, memory, reasoning, imagination, etc. These faculties are independent of each other and can be trained and sharpened by rigorous exercises.

Spearman's two-factor theory: Charles Spearman developed this theory in 1904. He proposed that intellectual abilities were comprised of two factors: one general ability or common ability known as 'G' factor and the other a group of specific abilities known as 'S' factor. 'G' factor is universal and inborn ability. Greater the 'G' in an individual, greater success he has in his life. 'S' factor is not inborn but acquired and it differs from one activity to another in the same individual.

Multifactor theory of Thorndike: Thorndike proposed the multifactor theory of intelligence and said that there was nothing like General ability. He proposed that every mental activity requires an aggregate of different set of abilities. He identified four main attributes of intelligence which

were following:

- **Level**-refers to the level of difficulty of a task that can be solved.
- **Range**-refers to a number of tasks at any given degree of difficulty.
- **Area**-means the total number of situations at each level to which the individual is able to respond.
- **Speed**-is the rapidity with which we can respond to the items.

Theory of Primary mental abilities or the Group factor theory: This theory holds that intelligence is neither composed of innumerable highly specific factors, nor is an expression of a general factor that pervades all mental activities. Instead, intelligence is composed of a number of groups of mental abilities. According to this theory, certain mental operations have in common a 'primary' factor that gives them psychological and functional unity and that differentiates them from other mental operations. These mental operations then constitute a group. There are a number of groups of mental abilities, each of which has its own primary factor, giving the group a functional unity and cohesiveness. Each of these primary factors is relatively independent of the others.

Thurstone has given a list of six primary factors:

- The Number Factor (N) -ability to do Numerical Calculations rapidly and accurately.
- The Verbal Factor (V) - required by tests involving Verbal Comprehension.
- The Space Factor (S) - involved in any task in which the subject manipulates the imaginary object in space.
- Memory (M) - Involving ability to memorize quickly.
- Word Fluency (W)-needed to think of isolated words at a rapid rate.
- Reasoning (R) - needed in tasks that require to discover a rule or principle involved in a series or groups of letters.

Guilford's model of structure of intellect: Guilford proposed a three dimensional structure of intellect model. According to Guilford each task involving intellectual capacity can be analysed according to: (1) content, (2) the mental operation involved and (3) the product resulting from the operation. He also classified content into five categories, namely--Visual,

Auditory, Symbolic, Semantic and Behavioural. Similarly, he classified operations into five categories, namely, Cognition, Memory retention, Memory recording, Divergent production, Convergent production and evaluation. And finally, products were classified into six categories, namely, Units, Classes, Relations, Systems, Transformations and Implications.

Hierarchical Theory of intelligence: Cyril Burt and Vernon put forward this theory of intelligence. They organized the factors constituting intelligence in a hierarchic order. At the top of the hierarchy, the 'G' factor or the general cognitive factor is placed. At the next level two broad group factors, corresponding to verbal-educational (v: ed) and practical-mechanical (k: m.) aptitudes are placed. These major factors may be further sub-divided. The verbal educational factor may be sub-divided into verbal and numerical sub-factors, and the practical mechanical factor into mechanical information, spatial, and psychomotor ability. At the lowest level of the hierarchy are the special factors. This hierarchical arrangement resembles an inverted genealogical tree, with 'g' at the top, 's' factors at the bottom, and increasingly narrower group factors in between. Vernon's theory is a compromise between Spearman's two factors and Thurston's multifactor theory.

Cattell's Theory of Fluid and Crystallized Intelligence: R.B. Cattell theorized that intelligence is of two types- Fluid intelligence, which is the product of heredity and crystallized intelligence, which is the product of environment. Fluid intelligence is general to many fields, and crystallized intelligence is specific to certain fields, like school learning. Fluid intelligence is used more in tasks requiring adaptation to new situations, while crystallized intelligence is used to tasks where habits have become fixed. These two factors are distinct but correlated.

Gardener's theory of multiple intelligence: Howard Gardner put forward a new and different view of human intelligence. His theory of Multiple Intelligences proposed that intelligent behaviour does not arise from a single unitary quality or factor of the mind. Rather, different kinds of intelligence are generated from separate metaphorical pools of mental energy. Each of these pools enables the individual to solve problems, or to create products,

that are valued within one or more cultural settings. The eight intelligences proposed by the theory are: linguistic, logical, spatial, musical, motor ability, interpersonal, intrapersonal and naturalistic intelligence.

