CONSTRUCTION AND STANDARDIZATION OF A VERBAL GROUP TEST OF INTELLIGENCE FOR THE STUDENTS OF SIKKIM

A Thesis Submitted

To

Sikkim University

In Partial Fulfilment of the Requirement for the
Degree of Doctor of Philosophy

By

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I do hereby declare that the present Ph.D. thesis entitled **"Construction and Standardization of a Verbal Group Test of Intelligence for the Students of Sikkim"** submitted by me to Sikkim University in partial fulfilment of the requirements for the award of the degree of **Doctor of Philosophy** in **Education**, is my original research work which is carried out by me under the supervision of Dr. Anju Verma, Assistant Professor, Department of Education, School of Professional Studies, Sikkim University, Sikkim. Further, I declare that the present thesis has not been submitted in any form earlier for the award of any degree, diploma or certificate.

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CERTIFICATE

This is to certify that the thesis entitled **"Construction and Standardization of a Verbal Group Test of Intelligence for the Students of Sikkim"** submitted by **Jyoti Walia** (Roll No. 15PDED01 and Registration No. 15/Ph.D/EDN/01) to Sikkim University in partial fulfilment of the requirements for the award of the degree of **Doctor of Philosophy** in **Education** has been carried out under my supervision and guidance and has not been submitted elsewhere for any degree or diploma. It is her original work and it is fit for submission.

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"CONSTRUCTION AND STANDARDIZATION OF A VERBAL GROUP TEST OF INTELLIGENCE FOR THE STUDENTS OF SIKKIM"

Submitted by **Jyoti Walia** under the supervision of **Dr. Anju Verma**, Assistant Professor, Department of Education, School of Professional Studies, Sikkim University, Gangtok 737102, INDIA

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Jyoti

Jyoti Walia

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CHAPTER – I

INTRODUCTION

1-1 Introduction

No two individuals are exactly alike. Some are bright, others dull, some are quick, others slow, some solve problems quickly and directly, others fumble over them for a long time, and some adapt themselves to new situations easily while others experience difficulty. In education it was accepted that good educational administration should consider the difference between individuals, because of the fact that each student is different in mental ability or intelligence. In other words, an intelligent person has more chances of success in life or in a given situation than one who is less intelligent. Intelligence plays an important role in one's academic, professional, social and personal life. The teachers and parents are often confused, curious and talk about the differences in the educational performance and academic achievement of the school going children; as most of them believe that intelligence is one of the main determinants in the student's success and failure. So that if the teachers know their students' intelligence, they can understand and manage experiences and accordingly supports them to learn according to their intelligence and abilities.

What does the term intelligence mean to psychologists? There is no agreement as regards the exact definition and nature of intelligence. Some of the experts defined intelligence as the ability to solve problems while few opined that it is the capacity to adapt and learn from experience. On the other hand, few argue that intelligence includes characteristics such as creativity and interpersonal skills (Santrock, 2018, p. 113). The teacher knows that individuals differ in their intelligence. The idea that people vary what we call intelligence has been with us for a long time. Plato discussed similar variations more than 2000 years ago (Woolfolk, 2016, p. 148). Gardner believes that intelligence has a biological base. Gardner (2009, p.5) opined that intelligence is a "biopsychological potential to process information in certain ways in order to solve problems or create products that are valued in at least one culture or community". Most of the psychologists generally agreed that intelligence increases up to adolescence and declines in old age. These are general trends, but little is known with sufficient certainty to be widely accepted (Chauhan, 2007, p. 290). It should be noted that the rate of growth of intelligence is not the same in the case of superior, average and inferior children. Children whose intelligence level is higher start at a higher level and continue remains to be higher for the entire period of growth. On the other hand, children whose intelligence level is inferior start at a lower level and remains lower upto maturity. While children of average intelligence lie in between. Some of the psychologists opined that the development of intelligence reaches its maximum by the 16th year, though some psychologist believe that intelligence goes on growing into early twenties. Santrock (2018, p. 113) in her book *Educational Psychology* mentioned that "The problem with intelligence is that-unlike height, weight, and age-intelligence cannot be directly measured. We can't peel back a person's scalp and see how much intelligence he or she has. We can evaluate intelligence only indirectly by studying and comparing the intelligent acts that people perform".

Intelligence has been viewed differently by scholars. There is no agreement as regards the exact definition and nature of intelligence. Ballard has remarked "While the teacher tried to cultivate intelligence and psychologist tried to measure intelligence, no body seemed to know what was intelligence." Some of the psychologists said it is an ability to adjust, few define it an ability to learn, while few said it is an ability to carry on abstract thinking. Some of the important definitions given below by different psychologists may help us to understand the meaning of intelligence:

"Intelligence is represented in behaviour by the capacity of the individual to adjust himself to new situations to solve new problems, to learn."—Freeman (1937)

"Intelligences is the ability to adjust oneself to a new situation". – Stern (1914)

"Intelligence is the aggregate or the global capacity of the individual to act purposefully, to think rationally and to deal effectively with the environment."
-- Wechsler (1950)

"Intelligence is the ability for adaptation to physical and social environment."
—Piaget (1952)

"Intelligence is the ability to adjust oneself successfully to a relatively new situation of life."-- William James (1907)

"Intelligence is the ability to learn."—Buckingham (1921)

Intelligence comprises of five primary abilities i.e., 'S' or Space factor, 'N' or Number factor, 'V' or Verbal Comprehension factor, 'W' or Word Fluency factor and 'M' or memory factor. —Thurstone (1946)

"Intelligence is the ability to make profitable use of past experience."
—Thorndike (1960)

"Intelligence is the ability to undertake activities." – Stoddard (1943)

"Intelligence is the analytic and synthetic ability of mind."—Spearman (1923)

"Intelligence means the capacity to judge well, to reason well and to comprehend well."-- Binet (1960)

"An individual is intelligent in proportion as he is able to carry on abstract thinking."—Terman (1916)

"Intelligence is ability to judge well, to comprehend well, to reason well".
– Burt (1946)

"Intelligence is the ability to solve problems which require the comprehension and use of symbols i.e. words, numbers, diagrams, equations, formulae". –Garret (1965)

Few Definitions of intelligence on the Web:

"The ability to understand and think about things, and to gain and use knowledge"
—Macmillan Dictionary

"The ability to acquire, understand, and use knowledge"
-- American Heritage Dictionary

"The capacity for understanding; ability to perceive and comprehend meaning"
-- Collins English Dictionary

"Capacity for learning, reasoning, and understanding; aptitude in grasping truths, relationships, facts, meanings, etc."

-- Random House Kernerman Webster's College Dictionary

"The ability to learn or understand things or to deal with new or difficult situations"

--Learners Dictionary

"Human intelligence**,** mental quality that consists of the abilities to learn from experience, adapt to new situations, understand and handle abstract concepts, and use knowledge to manipulate one's environment". —Britannica Encyclopaedia

Broadly speaking it is very difficult to categorise these above definitions. It may be said that intelligence is an ability to "see the right thing at the right moment in the right way. It is a general capacity to understand and meet with the situations that life may present, successfully (Aggarwal, 2004, p. 195). However, Wechsler (1916) gave a very comprehensive definition of intelligence as "Intelligence means the aggregate or global capacity of the individual to act purposefully, to think rationally, and to deal effectively with his environment." Stoddard (1943) defined intelligence with a wide scope as it is the ability to undertake activities that are characterized by difficulty, abstraction, complexity, adaptiveness to a goal, economy, social value, and the emergence of originals, and to maintain such activities under conditions that demand a concentration of energy and resistance to emotional forces.

Thurstone (1921, p.201) in his paper entitled "Intelligence and Its Measurement" mentioned that Intelligence as judged in every-day life contains at least three psychologically differentiable components which are : a) the capacity to inhibit an instinctive adjustment, b) the capacity to redefine the inhibited instinctive adjustment in the light of imaginal experienced trial and error, c) the volitional capacity to realize the modified instinctive adjustment into overt behaviour to the advantage of the individual as a social animal.

1-2 Measurement of Intelligence

The measurement of intelligence with the help of tests is a concept which is approximately less than a century old. It began when educators in France realized that some students needed more help with learning than others did (Ciccarelli and Meyer, 2008, p. 326). Generally, it is seen that intelligence of a person is different from the others. The intelligence of people are assessed by a number of intelligence scales/tests which have been devised by many psychologists. Intelligence tests are known as psychological tests those are designed to measure a variety of mental functions, such as reasoning, vocabulary, word fluency, perception, comprehension, analogies, classifications and judgement. Intelligence tests assess the characteristics of human intelligence.

Various types of tests have been constructed so far measuring the intelligence but the credit goes to the Binet and Stanford, who have first developed the test measures intelligence. Binet in considered the father of intelligence.

The available tests are classified in a number of ways.

1-3 Classification of Intelligence Tests

Intelligence tests are of several types. They can be classified on the basis of their administration or on the basis of their nature.

1. Classification on the basis of administration:
    a) Individual Tests, and
    b) Group Tests.

a) Individual Tests

Individual intelligence tests are given to individuals. These are used to assess/test the intelligence of individuals. The first practical general intelligence test, the Binet-Simon scale, was administered individually (Sharma, 2011, p.233).

b) Group Tests

As the name suggests group tests are designed to test the intelligence of a group and not of the individual. All the members of the group receive same directions and they have to perform same work/task/activities. The first practical group tests of general intelligence was developed for the Armed Forces during the First World War (Sharma, 2011, p.234).

2. Classification on the basis of nature of tests:

a) Verbal Intelligence Tests,

b) Non-verbal Intelligence Tests, and

c) Performance Intelligence Tests.

a) Verbal Intelligence Tests

Verbal tests are those tests which may be administered individually or in a group. Verbal tests make use of language. As we know that reading and writing is must in verbal test hence, these tests are meant only for the literate persons who have the linguistic ability. Here the instructions are given in words. Examinees should be literate and are able to use language as well as paper and pencil for giving the responses. The test content is loaded with the verbal material.

b) Non-verbal Intelligence Tests

Just like the verbal tests, non-verbal tests may also be administered individually or in a group. In Non-verbal tests such type of activities are included which do not require the use of any language. The non-verbal tests are only created so that the examinee while making a minimum use of language but performing, instead, many activities. Non-verbal tests contain pictures, diagrams, geometrical figures, etc. in the form of different exercises/worksheets in place of words.

c) Performance Intelligence Tests

Performance tests require examinee to manipulate objects and other materials to perform a task. Here, the child is asked to do something rather than reply a question. Construction or drawing of different patterns or solving problems in terms of concrete material are generally involve in performance tests. Writing in language on sheets is not necessary for answering the items. For example, Kohs' Block Design Test. A major advantage of performance tests is that they can be easily administered to persons who are deaf, who have language difficulty and belongs to different cultures. These tests are generally very useful to the persons who cannot read and write.

1-4 Theories of Intelligence

The nature and types of intelligence can be properly understood by explaining different theories of intelligence. In the field of psychology, we may find a number of theories where psychologists or different researches explained the nature of intelligence. It is said that Galton was the person who firstly propose the theory of general intelligence. In the opinion of Galton "intelligence is a real faculty with a biological basis that could be studied by measuring reaction times to certain cognitive tasks." The psychologists grouped the theories of intelligence in different types like psychometric theories; cognitive theories; cognitive-contextual theories; biological theories; factor theories; and information processing theories etc. In the present study, theories of intelligence are discussed in two categories namely factor theories and cognitive theories.