9.5 MEASUREMENT OF INTELLIGENCE

Owing to the intangible and abstract nature of the concept of intelligence, it cannot be measured physically or directly. Modern psychologists believe that intelligence can be assessed only when it gets manifested in the behaviour of man. That is why intelligence tests have been constructed and used extensively to measure intelligence. Intelligence tests give an "intelligence quotient" or IQ as a measure of intelligence. However, people tried to measure intelligence using different means since very long.

Psychologists first tried to measure mental ability in the late 19th century. However, no formal measures of intelligence existed at that time and hence the people were evaluated on the basis their fame, judged by encyclopaedia entries, honours, awards, etc. It was thought that intelligence was hereditary. Later, psychologists began to judge intellectual ability on the basis of some skills such as reaction time, sensitivity to physical stimuli and body proportions. The name of Sir Francis Galton, who was a pioneer in the measurement of **individual differences,** is important in this regard. He tried to measure sensory responses or visual and auditory acuity and reaction times and their relationship to differences in ability.These were first attempts to measure intelligence quantitatively and study individual differences.

The abbreviation "I.Q." meaning **"Intelligence Quotient",** most widely used measure of intelligence in modern times, was first coined by the German psychologist **William Stern** in the early 1900s. This term was later used in 1905 by Alfred Binet and Theodore Simon, who published the first modern intelligence test, the Binet-Simon intelligence scale. Later, the Binet-Simon scale was adopted for use in many other countries. The Binet and Simon tests were based on practical knowledge, reasoning, memory,

vocabulary and problem-solving that predicted academic success of students. During the course of development and use of the scales Binet-Simon realized that some children were able to answer more advanced questions that older children were generally able to answer, and vice versa. Based on this observation, they suggested the concept of a **Mental Age.** These tests were based on the premise that all children followed the same course of intellectual development, and hence children may be assigned a Mental Age which corresponded to their ability to perform tasks or solve problems appropriate for that particular age. For example, if a six year-old boy could perform the tasks at the same level as an average eight year-old; his mental age will be eight.

TO LEARN MORE

- German psychologist William Stern first coined the term ***"intelligence quotient"***, in the early 1900.
- In 1905 Alfred Binet and Theodore Simon published the first modern intelligence test- the Binet-Simon intelligence scale.

Later Lewis Terman of Stanford University adapted the Binet Simon tests for American use. This adapted test first published in 1916 and was called the Stanford-Binet Intelligence Scale. He advocated that an individual's intelligence can be measured as a quotient (intelligence quotient). The formula for the quotient was,

$$\text{I.Q.} = \frac{\text{(Mental Age)}}{\text{(Chronological Age)}} \times 100$$

Thus, a five year old boy who answers all questions meant for seven year old students would have an IQ of 140. On the other hand, a six year-old boy achieving at the same level as his six year-old students would score a 100. Thus, score of 100 is the average score which is still in use even today.

At the beginning of the First World War, U.S. Army needed to screen huge number of recruits. Accordingly Robert Yerkes, who was chairperson

of the Committee on the Psychological Examination of Recruits, developed two tests known as the Army Alpha and Army Beta in 1917. The Army Alpha was designed as a paper pencil test, while the Army Beta was an oral test for those who were unable to read. After the end of the First World War, the tests remained in use in a wide variety of situations outside of the military with individuals of all ages, backgrounds and nationalities.

American psychologist David Wechsler developed a new intelligence test known as the **Wechsler Adult Intelligence Scale (WAIS)** in 1955. Wechsler developed two different tests for use with children: the Wechsler Intelligence Scale for Children (WISC) and the Wechsler Preschool and Primary Scale of Intelligence (WPPSI). The adult version of the test has been revised since its original publication and is now known as the WAIS-IV.

The WAIS-IV has 10 subtests along with five supplemental tests. The test provides scores in four major areas of intelligence: a Verbal Comprehension Index, a Perceptual Reasoning Index, a Working Memory Index, and a Processing Speed Index. The test also provides two broad scores that can be used as a summary of overall intelligence: a Full-Scale IQ score that combines performance on all four index scores and a General Ability Index based on six subtest scores. However, unlike Stanford-Binet, which is scored on the basis of chronological age and mental age, the WAIS is scored by comparing the test taker's score to the scores of others in the same age group. The average score is fixed at 100, with two-thirds of scores lying in the normal range between 85 and 115. This scoring method has become the standard technique in intelligence testing and is also used in the modern revision of the Stanford-Binet test.