A. Factor Theories of Intelligence

(i) Binet's Uni-factor Theory (1904)
(ii) Spearman's Two-factor Theory (1904)
(iii) Thorndike's Multi Factor Theory (1926)
(iv) Thurstone's Group Factor Theory (1938)
(v) Thompson's Sampling Theory (1939)
(vi) Burt and Vernon's Hierarchy Theory (1950)
(vii) Guilford's Structure of Intellect Model (1967)

B. Cognitive Theories of Intelligence

(i) Jean Piaget's Theory of Cognitive Development (1952)
(ii) Cattell's and Horn's Theory of Fluid and Crystallized Intelligence (1965, 1978)
(iii) Gardner's Theory of Multiple Intelligence (1983)
(iv) Sternberg's Triarchic Theory (1985, 1988)
(v) Perkins's Three Components of Intelligence (1995)

A. Factor Theories of Intelligence

(i) Binet's Uni-factor Theory (1904)

NCERT (2007, p. 6) mentioned that Binet's theory of intelligence was rather simple as it arose from his interest in differentiating more intelligent from less intelligent individuals. Jain (n.d.) in a module 'Variations in Psychological Attributes - Part 2' mentioned that Binet was the first psychologist to formalise the concept of intelligence in terms of mental operations. His theory arose from his interest in differentiating more intelligent from less intelligent individuals. Binet's theory is called Uni or One factor theory of Intelligence as according to him intelligence consisting of one similar set of abilities which can be used for solving any problem in an individual's environment. Later on, when the researcher or psychologists started to collect or analysing data of individuals with the help of Binet's test this theory becomes disputed.

(ii) Spearman's Two-factor Theory (1904)

This theory was advocated by Spearman. According to him intelligence consists of two factors - one is "g" factor and the other is "s" factor (Chauhan, 2007, p. 279). The "g" and "s" factor stand for general ability and specific ability respectively. Every individual has one "g" factor and some "s" factors (or Specific abilities). The "g" factor remains always the same for the same individual while on the other hand "s" factor varies from task to task. Different individuals differ both in their "g" as well as "s" factors. For doing any activity "g" factor is always involved and some of the "s" factors are also involved. The chief criticism against this work is that Spearman fails to allow sufficiently for types of abilities, which while less general than ‘g’ are certainly not specific. The reason was that he was unable to get at ‘group factors’ and his samples were small (Aggarwal, 2004, pp. 210-211).

(iii) Thorndike's Multi Factor Theory (1926)

This theory is also known as anarchic theory of intelligence. Thorndike, in this theory stated that intelligence is composed of highly particularised and independent faculties. There is no significant relation between them. Chauhan (2007, p. 281) in his book ‘Advanced Educational Psychology’ mentioned about this theory as differences of intelligence among people are due to the number of connections in the neurological system. This theory there stated that there is no general intelligence. Every intelligence test consists of four attributes namely Level, Range, Area and Speed. When we test a person, we give him a certain number of tasks (area) and these tasks vary in difficulty (attitude). As per this theory a certain number of items are given in each level of difficulty (range) related to different tasks/area and they are responded in a given time (speed). Thorndike (quoted in Aggarwal, 2004, p. 211) concluded that there were three types of intelligence: i) Social Intelligence or ability to understand and deal with persons; ii) Concrete intelligence refers to dealing with things, as in skilled trades and specific appliances; and iii) Abstract intelligence or ability to understand and deal with verbal and mathematical symbols.

(iv) Thurstone's Group Factor Theory (1938)

Thurstone's Group Factor Theory of Intelligence is also known as Theory of Primary Mental Abilities, Multiple Factor Theory of Intelligence, and Factor Analysis Theory of Intelligence. Thurstone's Group Factor Theory of Intelligence is a midway between Spearman’s Two Factor Theory and Thorndike’s Anarchic or Multiple Factor Theory of Intelligence. According to Thurstone, intelligence is neither the projection of general ability nor of specific factor. He does not recognise the existence of ‘g’ or ‘s’ factor. According to Thurstone in any mental activities primary mental abilities played a very important role. Thurstone stated that there are seven primary mental abilities which constitute intelligence:

- Verbal comprehension--the ability to define and understand words
- Word fluency--the ability to produce words rapidly
- Number--the ability to solve arithmetic problems.
- Space--the ability to visualize relationships.
- Memory--the ability to memorize and recall
- Perceptual Speed--the ability to see differences and similarities among objects
- Reasoning--the ability to find rules

Thurstone believed that the performance of any task will require one or more of these mental abilities. Further, Thurstone mentioned that all these above stated factors are independent and there is no correlation with each other in these factors.

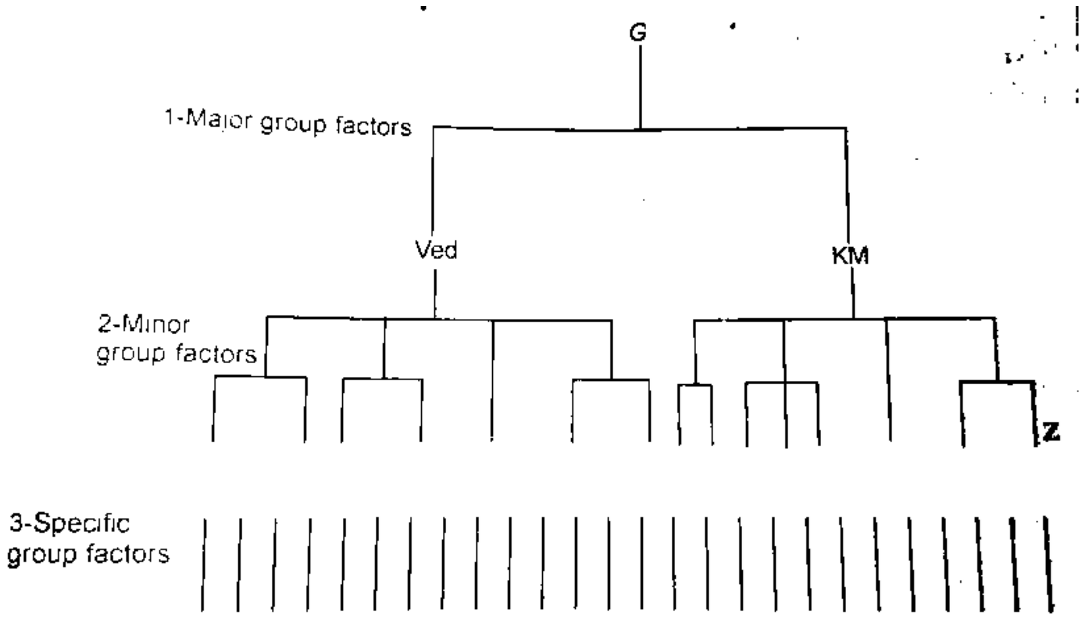
(v) Thompson's Sampling Theory (1939)

This theory is sometimes known as Oligarchic Theory or Group Factor Theory. According to this theory intellectual abilities belong to certain groups which are not related to each other. But there is close relationship between the abilities belonging to the same group i.e., they have got positive correlation. So according to this theory a child who is intelligent in one group of knowledge may not be intelligent in the other group. But he may be equally intelligent in the various subjects of that very particular group. Thomson believed in a “general ability” like Spearman’s “g”, but according to him it was not a basic entity; it was rather a constant combination of the ability elements.

(vi) Burt and Vernon's Hierarchy Theory (1950)

Chauhan (2007, p. 286) mentioned that Burt in (1940) separated statistically four factors of intellect, namely, (i) general factors which are common to all traits, (ii) group factors common to some of the traits, (iii) specific factors which are limited to each trait whenever it is measured, and (iv) error factors which are limited to each on each particular occasion it is measured. He proposed a five-hierarchical model which is as follows: (i) Human mind, (ii) Relational level or general factor, (iii) Associations, (iv) Perceptions, and (v) Sensations.

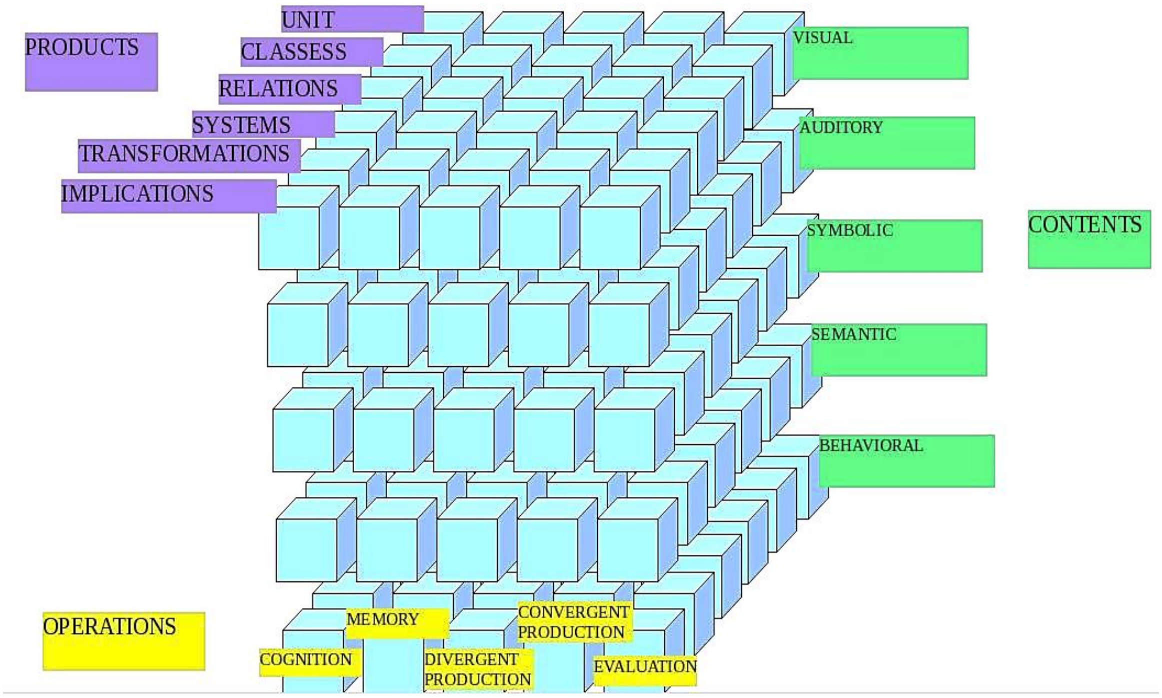
Vernon (1950) developed another factor-analytical view of the organization of intelligence. At the top of hierarchy, Vernon (quoted in Anastasi and Urbina, 1997 p. 264) placed Spearman's 'g' factor. After that Vernon placed two broad group factors, corresponding to verbal-educational (v: ed) and to practical-mechanical (k: m) aptitudes. These major factors may be further sub-divided like mechanical and manual etc. Further, these minor factors ultimately can be divided into various specific factors.



Model of a Hierarchical Organization of Abilities
Source: Chauhan (2007, p. 287)

(vii) Guilford's Structure of Intellect Model (1967)

Structure of Intellect briefly written as 'SOI' is a model of intellectual activity that was developed by Dr. J.P. Guilford and his associates in USA. Guilford suggests that the mind is composed of at least three dimensions of intellectual abilities. The model is a three-way classification of intellectual abilities, namely, operations, contents and products (Chauhan, 2007, p. 282). Guilford (quoted in Aggarwal, 2004, p. 212) stated that when five forms of operations of cognition, memory, divergent thinking, convergent thinking and evaluation-operate upon four forms of content- figural, symbolic, semantic and behavioural—and six forms of products- units, classes, relations, systems, transformations and implications—are produced. They together make up (4x5x6) 120 factors.



Source: *https://upload.wikimedia.org/wikipedia/commons/a/ae/Guilford_model.jpg*

The model has explored 120 intellectual abilities and this enables us to find out whether or not we are paying adequate attention to each of them. If not, how to improve. The model guides us to devise enrichment programmes for the creative and the gifted children. Guilford theory of intelligence regarded as one of the most comprehensive theory as it covers all possible aspects of intellectual activity. This theory has several educational implications.

B. Cognitive Theories of Intelligence

(i) Jean Piaget Theory of Cognitive Development (1952)

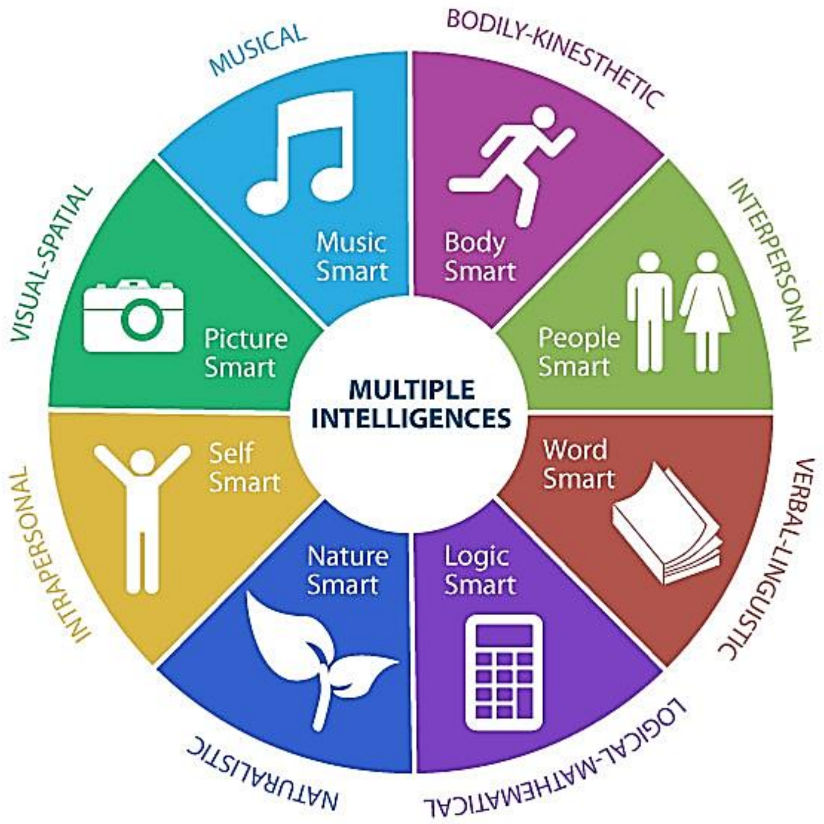
According to Piaget, every child took birth on this earth with a very a very basic mental structure and all the subsequent learning and knowledge of the child are based on this basic mental structure. Piaget's stage theory describes the intellectual development of children. Cognitive development involves changes in cognitive process and abilities (Sharma, 2021, p.120). According to Piaget, (quoted in Lewis and Marnat, 2006, p. 115) children normally develop intellectually through a series of progressive stages: sensorimotor (birth-age2), preoperational (ages2-7), concrete operational (ages7-11), and formal operational (ages 11-15). Piaget believed that the growth of intelligence ceases at around age 15, but a number of researchers have taken issue with this assertion.

(ii) Cattell's and Horn's Theory of Fluid and Crystallized Intelligence (1965, 1978)

Their theory states that there are actually two parts to intelligence. Fluid Intelligence (Gf) is an inherited basic capacity involving speed and accuracy of reasoning with nonverbal communication. It's affected by the previous and new experiences. Crystallized intelligence (Gc)- is a capacity as a result of experiences, learning and environment. (Pal, Pal, and Tourani, 2004, p. 183). It's basically the accumulated knowledge, and acquired skills that an individual possesses. As it relies on accessing information from long-term memory, hence it should not be equated with knowledge or memory.

(iii) Gardner's Theory of Multiple Intelligence (1983)

Howard Gardner of Harvard University propounded a unique contemporary theory of intelligence known as *'Theory of Multiple Intelligence'*. The theory first appeared in 1983 in his book 'Frames of Mind: The Theory of Multiple Intelligence.' He proposed that there was not one, monolithic kind of intelligence, that was vital for success, but rather a wide range of intelligences with seven key varieties. Gardner acknowledges that seven is an arbitrary figure. For the variety of intelligence, there is no magic number to the multiplicity of human talents (Chauhan, 2007, p. 287).



Source: *https://upload.wikimedia.org/wikipedia/commons/1/1a/Multiple-intelligence.jpg*

Pal, Pal, and Tourani (2004, p. 184) in their article mentioned that Gardner argues, "the multiple forms of intelligence that we must add to the conventional—and typical tested—logical and linguistic skills long called I.Q.". The multiple intelligence theory is that people possess eight types of intelligence: linguistic intelligence, logical-mathematical, spatial-visual, musical, motor ability, interpersonal, intrapersonal and naturalist and existential intelligence. Today (Northern Illinois University Center for Innovative Teaching and Learning, 2020) there are nine intelligences, and the possibility of others may eventually expand the list. Gardner's Multiple Intelligences Summarized:

Verbal-linguistic intelligence
Logical-mathematical intelligence
Spatial-visual intelligence
Bodily-kinesthetic intelligence
Musical intelligences
Interpersonal intelligence
Intrapersonal
Naturalist intelligence
Existential intelligence

(iv) Sternberg's Triarchic Theory (1985, 1988)

Sternberg (1982) hypothesized five classes of component processes by which the brain operates on the external information and does problem- solving. In an extension of his component process theory, Sternberg (1985) proposed the triarchic theory of intelligence which includes three sub theories: a componential sub theory, an experiential sub theory, and a contextual sub theory. The componential sub theory consists of meta components, performance components, and knowledge-acquisition components. The experiential sub theory is concerned with the ability to formulate new ideas by combining seemingly unrelated factors or information. The contextual subtheory is concerned with the ability to adapt to changing environmental conditions and to shape the environment in such a way that one’s strengths are maximized ant one’s weaknesses are compensated for. Sternberg’s Triarchic Theory of Intelligence creates a view of intelligence based on heuristic approach. Psychologists accept that intelligence is something that cannot be measured by one aspect of personality only. Sternberg (1988) presents theory of intellectual styles based on the concept of mental self-government, which represents an attempt to combine the concept of intelligence with that of personality (Lewis and Marnat, 2006, p. 115).

(v) Perkins's Three Components of Intelligence (1995)

In his book, ‘Smart Schools’ (1992), David Perkins analyzes a number of different educational theories and approaches to education. He advocates Gardner's theory of multiple intelligences positively. The main features which contain in Perkin's book are; it is based on research evidence; the education of the individual can be improved by employing appropriate teaching for transfer of learning; by emphasizing the project-based learning and concentrating on higher-order cognitive skills. Perkins (1995) studied thoroughly a large number of research studies related to the measurement of Intelligent Quotient and different programs of study designed to increase Intelligent Quotient. He presented that basic components or dimension of IQ are:

1. Neural intelligence. It is related to the accuracy, precision and efficiency of human neurological/ nervous system.

2. Experiential intelligence. It is related to knowledge accumulated with time and divergent experiences. It is the overall accumulation of one's expertise in different areas.

3. Reflective intelligence. This refers to ability or approaches that how a person behaves or manipulate his mental skills in various problems, learning and how he intellectually completed the challenging tasks. It includes attitudes that support endurance, rationalization and abstraction. It includes self-monitoring and self-management.

1-5 Conclusion

In essence, Binet conceived intelligence as consisting of one similar set of abilities which can be used for problem solving (general or specific) in an individual's immediate environment. As per Spearman intelligence consists of two factors - one is "g" factor and the other is "s" factor. According to Thorndike, intelligence is composed of highly particularised and independent faculties. There is no significant relation between them. Thurstone's Group Factor Theory of Intelligence is a midway between Spearman's Two Factor Theory and Thorndike's Anarchic or Multiple Factor Theory of Intelligence. According to Thurstone, intelligence is neither the projection of general ability nor of specific factor. The seven primary mental abilities which constitute intelligence are: Verbal comprehension, Word fluency, Number, Space, Memory, Perceptual Speed, and Reasoning. Thomson believed in a “general ability” like Spearman’s “g”, but according to him it was not a basic entity; it was rather a constant combination of the ability elements. Burt proposed a five-hierarchical model which is as follows: (i) Human mind, (ii) Relational level or general factor, (iii) Associations, (iv) Perceptions, and (v) Sensations. Vernon (1950) developed another factor-analytical view of the organization of intelligence. At the top of hierarchy, Vernon placed Spearman’s ‘g’ factor. The Structure of Intellect model of Guilford is a three-way classification of intellectual abilities, namely, operations, contents and products.

On the other hand, cognitive theories describe intelligence with respect to the changes involves in cognitive process. According to Piaget children normally develop intellectually through a series of progressive stages: sensorimotor (birth-age2), preoperational (ages2-7), concrete operational (ages7-11), and formal operational (ages 11-15). The fluid aspect of *Cattell's and Horn's* theory says that intelligence is a basic capacity due to genetic potentiality. The past and new experiences do have great impact, the crystallized theory is a capacity resultant of experiences, learning and environment. Gardner proposed that there was not one, monolithic kind of intelligence, that was vital for success, but rather a wide range of intelligences with seven key varieties. Sternberg proposed the triarchic theory of intelligence which includes three sub theories: a componential sub theory, an experiential sub theory, and a contextual sub theory. Perkins’s advocated that Intelligence Quotient (IQ) has three main dimensions: Neural intelligence, Experiential intelligence, and Reflective intelligence respectively.

CHAPTER – II

THE PROBLEM

2-1 Profile of Sikkim

Sikkim state situated in the North-Eastern part of the country. The nearest railway station to Sikkim state is New Jalpaiguri (West Bengal) and the nearest airport is Pakyong (Sikkim). Sikkim state is the least populated state and also known as the third smallest state after Goa and Delhi. Sikkim state shares its border with West Bengal and the neighbouring countries of Nepal, Bhutan and Tibet (Sikkim, 2010, p. 4). Sikkim was earlier a protectorate of India with a monarchy government but in 1975 it metamorphosed as the Twenty Second state of the Indian Union (Verma, 2014, p. 8). The total population of Sikkim state as per census 2011 stands at 610,577 out of which 43709, 136435, 146850 and 283583 belongs to North, West, South and East district respectively. As per census 2011 the Scheduled Tribes population of Sikkim state is 206,360 (105,261 males and 101,099 females) works out to 33.8 per cent. The scheduled caste population in the state of Sikkim during 2011 Census was 28,275 (14,454 males 13,821 females) constituting 4.63% of the total population. (District Census Handbook, 2011, p. 42). Gangtok is Sikkim's capital city. The Sikkim state has four districts namely; East, West, North and South. The important or major cities lies in these districts are Gyalshing, Jorethang, Rangpo, Namchi,Pakyong, Rhenock, Meli, Singtam, Mangan, Chungthang and Soreng. Sikkim is a multi-ethnic state comprising of more than 20 different groups, most predominant being the Nepalese, Lepchas and Bhutias (Chettri, 2013, p. 13). Majority of the population belong to Hindu religion. Two another important religions to which many people of Sikkim also belongs are Buddhism and Christianity. English is the official language of the State; along with it Nepali is also used as official language in Sikkim (Sharma and Chettri, 2020, p. 183).

The proportion of total literacy rate at the state level is 81.42% with male and female literacy rates of 86.55 per cent and 75.61 per cent respectively (District Census Handbook, 2011, p. 68). According to the Government of Sikkim English is the medium of instruction in Government schools and is treated as the first/primary language. A total number of eleven regional languages has been recognized by the Government of Sikkim as State languages. Besides these eleven languages the Directorate of Languages also monitors the development of three more languages viz. Hindi, Sanskrit and Tibetan.

To provide quality education to the people of Sikkim is the main aim of Sikkim Government. To fulfil or to achieve this aim the Government of Sikkim has given highest priority to the education sector by making almost 20% budgetary provisions of the State's budget and the records showing that much progress has been achieved by the students which is remarkable (Government of Sikkim). The Government of Sikkim has attempted to bring quality of education in the government schools by providing various incentives like free uniforms, text books, exercise copy, shoes, bags and raincoats etc. The government also provide various scholarships to students who get selected in competitive State level examination. Such scholarships encourage the meritorious students from rural areas, which in turn help in prepare a good citizen (Subba and Bhutia, 2016, p. 26).

Dewan (2012, p.15) in his book "*Education in Sikkim: An Historical Retrospect (Pre-Merger and Post-Merger Period*) mentioned that in spite of its being situated in the deeper regions of the Great Himalayas, Sikkim could keep pace with the educational development of its neighbouring countries like Tibet, Nepal and Bhutan. Starting from its indigenous elementary education, it gradually underwent changes due to the impact of monastic education, then western missionary endeavours of imparting western education and afterwards the present trends of educational development in India.