The modern IQ tests measure a precise mathematical score based on the Normal probability curve, with majority of people scoring the average and very smaller numbers of people at points higher or lower than the average. Roughly 95% of the population scores between 70 and 130 points. Important to remember here that the relationship between IQ score and mental ability is not linear and a person with a score of 120 does not have

double the mental ability of a person with a score of 60. The most commonly used tests are the Stanford-Binet, the Wechsler Intelligence Scale for Children (WISC), the Wechsler Adult Intelligence Scale (WAIS), and the Kaufman Assessment Battery for Children (Kaufman-ABC).



CHECK YOUR PROGRESS

Q 1: What is intelligence?

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Q 2: What is an intelligence test?

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Q 3: What is Mental Age?

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9.5.1 Types of Intelligence Tests

Intelligence tests may be classified on the basis of different criteria. Some of the important types of intelligence tests are as follows:

- **Verbal, non-verbal and performance tests**
- **Individual and group tests of intelligence**

Verbal tests of intelligence: The verbal tests of intelligence are very old tests. Spoken and written language is the chief medium of these tests. Test-takers are usually given written instructions and they respond to the questions using either spoken or written language. Knowledge of language plays a very important role in these types of tests since. Abilities of the students are expressed through the means of language while responding to the items in these tests. Some examples of this category of tests are: Stanford

Binet test, Army Alpha test, Army General Classification test etc.

It is important to note that, verbal tests can be administered either individually or in groups. In other words, verbal tests can be classified again as individual verbal tests and group verbal tests.

The **chief merits of verbal tests** are:

- Individuals with correct knowledge of language can apply their intelligence properly.
- Thinking, judgement, reasoning, abstraction, comparison, analysis, synthesis, problem solving etc. capacities can be effectively measured using verbal tests.
- Any confusion during the administration of the test can be easily removed.

The **demerits of verbal tests** are:

- Verbal tests cannot be used with illiterates or with young children.
- Due to differences in language of different places, same tests cannot be used everywhere.
- The validity and reliability of these tests are not above doubt.
- Verbal tests cannot measure native intelligence of individuals.

Non-Verbal tests of intelligence: Non-verbal tests are those that do not require the use of language at any stage of administration. No spoken or written language is used to construct the items, giving instructions to test-takers or in responding to the items. Instructions to candidates are given using demonstration, pantomime, gestures, charts etc. The items are given in the forms of pictures or structures and the candidates have to select or find out the appropriate alternative by observing the pictures or structures in the question. Though these are non-verbal tests, these tests use paper-pencil as used by the verbal tests. However, the use of pen or pencil is limited only to record signs such as """ or "X", or to record other non-verbal responses such as underlining, encircling the correct alternative. The non-verbal tests are usually administered as group tests of intelligence. Some examples of non-verbal tests are: **Chicago Non-**

verbal test, Army Beta test, Raven's Progressive Matrices test etc. The **merits of non-verbal tests** include:

- These tests can be used with illiterates as well as young children.
- These tests can be used with people having difficulties in using language.
- These tests can be used in different places or countries; since these tests are non-verbal they are free from social and cultural influences to some extent.

The main demerit of the non-verbal tests is that non-verbal tests cannot measure all mental qualities and hence cannot give a composite picture of intelligence of an individual.

Performance tests of intelligence: Performance tests are those that use language only at the stage of giving instructions to candidates and the items are manipulative in nature. Test-takers have to solve problems manually or have to manipulate different objects while responding to the items. Performance tests are used to test some such qualities that cannot be measured through verbal tests. These tests are generally administered individually. Some of the important performance tests are: **Pinter-Patterson scale, Porteus Maze test, Alexander Pass-along test, Bhatia performance test etc.**

Some **merits of performance test** are:

- Performance tests are very effective for use with young children, illiterates and people with difficulties in using language.
- These tests have clinical value, because these tests can be used to diagnose mental or neurological disorders.
- These tests are free from cultural influences to some extent.
- These tests help to identify practical and mechanical skills of students which in their turn help in providing educational and vocational guidance to students.