The structure of education in Sikkim is just like the other States of India. The structure of the education system of Sikkim state is divided into different levels. These are the primary (I-V), upper primary or middle, commonly known as junior high (VI-VIII), secondary (IX-X), senior secondary (XI-XII) stages and College or University, Diploma/Degree/Certificate Professional Courses. The state follows the national pattern of education 10+2+3. At present, approximately 1300 schools are there in Sikkim state. Until, 1994, there were three colleges in the State namely – Sikkim Government College, Tadong, Sikkim Government Law College, Burtuk and Sikkim Institute of Nyingma Higher Studies at Deorali. The first institute of Higher education was the Sikkim Government College, Tadong in the state of Sikkim. It was established in September 1977 by an Act of State Legislature to cater to the higher educational needs of students in the state. Now the State can boast of one Central University, one State University, more than 10 Government Colleges and also a number of private universities and colleges. The rise of colleges and other institutes in the state has surely increased the opportunity of providing higher education to the students of Sikkim and also created the job opportunities for the educated youths of the state.

The literacy rate of the state grows from 68.81% (2001) to 81.42% (2011) and the general education provided by its different institutions attracts lots of students from the neighbouring states. But there is a lack of professional colleges/institute in the field of science and technology. The state has to do more in the field of research and development. Due to the growth of higher education in Sikkim a number of research studies are conducted by the different researchers. But still in the field of test and measurement there is a need to do more researches. Research studies should be conducted to develop different instruments/tools to measure the ability, personality, aptitude, adjustment and creativity of the students. So far, no single study has been carried out in this field test and measurement to develop an intelligence test for the school students in Sikkim.

2-2 Need and Significance of the Study

Sikkim is such a state where the tribal population is very high and life is comparatively very hard here due to its geographic and other climatic conditions. Out of the total population of 610,577 (according to 2011 census) in Sikkim the tribal population happens to be 33.8%. The overall development of the state Sikkim depends upon the education of the people of Sikkim and for which the role of the parents is quite crucial. The parents do try always to encourage the youths especially the high school going students who are expected to play a very decisive role in nation building process. This has lead to the increased educational competitions and challenges amongst the students.

As the world is also becoming more and more advanced and complex; educational performance and achievement amongst students have also become more and more difficult. The teachers and parents are often confused, curious and talk about the differences in the educational performance and academic achievement of the school going children; as most of them believe that intelligence is one of the main determinants in the student's success and failure. It is this phenomenon which has encouraged the investigator to study the intelligence of the secondary/senior secondary school students of the state. Seeing the importance of intelligence of students and the necessity of intelligence tests as a measuring tool, the investigator feels that it is important to have a separate intelligence test to measure the general mental ability of the students of Sikkim state. As of now the state does not have a single psychological tool of its own to assess the general mental abilities of the children. Even though there are many intelligence tests that have been constructed and standardized by researchers of our country from time to time in many languages, they do not seem suitable for the students of Sikkim due to local norms. The investigator therefore, decided to construct and standardize a verbal group test of intelligence in the English language for the students of Sikkim. The present test is suitable as per, culture, tradition and environment of Sikkim state.

2-3 Statement of the Problem:

Intelligence tests plays a very vital role in the field of education. These tests provide the important information of child's intellectual development which helps the parents or professionals to know more about the child. It provides the necessary information how a child behaves in different cognitive processes and helps the professionals to identify the weakness and strength of a child. The intelligence test also helps in identification of learning difficulties and classification of individuals. Hence, the investigator was keen to undertake a study on **"Construction and Standardization of a Verbal Group Test of Intelligence for the Students of Sikkim".**

2-4 Operational Definition of Key Terms Used

The different key terms used in the title of the study and in the body of study are operationally defined as follows;

1. **Construction:** Construction of a test means to construct the items for the test. In the present study construction means to write the original test items on the basis of primary mental abilities given by Thurston and selection of items by means of item analysis.

2. Standardization: In the present study standardization means preparing the uniform procedures in administering and scoring the test and establishing its reliability, validity and norms.

3. Verbal Test: Verbal test is a type of test, which include statements and words. It is mostly a paper and pencil test. The students must be literate and they should have understanding of the language so that they can read and write. In this type of test, students use words in attaching meaning or responding to test items. Tests involving comprehension; vocabularies and mathematics are mainly of that type.

4. Group Test: Group tests can be administered to more than one individual at a time and usually can be administered simultaneously to any suitable size of group.

5. Intelligence: Intelligence is a general intellectual capacity which consists of the abilities; to reason well with abstract materials, to comprehend well, to have a clear direction of thought and to relate thinking with the attainment of a desirable end. In the present study, intelligence means the scores obtained by the students on a test developed and standardised by the investigator on the basis of Thurstone's primary mental abilities i.e. verbal comprehension, word fluency, number, memory and reasoning.

2-5: Objectives of the Study

The objectives of the present study are as follows:

1. To construct a verbal group test of intelligence for the students of IX, X, XI and XII (age 14 to 18).
2. To standardize the test by establishing its reliability and validity.
3. To set up norms for the test.
4. To develop a test manual.
5. To study the differences in the level of intelligence of the students with respect to their gender-wise, age-wise and class-wise.

2-6: Hypotheses of the Study

In the present study the following hypotheses are formulated by the investigator for testing:

1. There is no significant difference in the mean scores of the level of intelligence of the students with respect to their gender.
2. 14 and 15 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.
3. 14 and 16 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.
4. 14 and 17 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.
5. 14 and 18 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.
6. 15 and 16 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.
7. 15 and 17 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.
8. 15 and 18 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.
9. 16 and 17 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.
10. 16 and 18 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.
11. 17 and 18 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.

12. Ninth and tenth class secondary school students do not differ significantly with respect to their mean scores on the variable intelligence.
13. Ninth and +1 class secondary/senior secondary school students do not differ significantly with respect to their mean scores on the variable intelligence.
14. Ninth and +2 class secondary/senior secondary school students do not differ significantly with respect to their mean scores on the variable intelligence.
15. Tenth and +1 class secondary/senior secondary school students do not differ significantly with respect to their mean scores on the variable intelligence.
16. Tenth and +2 class secondary/senior secondary school students do not differ significantly with respect to their mean scores on the variable intelligence.
17. +1 and +2 class secondary/senior secondary school students do not differ significantly with respect to their mean scores on the variable intelligence.

2-7: Variables of the Study

The following were the variables in the present study:

<table>
<tr><th colspan="2">Variables</th><th>Levels</th></tr>
<tr><td rowspan="11">Independent Variables</td><td rowspan="2">Gender</td><td>Boys</td></tr>
<tr><td>Girls</td></tr>
<tr><td rowspan="4">Class</td><td>IX</td></tr>
<tr><td>X</td></tr>
<tr><td>XI</td></tr>
<tr><td>XII</td></tr>
<tr><td rowspan="5">Age</td><td>14</td></tr>
<tr><td>15</td></tr>
<tr><td>16</td></tr>
<tr><td>17</td></tr>
<tr><td>18</td></tr>
<tr><td>Dependent Variable</td><td colspan="2">Intelligence</td></tr>
</table>

2-8: Delimitations of the Study

The present study was delimited in the following aspects:

1. The language of the test in the present study was delimited to English only.
2. The test was delimited to only five out of seven Thurstone’s primary mental abilities.

CHAPTER – III

REVIEW OF RELATED LITERATURE

3-1 Introduction

It is necessary for a researcher to acquire up to date information about what has been uncovered in the particular area from which s/he intends to take up a problem for a research. Fox (1969 p.112) mentioned that through a process of integration of past research and thinking with current research and thinking, we move knowledge forward. For this process to function successfully, each researcher must know the past so that s/he can design research to build on what is already known and study what is not. During the process of reviewing the literature the investigator found a number of research studies conducted by the different researchers in the field of intelligence tests. Mainly the intelligence tests are categorised in four categories namely verbal tests, non-verbal tests, performance tests and adaptation of foreign tests. In the present study, the investigator has done the systematic reviews of related literature of only verbal tests of intelligence conducted in abroad and India to fulfill the purposes of the study.

3-2 Studies Conducted in Abroad

Binet (1905) French Psychologists have done a pioneer work in the field of intelligence testing. Binet-Simon published an intelligence test in 1905 which is known as Binet-Simon Scale. This scale consists of 30 tasks which an individual has to perform. These tasks were based on the maxims of simplest to the most complex and placed in serial order. This scale was prepared to test feeble-minded children. Binet and Simon recognised the defects of the first scale and revised the scale in 1908. They recognized that an improved scale would have to provide more valid norms, based upon a larger and more representative sampling of children at each age within the limits of the scale would have to be included to achieve finer units of measurement and greater accuracy (Freeman, 1965, p. 189). It was the first age scale which had created interests among the psychologists. Binet and Simon again in 1911 revised the scale in which age range was extended from 3 years to 15 years. The test consists of six items meant for each age. The first important revision of Binet-Simon scale was done in 1916. Terman with his associates made some modifications by avoiding certain drawbacks in Binet's test. The revision by Terman has been named as Stanford-Binet Test to give honour to the University where he worked (Freeman, 1965, p. 189). He placed six tests in each age group from 3 to 10, eight tests at the age 12, six tests at the age 14, six at 16 and six at 18. It was here that Terman introduced the concept of I.Q., as the ratio of the mental age to the chronological age (Aiken and Marnat, 2006m p. 118). In 1937, Terman revised the Stanford-Binet Test with the help of Merril and published the Revised Standord Test. It became useful for the age range of 2 to 18 years. The 1937 scale has two equivalent forms (L and M), each of which contains 129 test items, as compared with the 90 items in the first Stanford-Binet (Freeman, 1965, p. 212). The third revision of Stanford-Binet scale was done again in 1960. In this scale language was used to the highest degree. A large number of items were deleted those were criticised by the other researchers. Under this revision the conventional I.Q. was replaced by a Deviation I.Q. Realizing the need for updated norms, the publisher arranged for the test to be administered in 1972 to a stratified national sample of 2,100 children. The fourth edition of the Stanford-Binet Intelligence Scale (SB-IV), which was published in 1986, was constructed with attention to the needs of clinical, school, and other psychologists who use intelligence test information. It was the complete restructuring of the test into 15 subtests standardized on a sample of 5,013 persons ages 0-2 to 11-23. Advances in psychometric and cognitive theory since 1986 prompted a further revision of the Stanford-Binet in 2003. This fifth edition (Roid, 2003) was standardized over a sample of 4,800 and can be administered individuals from age 2 to 85 or older.

Wonderlic (1936) Personnel Test is a brief (2 to 3 minutes for reading directions, 12 minutes for taking the test), 50-item instrument based originally on the Otis Self-Administering Test of Mental Ability. Questions on the Wonderlic consist of analogies, definitions, logic, arithmetic problems, spatial relations, word comparisons, and direction finding. This test has been used extensively as a screening device in employment situations for many years, and research indicates that it is a fair and valid selection device for a wide range of jobs. Despite the brevity of the Wonderlic, its reliability coefficients and correlations with scores on the other measures of intelligence reportedly extend into the .90s.

Thurstone (1938) developed the Primary Mental Abilities (PMA) tests and published by American Council of Education. The tests were designed in two forms: 'Chicago' (long form, two hours and 'SRA' and short form, 45 minutes). Tests were constructed for use primarily at the high school level. The battery of tests consists of 11 tests, selected from the 60 tests tried out experimentally on 1154 pupils after using factor analysis. A second experimental battery of 21 tests was tried out on 437 subjects and factorially analysed. These 11 tests measure six primary mental abilities: (i) Verbal reasoning, (ii) Special abilities, (iii) Number ability, (iv) Memory ability, (v) Reasoning and (vi) Word fluency. They are arranged in booklets which can be administered in school periods to measure PMA. Traxler (1941) ascertained that the reliabilities of the original PMA tests were high, estimating by both split-half and test-re-test techniques. The inter-correlation of the tests was reported 0.20 to 0.90, the mean being 0.49.

Wechsler Scales (1939) developed by David Wechsler include several successive editions of three scales designed for adults, school-age children, and preschool children. The first form of Wechsler scales, also known as the Wechsler-Bellevue

Intelligence Scale, was published in 1939 with the objective of identifying psychotic and clinical disabilities. The test comprises 6 verbal and 5 performance sub-tests. To this test Wechsler added a second form in 1947, the Wechsler-Bellevue Scale Form-II. A complete revision and restandardization of Form- I was published in 1955 as the Wechsler Adult Intelligence Scale (WAIS). The WAIS was revised, restandardized, and republished in 1981 (WAIS-R) with 80 percent of the original items retained, norms updated, verbal and performance subtests alternated. In 1997 (WAIS-III) revised and renormed version of the WAIS and the WAIS-R. The new revised (WAIS-III) provided scores for Verbal IQ, Performance IQ, and Full-Scale IQ, along with four secondary indices (Verbal Comprehension, Working Memory, Perceptual Organization, and Processing Speed).

In 1949, Wechsler developed a test known as the Wechsler intelligence scale for children from 5 through 15 years of age (WISC). The scale was standardized on a sample of one hundred boys and one hundred girls at each of the eleven age levels. It comprises of 12 subtests, of which two are used as alternative or supplementary tests provided time permits. A revision of the WISC, with updated items especially on Information, Vocabulary and Picture Completion was done in 1974 (WISC-R). The new norms included black and other minorities in appropriate proportion. This scale was suitable for the children between the age group of 6 years to16 years and 11 months.

The third member of the Wechsler Intelligence Tests, the Wechsler Preschool and Primary scale of intelligence (WPPSI) was first published in 1967 and a revision, the WPPSI-R, in 1989. WPPSI to measure the intelligence of the children aged 4-6 years. The WPPSI items are similar to WISC. The revised version of the WPPSI scale with dated and biased items eliminated, for children between the ages 3 years and 7 years 3 months. The Object Assembly was added and the norms updated. In 1999 Wechsler Abbreviated Scale of Intelligence (WASI) was designed to meet the demand for a quick, reliable measure of intelligence in clinical, educational, and research settings. This scale provides scores for Verbal IQ, Performance IQ, and Full Scale IQ.

Wechsler Intelligence Scale for Children-IV (WISC-IV) was developed in 2003 and was designed for children between the ages of 6 years and 16 years 11 months. It consists of 10 core and 5 subtests grouped into 4 index scores, namely VCI, PRI, WMI, and PSI.

Cattell (1940) scale of superior merit, covers the range from 2 to 30 months. Its test items are adaptations of many that were developed and included in earlier tests, notable those of Gesell and his associates. The test items are grouped at age levels as they are in the Stanford-Binet. The scale was standardized by longitudinal testing: 1346 examinations were made on 274 children at the ages of 3,6,9,12,18,24,30 and 36 months. The reliability of the test was calculated by odd-even number method and corrected by Spearman Brown formula. Coefficient ranged from a low of 0.56± 0.05 at the age of 3 months, to a high of 0.90± 0.01 at 18 months. The median coefficient was 0.86 ± .02. These coefficients compared favourably with those found for other scales.

In 1960, Cattell revised the test in format of scale 1,2 and 3. The scale 1 is meant for children of 4 to 8 years and scale 2 and 3 are for adults. The validity of the test was obtained by the methods of concept validity and concrete validity. The reliability of the scales are also determined with different methods.

Terman–McNemar (1941) Test of Mental Ability was published on the lines of Terman Group Test of Mental Ability. It consists of 7 sub-tests (verbal and non-verbal).

The present group intelligence test is meant for the early age group of 7 to 12 and it comprises 162 multiple choice items within seven types of verbal subtest: synonyms, classification, logical selection, information, analogies, opposites, and best answer. Test of Mental Ability was a modification and replacement of the 1920 Terman Group Test of Mental Ability.

Kuhlman-Anderson (1963) developed and standardized a group test of intelligence which was suitable for the grades K-12. The test was originally developed in the 1920's but has been revised so many times since then. The test has verbal and nonverbal items and takes 50-75 minutes to complete. The test correlates well with performance in school and on other intelligence tests. The test allows the researchers to compare the children both chronologically in their age and by grade level. The test gives consistent results from one testing to the next. Different norms of cognitive skills quotient, standard scores, percentile and Stanine scale from different grade and age were established on the verbal and non-verbal.

Otis-Lennon (1967) School Ability Test is a revision of earlier tests in the Otis series: the Otis Self-Administering Tests of Mental Ability (OLSAT), the Otis-Lennon Mental Ability Test, and the Otis Quick-Scoring Mental Ability Tests. Like the previous tests, the eighth edition of the OLSAT comprises of a variety of pictorial, verbal, figural, and quantitative items to measure Verbal Comprehension, Verbal Reasoning, Pictorial Reasoning, Figural Reasoning, and Quantitative Reasoning from kindergarten to grade 12. There are seven levels of the OLSAT-8 (Kindergarten, Grade 1. Grade 2, Grade 3, Grades 4-5, Grades 6-8, and Grades 9-12), each of which can be administered in 60 to 75 minutes. Scores include School Ability Indexes (SAIs), percentile ranks and stanines based on age and grade level, scaled scores, and normal curve equivalents (NCES). The School Ability Indexes have a mean of 100 and a standard deviation of 16. The norms, which are based on a large national sample, are expressed as percentile ranks, stanines, and NCES by grade.

Bayley (1969-2006) Scales of Infant and Toddler Development, 3rd Edition (Bayley-III; Bayley, 2006) measures cognitive, language, motor, social-emotional, and adaptive development. It is a revision of its predecessor, the Bayley Scales of Infant Development Second Edition (BSID-II- Bayley, 1993). The Bayley-III examines all the facets of a young child's development. This scale is suitable for children within the age range of 1 to 42 months. It consists of five scales. The first three scales i.e. Cognitive Scale, the Language Scale, and the Motor Scale are administered by the clinician. The other two scales, the Social-Emotional Scale and the Adaptive Behaviour Scale are completed by the parents or the primary caregiver. The Cognitive Scale, the Language Scale, the Motor Scale and the Social-Emotional Scale consists of 91, 48, 138 and 35 items respectively. The Adaptive Behaviour Scale assesses the attainment of practical skills. As per the manual the Bayley-III may only be administered by trained professionals who have experience in the administration and interpretation.

McCarthy (1972) constructed an instrument to assess the children's abilities namely McCarthy Scales of Children Abilities (MSCA). This scale is suitable for children between the ages of 2.5 and 8.5 years. It consists of 18 tests, giving the examiner multiple opportunities to observe the child's approach to a variety of problems and stimuli. The tests are grouped into six overlapping scales: Verbal, Perceptual-Performance, Quantitative, General Cognitive, Memory and Motor. The General Cognitive score, based on 15 of the 18 tests in the battery, comes closest to the traditional global measure of intellectual development. This General Cognitive Index (GCI) is a normalized standard score, reported in the same units as traditional IQs (with a mean of 100 and SD of 16) and found within each 3-months age group. In the development of the MSCA the term IQ was deliberately avoided because of its many misleading connotations. The GCI is described as an index of the child's functioning at the time testing, with no implications of immutability. Scores on the 5 additional scales are based on the same age groups and have a mean of 50 and SD of 10.

Henmon-Nelson (1973) the widely used Tests of Mental Ability which first appeared in 1931, has been given a thorough revision and re-standardization. The test is now published in three levels, that is, for grades three to six, six to nine, and nine to twelve. Each level of the test comprises 90 multiple-choice items in spiral-omnibus form, with several types of verbal items prevailing; there are some numerical items and figure analogies. A fourth level, for college students, is in preparation. The scoring of the test is very easy and can be done with the help of carbon-paper. The test booklets use in the test are consumable. Norms for each level are also provided in the form of grade wise percentile ranks, grade norms, and deviation IQs.

CTB/Mc Graw-Hill (1981) developed a California Test of Cognitive Skills (TCS), a successor to the well-known California Short Form Test of Mental Maturity and the Short Form Test of academic Aptitude. The test composed of four subtests: Sequences, Analogies, Memory and Verbal Reasoning- at five grade levels (2-3,3-5,5-7,7-9,9-12). In addition to age or grade percentile rank, Stanine and standard score norms for each subtest, the combined scores on all four subtests may be converted to a Cognitive Skills Index (CSI).

Lohman and Hagen (1982) Cognitive Abilities Test (CogAT), sixth edition (by D. F. Lohman and E. P. Hagen) is a replacement to the Lorge-Thorndike Intelligence Tests. It is designed to assess the abilities of school children to reason and solve problems by using verbal, quantitative, and spatial (nonverbal) symbols. CogAT is a multilevel test, with Levels 1 and 2 for grades K-3 and Levels A-H for grades 3-12; it takes approximately 90 minutes to complete. Each level contains a Verbal Battery, a Quantitative Battery, and a Nonverbal Battery consisting of two to three subtests. Separate scores obtained on the three batteries and an overall composite score may be converted to various types of norms (standard age scores, national grade and age percentile ranks, grade and age stanines, and normal curve equivalents) based on a national standardization conducted in 2000.

Kaufman and Kaufman (1983a) developed the Kaufman Assessment Battery for Children (KABC) to assess the problem-solving abilities of 2.5 to 12.5 children requiring Simultaneous Processing (seven subtests) and Sequential Mental Processing (three subtests). In this assessment test 13 of the 16 game like subtests can be administered I 35 to 85 minutes. The battery yields four global scores: Sequential Processing, Simultaneous Processing, Mental Processing Composite (combining the first two) and Achievement. Each of these is a standard score with a mean of 100 and an SD of 15.

Differential Ability Scales (1990) developed by Elliott, 1990 is to provide ability profiles for analyzing and diagnosing children's learning difficulties, to assess changes in abilities over time, and to identify, select, and classify children with learning disabilities. The DAS consists of 20 subtests, including 12 core subtests, 5 diagnostic subtests, and 3 achievement subtests. The three achievement subtests (Number Skills, Spelling, Word Reading) are useful in assessing basic academic skills, but the core and diagnostic subtests provide the principal means of assessing cognitive abilities. Four to six core subtests, from age 2 years 6 months through 17 years 11 months, are administered to each examinee, Scores on various core subtests are combined to know the overall indexes of Verbal Ability and Non-verbal Ability for preschool children:

Verbal, Nonverbal Reasoning, and Spatial Ability for school-aged children; and General Conceptual Ability on a scale having a mean of 100 and a standard deviation of 15 for preschool and school-aged children. Although the diagnostic subtests are not used in computing the ability indexes, they provide useful information for understanding a child's cognitive strengths and weaknesses. The DAS norms are based on a sample of 3.475 U.S. children, stratified by age, sex, race-ethnicity, parent education, geographical region, and educational preschool enrollment. Exceptional children (learning disabled, speech and language impaired, educable included in the sample.

Kaufman and Kaufman (1990b) developed the Kaufman Brief Intelligence Test (KBIT). It is a brief, individually administered measure of verbal and non-verbal intelligence that can be administered to test takers aged 4 to 90 years. The test comprises three subtests, two verbal and one non-verbal. The normative sample comprises 2120 children and adults from the US. Internal consistency was assessed by correlating split-halves based on Rasch calibration of item difficulties, and adjustment using the Spearman-Brown formula. Internal consistency reliability values reported for verbal (mean = 0.91, range = 0.86-0.96), nonverbal (mean = 0.88, range = 0.78-0.93), and IQ composite (mean = 0.93, range = 0.89-0.96) are excellent. Test-retest reliabilities and correlations for the verbal, nonverbal, and IQ composite scores were 0.80 or higher (means of 0.91, 0.83 and 0.90, respectively), with the single exception of the nonverbal score for children aged 4 to 12 years, where the correlation was 0.76.

Kaufman and Kaufman (1993c) devised Kaufman Adolescent and Adult Intelligence Test (KAIT). The test was designed as a measure of intelligence for ages 11 to 85 years or older. The battery is composed of a Crystallized Scale with subtests-Auditory Comprehension, Doble Meanings and Definitions-that measures concepts acquired form schooling and acculturation, and a Fluid Scale with subtest- Rebus Learning, Mystery Codes, and Logical Steps- that tap the ability to solve new problems. The KAIT also includes a brief Mental Status test to assess attention and orientation in testee who are too cognitively impaired to take the full battery. The battery is relatively easy to administer. Its normative sampling is adequate, and the reliability and validity data reported in the technical manual appears promising.