Some **demerits of performance test** are:

- These tests are time consuming and cannot be used with groups.

- These tests cannot differentiate between the various levels of general intelligence.
- Reliability index of these tests are relatively low.
- These tests can measure only a few of the intellectual capabilities and hence cannot present an overall picture of intelligence of an individual.

Individual tests of intelligence: An individual test of intelligence is one which is administered to only one individual at a time. It is claimed that individual tests can accurately measure intelligence and can give a complete picture of intellectual abilities of an individual. Individual tests of intelligence can be verbal, non-verbal or performance type test. Alfred Binet popularized the individual tests of intelligence. Examples of verbal individual intelligence test are: Binet Simon intelligence test, Stanford Revision of Binet test, Wechsler Bellevue intelligence test etc. Similarly examples of non-verbal and performance individual tests are: Alexander Pass Along test, Koh's Block Design, Wechsler performance test etc.

Some of the **merits of individual test** are:

- Tester can pay more attention to the testee.
- Tester can easily encourage the testee and observe his behaviour during the test more closely.
- Scores on individual tests are not as dependent on reading ability as scores in group tests.
- Individual tests are more valid and reliable.

Some of the **demerits of individual test** are:

- Individual tests are time consuming
- Individual tests require a highly-trained tester.
- Individual tests cost more than the group test.

Group tests of intelligence: Group tests of intelligence were developed to meet pressing needs of testing large number of recruits during the First World War. Group tests of intelligence can be administered to a group of persons at a time. These tests help to

test large groups simultaneously and the instruction and administration procedures are also simplified. These tests do not require highly trained individuals to use the tests. Group tests can be either verbal or non-verbal. Examples of verbal group test are: Army Alpha test, Lorge Thorndike Intelligence test, Army General Classification Test (AGCT), Terman-McNemar Tests of Mental Ability etc. Examples of non-verbal group test are: Raven's Progressive Matrices test, Chicago non-verbal test, SRA test of general ability etc.

Some of the **merits of group test** are:

- Group tests can be administered to very large numbers simultaneously
- the role of the tester is simplified
- scoring of group test is usually more objective
- large, representative samples are often used and hence it leads to better established norms
- A highly verbal group test can have a higher validity co-efficient than an individual test.
- Group tests are economic in terms of time, money and effort required.

Some of the **demerits of group test** are:

- Scores on the group test are generally dependent on the reading ability.
- Information obtained by the group test is generally less accurate than the individual tests
- Tester has lesser opportunity to establish rapport, obtain cooperation, and maintain interest of the testee
- These tests cannot readily detect if testee is tired, anxious, unwell
- There is evidence that emotionally disturbed children do better on individual than group tests
- Test-takers' responses are more restricted.

9.5.2 Uses of Intelligence Tests

Intelligence tests have many uses that have been discussed under:

- **Educational uses:** Intelligence tests are of immense use in educational field. Following points are important in this regard:
  - **Selection of course:** Intelligence test works as a basis for selecting different subjects or courses for students. Different courses or subjects require different levels of intellectual abilities. Hence intelligence tests can help pupils to select courses in tune with their intellectual abilities.
  - **Selection of pupils:** Intelligence tests help to select prospective students at the time of giving admissions to an institution.
  - **Classification of students:** Students need to be classified in the field of education to meet various purposes. Intelligence tests help in classifying students on the basis of their intellectual qualities.
  - **Comparison of students:** Various educational decisions are based on comparison of students on the basis of their abilities. Intelligence tests help to make such comparisons between students.
  - **Prognosis of educational potentialities:** Students come to educational institutions with different inborn talents and qualities. Intelligence tests help to identify such strengths and qualities among the students and help to give them instructions and training to develop their potentialities fully.
  - **Identification of different categories of students:** All students do not have same level of intelligence. Teaching students with different levels of intelligence in a single class is very difficult and harmful. Intelligence test helps to identify students with different levels of intelligence and group them into homogeneous classes so that appropriate content and methods can be used in tune with their intellectual abilities.

Intelligence tests help to identify gifted as well as backward students so that appropriate instructional measures can be arranged for them.