Das and Naglieri (1997) Cognitive Assessment System (CAS) is based on the Planning, Attention, Simultaneous, and Successive (PASS) model of intelligence. In turn, the model is grounded in the theory of cognition and brain organization espoused by the Russian neuropsychologist, A.R. Luria. The recently edition of this test i.e. the Cognitive Assessment System 2nd Edition (CAS2), was designed to measure cognitive processing abilities important for a broad range of differential diagnoses and instructional planning in individuals aged from 5:0 through 18:11. It provides practitioners with a valid and reliable tool to evaluate children's strengths and weaknesses in important areas of cognitive processing. Each PASS scale as well as the CAS2 Full Scale yields a standard score with a mean of 100 and an SD of 15. It yields five supplemental composite scores: Executive Function without Working Memory, Executive Function with Working Memory, Working Memory, Verbal Content, and Nonverbal Content. A visual versus auditory comparison is also provided. The standardization sample was a representative group of 2,200 children and adolescents aged 5:0 through 17:11 years. A stratified random sampling plan was used to obtain a sample that closely matched the US population. Full scale reliability is 0.96 with the PASS Scale reliabilities ranging from 0.83 to 0.93.

Hashmi (2000) Standardized an intelligence test for the middle level students (i. e. Class VI and VII, age group 11+ and 12+). Stratified random sampling technique was applied by the researcher. The test was conducted on a sample of 12120 boys and girls of Class VI and 9645 boys and girls of Class VII from 335 schools of Bahawalpur, D.G. Khan, Multan and Sargodha divisions. Thurstone's model of Multiple-factor Theory of intelligence test was used for this study. The researcher developed ten tests (i. e. five for class VI and five for class VII) in Urdu. Co-efficient of correlation was computed to determine the internal reliability of the test. The find the reliability of the test, the researcher used the Kudar and Richardson's formula KR#20 and KR#21 for class VI and VII.

Hussain (2001) undertook a study on development, construction, validation, and standardization of a group verbal intelligence test in Urdu language for adolescents. The test contains 128 items and was standardized on 1080 candidates. The reliability of the test was determined by test-retest, split-half and Kuder Richardson Method. The validity of test was also established.

Woodcock-Johnson (2001) Tests of Cognitive Abilities is an intelligence test series (often referred to as IQ test) which was first developed in 1977 by Richard Woodcock and Mary Johnson. Further, the Woodcock-Johnson test was revised in the year 1989 and 2001. Today's most recent version of the test is known as the WJ-III. It is based on the Cattell-Horn-Carroll (CHC) theory the most current theoretical model. This battery consists, in turn, of a Standard Battery of 10 tests and an Extended Battery of 10 additional tests. The WJ-III is designed to be tailored for people of all ages, from 2 to 90+ and a relatively short testing time (approximately 5 minutes per test).

Suwanvichit (2003) undertook a study on Construction and Standardization of Verbal and Non-Verbal Group Test of Intelligence for Southern Thai Students belonging to Age Group 14-17. The total number of the respondents (students) was 6,995. The multi stratified random sampling method was applied for selection of the sample. The test contains two sections; (i) Section I (Verbal Test), it contains three parts i.e. (1) Verbal Ability Part, (2) Reasoning Ability Part and (3) Numerical Ability Part, and (ii) Section II (Non-verbal Test), it contains two parts i.e. (1) Information Ability Part and (2) Reasoning Ability Part. Out of 120, 76 items with example items in every part were finally selected for the inclusion in final form. Distractor analysis, Chi- Square, Item Difficulty and Item Discrimination were the major techniques used for the item analysis work. The reliability coefficients were ranging between 0.848 to 0.952. The concurrent and concept validity have been studied for the present test. The validity varies from 0.610 to 0.693 respectively.

Khan (2006) conducted a study on construction and standardization of a Verbal Group Test of Intelligence for the students of age group 14 to 16 years. The test consists of 60 items from four subtests: analogies, series (number & alphabetical), classification and word building. The test was administered on a sample of 10,000 children of the Province of Punjab and Islamabad. The reliability of test was determined by using split-half and Kuder Richardson methods. The values of correlations of all parts were 0.44, 0.39, 0.43 and 0.48 respectively.

Hashmi, Tirmizi, Shah and Khan (2011) undertook a study on Development and Validation of Intelligence Test for Grade Seven Students (Age Group 12-13 years). The theoretical base for prepareing the items of the test was from the Thurstone Model of Intelligence. He gives the following abilities: Perceptual ability(P), Numerical ability(N), Verbal(V), Memory(M), Reasoning ability(R), Spatial ability (S), and fluency in dealing with words (W). The total sample of the study consisted 9645 students derived from 335 schools including boys and girls from four divisions of Punjab, Pakistan. Finally, the test comprises 60 items which were selected through item analysis. Each of the tests contains 12 items. High degree of correlation between each test and total test confirmed the overall coherence of the test. The reliability of the test was established by using the Kudar Richardson‘s formula KR#20 and KR#21.

Hussain, Jamil, Siraji and Maroof (2012) undertook a study on Development and Standardization of Intelligence Test for Children. The study was delimited to only 600 children’s of age group 6 to 11 years. Two statistical techniques i.e. difficulty level and discrimination index were used for item analysis. Following were the major conclusions of the study: (1) The items with discrimination index zero or below were rejected. These items were 1, 29 in test of age level six. 33, 36, and 42 in test of age level seven. 9, 15,24,27,33 and 40 in test of age level eight. 4,7,47 and 50 in test of age level nine and 3,42 in test of age level ten. (2) As the total number of items with difficulty level above 84% were 93. This depicts that 31% items in the test were very easy. (3) As the total number of items with difficulty level below 16% were 5 in all tests. This shows that very difficult items were very few ones. (4) As most of the items fall in discrimination index range 16% to 84%, this shows that these items are good discriminators.

3-3 Studies Conducted in India

Jalota (1951) standardized a Group Test of Intelligence (Verbal) in Hindi and revised it in 1963. It is known as Samuhik Manasik Yogyata Pariksha. The test contains 100 items from the following areas as (i) Vocabulary—Similar, (ii) Vocabulary—Opposite, (iii) Number series, (iv) Classification, (v) Best answer, (vi) Influence, (v) Analogies etc. Time allowed for attempting the test was twenty minutes. The test is applicable to male and female students of classes 8 to 11 and age group 12-16 years.

Bureau of Psychology (1953) developed a Verbal Group Test of Intelligence for 12 plus primarily for male students of class VII. The test was standardized on 1970 twelve year old children reading in 69 junior high and higher secondary schools of the state of Uttar Pradesh. Reliability coefficient of the test was calculated by split-half method and correlated by Spearman-Brown formula on the basis of random sample of 100 scripts. It was found to be 0.97 corresponding to a standard error of 2.52 points for a child's IQ into various groups has been provided.

Desai (1954) undertook a study on the topic entitled "The Construction and Standardization of a Battery of Group Tests of Intelligence in Gujarati for the Age-Group 12-18 Studying in Standards VII to XI of Secondary Schools. The subtests included in the tests were: following directions, opposites, disarranged sentences, proverbs, reasoning, number sequence, analogies, similarities, narrative completion, memory and suggestibility, synonyms and antonyms, classification, arithmetical problems, geometrical figures, family tree, arranging in alphabetical order-imagery tests, code language or foreign language tests, mirror image, and general information. The test was standardized on a sample of 9525 (4755 boys and 4770 girls) students from various classes of Gujarati medium schools with a time limit of 70 minutes. The coefficients of reliability found by split half and test-retest methods were 0.77 and 0.88 respectively and that for the whole test by Spearman-Brown formula was 0.94. Internal validity coefficients were found to vary from .503 to .845. The findings of the study revealed that as regard to sex, the VII grade girls scored much lower than the boys of the same class. No difference was found in intelligence up to the age of 14 due to sex but after that age, girls were found to be a bit better.

Bureau of Psychology (1955a) constructed and standardized a Verbal Group Test of Intelligence for assessing the intelligence of school going population particularly in Uttar Pradesh in the Age Group of 13+. The test consists of 100 items. The test was standardized on 1000 students from 27 higher secondary schools of five educational regions of Uttar Pradesh. Distribution of scores was found to have a mean of 28.96.

SD. 19.8 and median value 25.12. Distribution was thus found to be positively skewed (+.86) and this skewness being highly significant.

Bureau of Psychology (1955b) constructed and standardized a Verbal Group Test of Intelligence for assessing the intelligence of school students particularly in the age group of 14+. The test was standardized on 952 fourteen years old boy students reading 27 higher secondary schools of Uttar Pradesh. The mean of the distribution of the raw scores was found to be 34.19 and SD. 20.03. Distribution was thus found to be positively skewed for which it was designed so as to discriminate better at middle and higher levels of intelligence. For standardizing the test, the mean of IQs was kept 100 and S.D. 15. The reliability coefficient of the test was calculated by split-half method and corrected by Spearman-Brown formula. It was found to be 0.96.

Pillai (1955) conducted a study on "Preparation and Standardization of a Test of General Mental Ability in Malayalam for School Children". The test was standardized on a sample of 2000 students. The sample included urban and rural, boys and girls of all age groups from upper-middle through lower social strata representing the Malayalam speaking students. The test consists the following seven subtests: similar, opposites, number series, classifications, best answers, reasoning and analogies. All the seven subtests were found to be highly saturated with 'g'.

Central Institute of Education (CIE) Delhi (1957) undertook a study with the aim of constructing an individual scale of intelligence in Hindi for the age group of 3 to 16 and above. The test was administered to a random sample of 1436 (712 boys and 724 girls) school children of 50 schools in Delhi Metropolis. Mental ages for each age group were taken to represent the total score on the test. The statistical technique of correlation i.e. biserial r's were calculated for tests allocated to a particular age and also for the ones preceding and succeeding. The scale consisting of valid items and having the criterion of internal consistency fairly fulfils the necessary conditions of a standardized test of intelligence.

Tandon (1957) undertook a study on “Revised Mental Testing (A Study of General Mental Ability with College Adults)”. The sample consisted of students of faculty of education, arts, science and engineering of Banaras Hindu University. The first revision of the test was conducted on 328 students. The Spearman-Brown split-half and K-R reliability coefficients ranged between 0.79 and 0.93. For the Second revision of the test was conducted on 1,099 unselected college adults. The reliability coefficients ranged between 0.84 and 0.99. The validity coefficients ranged from 0.51 to 0.82 and from 0.30 to 0.87 in both groups respectively.

Mehta (1958) conducted a study entitled “A Study of Intelligence of Rajasthan Children of Age Group 12-14 Years Reading in School Grades VII and above” to revise his own intelligence test constructed in 1949. The total sample consisted of 1605 (330 girls and 1275 boys) students. The split-half reliability of the test was found to be 0.79 and after employing the Spearman-Brown formula, it was found to be 0.93. The K-R formula gave a reliability coefficient of 0.91. Empirical validity coefficient for the tests with school marks was found to be 0.44. The results show sufficient ‘g’ saturation.

Central Institute of Education (CIE) Delhi (1959) developed a test for assessing general ability of school going children of age group eleven to fourteen years. It was an omnibus test in Hindi having a variety of items. The final form of the test consisted of 85 items distributed among the types of matching the rhyme, same or opposite, classification, numerical problems, syllogistic reasoning, analogies, essential thing, code, number series, best answer and synonyms. The test was standardized on a sample of 1214 (633 boys and 581 girls) randomly selected. The split-half reliability coefficient of the test was 0.97. The test-retest reliability coefficient ranged between 0.73 and 0.87. The validity coefficient for the test against the previous school examination marks was 0.42 for boys and that for girls was 0.33. The validity coefficient for the test against the teacher's estimate was 0.60.

Kapat (1960) constructed a Group test of intelligence in Bengali for children of grade V and VI. The test contains items on classification, analogy, series completion, synonym, antonym and practical judgment. The verbal part of the test had thirty-five items and the non-verbal part forty items. Altogether the test contains 75 items. Standardization of the test was done on 396 Bengali speaking children of five schools in Calcutta and its suburbs. The split-half reliability coefficient for different subtests ranged between .76 to .80. The validity coefficient of the test ranged from 0.32 to 0.70.

Pathak (1961) conducted a study on "Construction and Standardization of Group Intelligence Tests in Marathi for Ages 9 to 13". The final test consist of 116 items. The test was standardized on a sample of 10,738 boys and girls selected by employing random sampling technique from 36 primary and 22 secondary schools in Bombay, Puna, Ratnagiry, Thana and Surat. The reliability of the test by test-retest method was found to be 0.89. Validity of the test against Kamat's Individual Intelligence Test was found to be 0.74.

Joshi (1961) undertook a study on the topic entitled "Construction and Standardization of a Group Test of General Mental Ability in Hindi for School and College Students". The verbal spiral omnibus group point scale type test was chosen to be the test format. The test was standardized on students of grades VIII to XII. The final form of the test consisted of 87 items. The reliability coefficients found to be ranged from 0.81 to 0.86 for different class levels and between 0.84 and 0.90 for the different age levels and all the seven sub-tests were found to be highly saturated with 'g'. Construct validity coefficient was found to be 0.88.

Pandey (l961) conducted a study on the Preparation of a Standardized Group Test of General Mental Ability for School Going Students in Nepal. The test consists of seven subtests viz., synonyms, antonyms, number series, classification, best answers, reasoning and analogies. The test was standardized on 2,694 students of Nepali speaking children representing different social strata of Nepal. The reliability coefficients were calculated with K-R formula 21. The reliability coefficients for ages 13, 14 and 15 were 0.89, 0.83 and 0.87 respectively. The 'g' factor loading on various elements of the test ranged between 0.541 to 0.761 respectively. The study found that students reached their maximum level of intelligence at the age of sixteen and remained almost constant till the age of eighteen.

Bhatt (1962) construct and standardise a scale for Gujarati pupils of standards V, VI and VII suitable to the exigencies of the urban, semi-urban and rural cultures. The test was verbal and nonverbal in nature and standardized on a sample of 9822 (5173 boys and 4649 girls) students drawn from fifty eight schools of three cities, seventeen towns and thirteen villages. The reliability coefficients of the test was computed by K-R formula, split-half method, Gauttman's formula and Rulon's formula were 0.93, 0.91, 0.97 and .98 respectively. The congruent validity of the battery was estimated by correlating IQs on the present test with those obtained on the other intelligence tests. The correlation of this test with Shukla's adaptation of the Stanford Binet Intelligence scale, Desai's Group Test of Intelligence and Joshi's Group Test of General Mental Ability was found to be 0.819, 0.880 and 0.683 respectively. The findings of the study revealed that i) the data for the age groups of 9, 13, 14 and 15+ were found to be truncated; ii) the increase in the mean scores of age groups from 9 to 10 years was less than that from 10 to 11 years; and iii) there was no significant rise in the mean score at the age of 13 and it decreased during the subsequent years.

Hundal (1963) constructed and standardized a Verbal Group Test of General Mental Ability for the Panjabi Speaking School Children of Age-Group 13-17 years. The final test was administered on a random sample of 1,882 students from grades VII to XI of age group 13 to 17 years selected from the schools in the Punjabi speaking areas of the Panjab. The reliability coefficients found by test-retest method ranged from 0.87 to 0.90 for different grades; and that by split-half method they were around 0.95. The validity coefficient against academic achievement score was 0.83.

Singh (1963) conducted a study on "Preparation of a Standardized Group Test of General Mental Ability for School going Children in Panjab". Singh's group test of general mental ability was mainly the adaptation of the Jalota's General Mental Ability Test in Hindi. Out of seven subtests, five were taken from Jalota's scale and other two were of vocabulary, synonyms and opposites. The test was standardized on a sample of 2,985 school going students of classes VIII to X from 25 different schools of various cities in Punjab. The reliability coefficient found by split-half was 0.93 and the validity coefficients for the test was found by correlating the scores with school marks which ranged from 0.41 to 0.50 for grades VIII to X. The validity coefficient of the test with a Hindi group test of intelligence was found to be 0.63.

Mallin (1964) undertook a study with the objective to prepare an Indian Adaptation of Wechsler's Intelligence Scale for Children. The verbal tests were administered principally in Nagpur, Bombay, Simla and Mangalore. 656 children were selected as a sample for standardization of the test of age group ranging from 6 to 15 years from urban schools. The reliability coefficients of the Wechsler's Intelligence Scale for Children as found out by test-retest method for verbal scale, performance scale and for full scale were 0.92, 0.93 and 0.91 respectively. The validity of the test against ratings against teachers', Draw-a-Man Test and The California Test of Mental Maturity was found to be 0.61, 0.71 and 0.63 respectively.

Agnihotri (1965) conducted a study on "Construction and Standardization of Verbal Group Intelligence Test for the Age Group Eleven Plus in Madhya Pradesh". The final tryout of the test was on 2000 (1,520 boys and 480 girls) students from 57 (42 boys' and15 girls') schools. The test consisted of 100 items on classification, analogies, essentials, opposites, sentence completion, number series, arithmetical problems, disarranged sentences and following directions. The tests were in Hindi. The reliability coefficient worked out by using Kuder-Richardson formula was .94. The validity was established by correlating the test scores with the class teacher's ratings on a five point scale; the validity coefficient was 0.63. Norms were prepared on the basis of Age Allowances method. The time required for administration of the test was forty-five minutes.

Kaul (1966) constructed and standardized a Verbal Group Test of Intelligence in Kashmir State (Age-Group 12+ to 16+). The test consists of seven subtests viz., opposites, similarities, classifications, analogies, problems, number series, and jumbled sentences. There were 148 items in the test with a time limit of 100 minutes. The test was standardized on a sample of 5,872 pupils of age group 12+ to 16+ drawn from 31 schools of three districts of Kashmir. The reliability coefficients by split-half and test-retest method was found to be 0.94 and 0.90 respectively. The correlation coefficient of the test score with teachers' estimates, validity coefficient was found to be 0.52 and that with the Raven's Standard Progressive Matrices it was 0.77. The study revealed that there was an increase in the mean scores with age. Further, it was found that with the exception of age group from 12 to 13 other groups showed a constant rise in intellectual growth.

Patel (1966) constructed and standardized a Group Test of Intelligence (for the Children of Age-Group 13-16). The test included verbal and figural items covering five factors viz., reasoning, perceptual memory, numerical and spatial relations. The test consists of 100 items. The test was standardized on a sample of students in the age range 13 to 16 studying in grades VIII to XI of schools in Gujarat. The reliability coefficient of the test by test-retest and split-half method was found to be .87 and .99 respectively. Concurrent validity of the test was found to be 0.75. The validity against the teachers' estimates of intelligence was found to be 0.65.

Ahuja (1966) constructed and standardized a Group Test of Intelligence in English for the Age-Group 13 to 17 years studying through English medium in the secondary schools of Greater Bombay. The test comprises eight subtests viz., analogies, classification, arithmetic reasoning, best answer, comprehension, following directions, vocabulary and series. The test was standardized on 10,132 students of both genders (boys and girls) selected by employing the method of stratified random sampling technique from 53 schools. The coefficients of reliability as calculated by test-retest method and split-half method were .84 and .97 respectively. The validity coefficients obtained by comparing the test results with scholastic marks and teachers' judgements were found to be .53 and .61 respectively. The validity coefficients found against other tests of intelligence varied from .55 to .80.

Chatterji and Mukherjee (1967) undertook a study which aimed at developing a test which would measure verbal ability through a nonlanguage or language fair medium. The test was administered to about 1075 students of class VIII belonging to thirteen different schools of Calcutta. The test consists of four parts viz., classification, opposites, analogy and picture arrangement. The revised items were arranged on the basis of their difficulty values separately for the four parts of the NLTVI. The final test was administered on the students of class VIII of randomly selected three boys' and three girls' schools of Calcutta which had Bengali as the medium of instruction. The reliability coefficients (K-R formula 21) were 0.64, 0.69, 0.76 and 0.79 for all the four parts of the test. The validity coefficients were calculated against the total annual school examination marks. They ranged from 0.22 to 0.64 with a median of 0.38.

Oak (1967) constructed and standardized an Omnibus self administering battery of group test of intelligence in Marathi. The final form of a test consists of 95 items arranged in an omnibus spiral form. The number of items included in the each subtests were 12 in classification, 6 in opposites, 12 in similarities, 15 in series, 11 in arithmetical reasoning, 14 in logical reasoning, 15 in analogies and 10 in following directions. The test was administered to 7, 946 (4350 boys and 3596 girls) students of classes VII to XI age group 11+ selected randomly from 18 schools of Bombay city. The stability and internal consistency coefficients were found to vary from 0.84 to 0.93 and 0.88 to 0.94 respectively. Validity coefficient against teachers' judgement and annual examination marks for each school separately (predictive validity) were found sufficiently high.

Ahuja (1969) undertook a study on Construction and Standardization of a Group Test of Intelligence in English for the Age-Group 9 to 13 years which would have a predictive value for scholastic aptitude too. The final form of the battery was scrambled words, analogies, classification, disarranged sentences, same-opposites, series and best answers. The test was standardized on 10,373 students by employing the method of random sampling technique from 53 schools of 40 different postal zones under Greater Bombay. The coefficients of reliability as calculated by test-retest method and split-half method were .852 and .943 respectively. The validity coefficients obtained by comparing the test results with examination marks and teachers' judgements were found to be .494 and .491 respectively. The validity coefficients found against other tests of intelligence were .56 and .73 respectively.

Bhatt (1969) undertook a study to make a revision of the Desai's Group Test of Intelligence for grades VII to XI, originally standardised by K.G. Desai in 1951. The test comprises ten subtests i.e., following directions, opposites, disarranged sentences, classification, meanings of proverbs, number sequence, analysis, differentiation, arithmetical reasoning and verbal reasoning. The final version of the test comprised 100 items of which 45 items were retained and modified from the original Desai's Group Test of Intelligence. The test was finally administered on a sample of 2003 (1106 boys and 897 girls) student (grades VIII to XI) from the schools selected by stratified sampling method. Reliability coefficients as determined by split-half and test-retest methods were found to be 0.86 and 0.84 respectively. The concurrent validity of the test was estimated by correlating the IQs on the present test with IQs on three other tests viz., the Desai Group Test of Intelligence, the Bhatt's Group Test of Intelligence, and the Bhavsar's Non-verbal Group Test of Intelligence. The validity coefficients with these three tests were found to be 0.77, 0.65 and 0.69 respectively.

Bora (1969) developed an Omnibus type verbal group test of intelligence in Assamese for pupils of classes VII to X of schools in Assam. The test items were based on foreign tests like the Otis Group Test of intelligence, the Pressey Group Point, the Army Alpha Test, the Terman Group Test of intelligence and the Thorndike Intelligence Examination. The test was administered on 1193 girls and 2028 boys of Greater Guwahati areas. The test re-test reliability coefficient was 0.94 and by K-R formula 20 was 0.89. The split-half reliability coefficient varied from 0.91 to 0.96 for different classes. The coefficient correlation of scores on the test with Hermon-Nelson Tests of Mental Ability, Grade Nine to Twelve, Form A, 1957 was found to be 0.73.

Trivedi (1969) conducted a study on “Standardization of Culture Free Test of Mental Ability for Assam” to meet the need for one common empirical device for the measurement of intelligence in a multilingual state. The present test proposed to assess the general intelligence of students of grade X in Assam. The final form of the test contains 107 items in all. The investigator made a cluster sampling having stratification on the basis of mother tongue. The test was standardized on 1,310 pupils of class X from different schools chosen at random from eleven districts of the state. The reliability coefficient of the test on Gulliksen’s formula ‘16’ was found to be 0.911. The validity coefficients of the test were obtained by correlating it with NIIP70/23 Nonverbal Group Test of Intelligence, London and with Group Test of Intelligence produced by the Department of Education, Gorakhpur University. The computed values of Pearson’s product-moment correlation coefficients were found to be 0.86 and 0.62 respectively.