- **Setting appropriate level of aspiration for students:** Setting appropriate level of aspiration is very important to achieve success and to avoid frustration. According to Sawrey and Telford, "One should aim for what one desires. In other words, one should very carefully set one's level of aspiration neither too high nor too low, if one ventures to be successful. It is possible only when one's potentiality can be properly assessed. Intelligence tests can serve this purpose, and hence they are found to assist the individual to establish a level of aspiration that is realistic in terms of intellectual potential."
- **Improving teaching-learning process:** Intelligence tests may help to improve the teaching-learning process. The view of Crow and Crow is noteworthy in this regard. They wrote, "Results of intelligence tests can help a teacher to discover what the child can learn and how quickly he can learn, as well as the teaching methods that should be applied and the learning content that should be utilized to guide the learner to use his mental potentialities to their utmost."
- **Educational guidance:** Guidance is an important educational service to help students to find their place. Intelligence tests help to provide proper guidance to students on the basis of their intellectual capacities.

- **Use in vocational guidance:** Similar to educational guidance, vocational guidance is very important to be successful and to live a contended life. Intelligence tests help to provide guidance to students in their choice and preparation for a particular vocation.
- **Diagnosis of mental disorders:** Various mental disorders may

be diagnosed with the help of intelligence tests.

- **Use in child guidance:** In order to provide appropriate guidance to children, their level of intelligence must be known. Very high or very low level of intelligence, both may lead to problem behaviour of the child. Intelligence test helps to know the child properly and to give him guidance accordingly.
- **Studying individual differences:** Intelligence is the greatest factor of individual difference. Tests of intelligence help to understand the nature, depth and dimensions of individual difference among students.
- **Use in research:** Intelligence tests are extensively used in research. Various educational and psychological research problems need intelligence testing for finding their appropriate solutions.



CHECK YOUR PROGRESS

Q. 4: What is a verbal test of intelligence?

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Q. 5: Mention any two demerits of group test of intelligence.

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9.6 CONSTRUCTION OF AN INTELLIGENCE TEST

In order to construct a standardized intelligence test, one must always remember some important concepts about the nature of intelligence. These concepts are:

- Intelligence is normally distributed among people. This implies that majority of the people are average and only a few are very bright or

dull in terms of intelligence.

- Heredity and environment, both influence intelligence of an individual.
- Measurement of intelligence is relative, i.e. when we talk about intelligence of an individual we talk about his intelligence in relation to other individuals.
- Wide differences in terms intelligence exist among individuals.
- Intelligence grows with increase in age; but it does not grow throughout life and there is no definite age at which the growth of intelligence stops.
- Intelligence does not differ on the basis of sex.
- Race, caste or culture does not make difference to intelligence.

The general principles and the steps to be followed while constructing a psychological test (has been already discussed in UNIT-IV) apply to the construction of an intelligence test as well. Additionally, following considerations must govern the construction of a standardized intelligence test.

While planning for an intelligence test it has to be seen for which grade or age the test is to be constructed. Because a test designed for a particular age or stage must be of particular shape and nature. The items must also be developed or selected accordingly. Standardizing an intelligence test implies:-

- Standardizing the condition or situations under which the test is to be administered.
- Deciding what results could be expected from the test-takers in that standardized environment and in proportion to the level of intelligence. (fixing the norms)
- Ensuring that the results obtained are the measures of intelligence only (establishing validity)
- Ensuring that the scoring procedure gives same results on retesting (establishing reliability)
- Ensuring accurate interpretation of results.

After planning for the test, the first task is to write or collect items for

the test. This collection of items depends on the nature of the test, i.e. items for a verbal test of intelligence will be different from the items for a non-verbal test. More items than actually planned for the test should be collected at this stage since in the final stage some items would be deleted on the basis of analysis of the items.

The second task is to carry a preliminary administration of the selected items on a group of individuals selected from the population for which the test is to be constructed. The objective of this preliminary administration is to find out too difficult or too easy items, selecting the defective items and the items that are ambiguous. These defective items are discarded or revised and some other items are prepared if required.

The selected items are then arranged in ascending order of difficulty. It has to be kept in mind that most of the items should be within the difficulty level of at least 50% students and only a few items should be too difficult and too easy.

After finalizing and arranging the items and preparing clear directions to the takers of the test, the test is administered to a large sample of the group for which the test is constructed. After the administration of the test the responses or answers are scored objectively.

Subsequently, scales must be prepared for the appropriate interpretation of the scores. Various statistical means are used for preparing these scales. Some of the important ones are:

Percentile norm: Percentile norms help to judge and interpret the scores of students of a particular age group. Percentile norm is a process of converting raw scores of individuals into percentiles. A percentile is a score below which a given percentage of individuals in a group fall. For example, the 65th percentile is the score below which 65% of the individuals lay on the basis of their scores.

Norm and Mental Age: When the test-takers belong to different age groups then separate norm for each age group is determined. For example, a test consisting 100 items is administered to a group of students ranging from 8 year old to 11 year old. Now Mean of the scores for each of

the age group (8, 9, 10, 11) is calculated which is the norm for that particular age group. When the test is administered to another group of students, then their scores are compared with the norm established for that particular age group. If a student scores equal to the norm for a particular age group then his Mental Age would be the age of that group irrespective of his chronological age. For example, if an eight year-old boy could obtain a score which corresponds to the norm for average ten year-old; his mental age will be ten.

Intelligence Quotient (I.Q.): Only Mental Age cannot give a clear idea about the intelligence of an individual. An eight year old student with a mental age of ten and a six year old student with mental age of eight do not signify the same thing and cannot be compared. In order to make a comparison between the two, both their mental age as well as chronological age must be considered. Intelligence Quotient is a proportion of these two ages which is calculated using the following formula:

$$\text{I.Q.} = \frac{\text{(Mental Age)}}{\text{(Chronological Age)}} \text{ X } 100$$

However, the most important thing is to develop and define the concept of the mental ability or characteristic which the test-maker wishes to measure. Before giving final shape to the test, reliability and validity must be established using proper statistical measures. It must be kept in mind that the group on which the preliminary administration of the test is done, must be representative of the group for which the test is constructed. Moreover, the group must represent the population when the test is administered to establish norms for the test.



9.7 LET US SUM UP

The unit can be summarized as-

- Intelligence is a relatively permanent general mental ability which affects all the psycho-physical structure, strength and ability of an individual.
- This mental faculty determines controls and directs all mental functioning

and behaviour of an individual.

- An intelligence test is a test designed to measure intelligence. There are different types of intelligence tests such as verbal and non-verbal, individual and group tests.
- Various intelligence tests are used to measure intelligence. Intelligence tests give an "intelligence quotient" or I.Q. as a measure of intelligence. Though there are numerous theories of intelligence, there is hardly any agreement among the theories about the nature of intelligence. Every theory explains intelligence from a different perspective contradicting the views of another theory.
- Construction of an intelligence test must follow the general principles and the steps that are followed while constructing a standard psychological test.

9.8 FURTHER READING

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9.9 ANSWERS TO CHECK YOUR PROGRESS

Ans to Q No 1: Intelligence is a wide-ranging general mental ability which affects all the psycho-physical structure, strength and ability of an individual. This mental faculty is relatively permanent which determines controls and directs all mental functioning and behaviour of an individual.

Ans to Q No 2: An intelligence test is a test designed to measure intelligence. There are different types of intelligence tests and they measure thinking, reasoning, learning, and other varieties of mental capacities and skills

of an individual.

Ans to Q No 3: Mental Age of an individual is the age of that group, questions or tasks meant for which group can be answered by the individual. For example, if a five-year-old child can successfully answer the questions meant for seven-year-old children, then his mental age would be seven years.

Ans to Q No 4: The verbal tests of intelligence are the tests that use spoken and written language as the chief medium of tests. These verbal tests are very old tests. Test-takers are usually given written instructions and they respond to the questions using either spoken or written language.

Ans to Q No 5: Two demerits of group tests of intelligence are: (i) tester has lesser opportunity to establish rapport, obtain cooperation, and maintain interest of the testee, and (ii) test-takers' responses more restricted in group tests.

9.10 MODEL QUESTIONS

Short Questions (Answer within 150 words)

Q 1: Discuss the nature of intelligence.

Q 2: How is intelligence measured?

Q 3: Discuss the concept of Multiple Intelligence.

Long Questions. (Answer 500 words)

Q 1: Write a brief note on the factor theories of intelligence.

Q 2: Discuss the uses of intelligence test.

Q 3: Write a note on the different types of intelligence tests.

Q 4: Discuss the procedure for constructing an intelligence test.

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