Bhatt (1970) undertook a study with aimed at Adapting Wechsler Intelligence Scale for Children (WISC) for Gujarati Population for the age groups from five plus to fifteen plus. The scale was standardised on a sample of 440 (220 boys and 220 girls) children of Ahmedabad city drawn from 12 schools of age groups from 5+ to 15+. The WISC consists of 12 subtests viz., information, comprehension, arithmetic, similarities, vocabulary, digit span, picture completion, picture arrangement, block design, object assemble, coding A&B and mazes. The reliability coefficients by split-half, test-retest method for verbal score were 0.90 and 0.98 respectively and for performance score, test-retest coefficient was 0.97 and for null score, it was 0.99. Validity was found out by using seven well standardised intelligence tests of Gujarat, school marks, teacher's ratings and speed and accuracy tests. The validity coefficients against the Standford-Binet Intelligence Scale, the Desai's Group Test of Intelligence, the Bhatt's Group Test of Intelligence, the Desai-Bhatt's Group Test of Intelligence, the Shah's Nonverbal Group Test of Intelligence, Draw-a-Man Test, and the Bhavsar's Nonverbal Group Test of Intelligence were found to be 0.653, 0.729, 0.701, 0.679, 0.499, 0.484 and 0.546 respectively.

Yadav (1970) undertook a study on development of an Intelligence Scale in Hindi for Children in the age group 8 to 12. The scale consists of five individual tests viz., information, comprehension, arithmetical problems, similarities and vocabulary. Tryout was conducted on a stratified sample of 210 children selected from Delhi schools. Reliability of comprehension and similarity tests was estimated by the Cronbach's general formula, whereas in the case of information, arithmetic problems and vocabulary tests, K-R formula 20 was used. The reliability coefficients for the different subtests ranged from 0.80 to 0.93. Tests in the constructed scale were validated by construct validity approach and analysis of variance approach. The validity coefficients were highly significant ranging from 0.51 to 0.66.

Patel (1970) constructed and standardized a Test of Intelligence. There are 80 items in the test with four subtests viz., series, synthesis, analogy and classification. The test was standardized on a sample of 4471 students of grades VIII to X, of age group 14 + to 16 + selected randomly from 70 schools. The test-retest, split-half, K-R and various other methods were applied to estimate the reliability of the test which varied between 0.82 and 0.97. The validity of the test with school marks was 0.54. Concurrent validity coefficients ranged from 0.65 to 0.80 when measured against other local verbal and nonverbal tests of intelligence.

Shah (1971) conducted a study on adaptation of the Stanford-Binet Intelligence Scale (1960 revision) for the Gujarati Population. Before translating the test forms from English to Guajarati, the items of the each test were critically studied. For final tryout a stratified sample was taken into consideration. The provisional final scale was administered individually to 400 subjects of the standardization group. The reliability coefficients of the test by test-retest and average difference method were found to be 0.95 and 0.96 respectively. Validity coefficients of IQs with teachers' estimate of intelligence and annual examination marks were 0.56 and 0.49 respectively.

Pillai (1978) constructed and standardized a Verbal Test of Intelligence in Tamil (for the age group 10+ to 15+). For final administration of the test a sample of 5,000 pupils were selected from 34 schools out of the 14 districts of Tamil Nadu by using stratified proportionate sampling technique. The test comprises seven subtests namely; synonym, antonym, analogy, classification, mixed words, reasoning (verbal) and reasoning (numerical). The final test comprises 110 test items. The test-retest and split-half reliability was found to be 0.84 and 0.88 respectively. The content validity was considered on the basis of various types of behaviour assessed by the subtests. Norms were determined in respect of the total sample, grades and age groups. The study revealed the differences in the means for pupils in respect of combinations of different grades and different age groups (10+ to 15+).

Thakur (1979) conducted a study with the major objective to construct and Standardize a verbal group test to measure the general mental ability of students reading in Classes V to VIII of Assamese medium High and Higher Secondary Schools of Upper Assam. The test comprises seven subtests- logical selections, analogies, number series, synonyms-antonyms, proverbs, classifications and best answers. Finally, after item validity index, item discrimination index and effectiveness of item distracters 100 items selected for the test. The final version of the test was administered to 5,282 (3,039 boys and 2,243 girls) by employing a stratified random sampling technique. The reliability coefficients obtained by test-retest, split-half and rational equivalence methods for the total sample and for the different classes of boys and girls separately were found to range from 0.89 to 0.97. Standard errors of measurement varied from 4.58 to 4.74. Content, construct and concurrent validity were established and the obtained validity coefficients were found to range between 0.41 to 0.88. The 'g' saturation values calculated for seven different elements were too high to assume that there was sufficient closeness between the elements used in the sub-tests. The 'g' saturation obtained for all the seven subtests ranged from 0.39 to 0.90, which revealed the existence of a general mental ability factor.

Patel (1981) undertook a study on a topic entitled “Construction and Standardization of General Ability test for Standards XI and XII” with the main objective to develop a non-reading test of general mental ability for Gujarati speaking students of higher secondary schools of Gujarat state. The test consists of two parts. Part One tested the student's familiarity with the world around him through his experience in home, school and community. There were test questions in various fields of Indian culture, science, social science, community affairs and arts. Part Two avoided any culture content. It presented geometry drawings designed to test the student's power of abstract reasoning. This part of the test presented an equal challenge to all students regardless of their cultural background. The total sample comprises 5,725 students studying in the higher secondary schools of Gujarat state. The coefficient of reliability ranged between 0.71 and 0.87 by different methods. The validity coefficients of the test with other tests of intelligence were 0.68 and 0.79. It is observed that the test was heavily loaded with 'g' factor. Age norms and grade norms were established and deviation IQs and percentiles for the test were computed.

Shah (1981) undertook a study entitled to Construct and Standardize a Verbal Reasoning Test for Students of Standard VI and Standard VII in Saurashtra. 72 strata, according to sex, grade, area and district, were decided for the sampling procedure. The final test was administered to 9,382 students of 200 different schools of 118 different places in Saurashtra. The reliability of the test was established by test-retest method, split-half method, Rulon formula, K-R and Flanagan formula. The reliability coefficients of correlations were found to be 0.88, 0.89, 0.86, 0.92 and 0.84 respectively. The three types of validity established were congruent validity (0.72 and 0.52), concurrent validity (0.88 and 0.80) and predictive validity range from (0.22 to 0.36). The findings of the study further revealed that differences in sex, grade area (rural vs. urban) were significant.

Bhat (1981) standardized a Verbal Reasoning Test for Students Studying in Grades VIII and IX of Secondary Schools in Saurashtra Area. The main objectives of the study were: i) to construct and standardize a verbal reasoning test in Gujarati, ii) to check the significance of difference between subgroups based on sex, region and grades, and iii) to prepare norms for boys and girls, separately. The total sample of study comprised 5,449 students from 96 different schools of 62 different places of Saurashtra region by the stratified random sampling technique. The items were constructed on the lines of the DAT. The final form of the test contains 60 items. Reliability was established by test-retest, split-half, and Kuder-Richardson formulas 20 and 21. The reliability coefficients of the test were found to be 0.82, 0.93, 0.91, and 0.82 respectively. Validity of the test was established by correlation with other intelligence tests and aptitude tests. The findings of the study revealed that i) The means of boys and girls of Grade IX were higher than those of Grade VIII ii) The means of boys were higher than those of girls in Grades VIII and IX and in the total sample.

Rathor (1983) constructed and standardized a group test of intelligence in Oriya for the children of age group 8 + to 12 + and to compare the intelligence of tribal and non-tribal students of Orissa. The verbal form of the test contained seven parts, namely, general information, arithmetic problems, logical reasoning, verbal comprehension, numerical series, verbal relations and vocabulary. The non-verbal form included seven components like similarities, figure analogies, seeing the opposites, classification, progressive series, story sequences and matrices. After item analysis 85 items were included in the verbal test and 64 items in the non-verbal test. For standardization purposes, 2500 students studying in classes IV to VIII of Orissa state were taken. The split-half reliability of the test varied from 0.84 to 0.94 in the verbal test and 0.78 to 0.83 in the non-verbal test for different age groups. The KR-21 reliability coefficients ranged from 0.80 to 0.91 for the verbal test and from 0.79 to 0.85 for the non-verbal test. The test-retest reliability coefficient over one month of time varied from 0.78 to 0.88 for different age group students. The validity coefficients of the test against Cattell's CFIS-2 Form A, ranged from 0.50 to 0.75 and 0.63 to 0.76 for the verbal and the non-verbal tests respectively. With Raven's Coloured Progressive Matrices, the validity coefficient varied from 0.64 to 0.71 and 0.61 to 0.70 for verbal and non-verbal tests respectively. The factors identified for the verbal test scores were a general factor, numerical ability, verbal ability and verbal reasoning. The factors for the non-verbal test were a general factor, perceptual reasoning ability, and perceptual comprehension ability. The findings of the study revealed that the tribal and non-tribal students' were equal in intelligence and the boys were more intelligent than the girls.

Mishra (1984) constructed and standardized a verbal group test of intelligence for the age group of 12 to 15 years' students in Oriya. The final try out test constituted of 100 test items of seven item areas in five sub-test forms. The reliability of the test was estimated by using Split-half reliability method, Test-Retest reliability method, Parallel form reliability method and Inter-item consistency method. The split-half reliability indices were reported for a sample of 340 pupils taken from different levels of 12+ to 15+ for each form of test was found to be 0.89 and 0.90 for Test form "A" and "B" respectively. The Test-Retest reliability was estimated for a sample of 310 students of the appropriate age range for different forms of the test was found to be 0.79, 0.81 and 0.80 for Test form "A", "B" and "both A & B" respectively. The Parallel form reliability indices reported age wise each with a sample of 500 students were estimated for age group 12+, 13+, 14+, 15+ and mixed group were found to be 0.74, 0.77, 0.73, 0.78 and 0.76 respectively. The inter-item consistency reliability coefficients by the use of KR 21 formula were reported for all the four age levels and for various test forms. In case of Test form "A" the indices range from .84 to .87, Test form "B" from .82 to .86 and of the both the forms taking together .90 to .92 respectively. The validity of the test was estimated by using Concurrent validity and Construct validity. The concurrent validity has been estimated by correlating the test scores with the scores obtained by Raven's Standard Progressive Matrices, Cattell's Culture Fair Intelligence Test and Academic Achievement Scores. The estimated validity coefficient of correlation are .73, .52 and .55 with SPMs .63, .58 and .55 with Cattell's Test and .58, .55 and .56 with the scores of academic achievement. The construct validity has been reported through a measure of internal consistency with the help of internal correlation indices among various sub-tests of the Test forms. These indices were found to be as low as .27 and high as .78.

Nair (1984) conducted a study on a topic entitled "Construction and Standardization of a Battery of Tests for Measuring Intelligence of Indian Children between the Age Group Two Months and Six Years". The method of simple random sampling was used for the selection of the sample. The study was conducted on 1084 (529 girls and 555 boys) children from 16 schools in the city of Bombay. Different problems of thinking and reasoning, viz., classification, mixed sentences, sentence completion, etc. involved in the test. The age norms, grade norms and validity of the test were established. Percentile ranks, stanine scores, sigma scores, standard scores, T-scores, standard deviation, mean correlation coefficient and standard error we computed. The reliability of the tests was calculated the spilt-half method using the Spearman-Brown Prophecy Formula, Rulon's Formula and K-R 21 Formula. The coefficients of reliability as calculated by the above formula ranged from 0.75 to 0.89. The main findings of the study found that on comparing the mean I.Q.s of girls and boys belonging to four different age groups, the mean I.Q. of the girls was slightly higher than that of the boys while in the remaining three, it was lower. The mean I.Q. of the total sample of girls was also slightly higher than that of the boys.

Mishra (1985) Constructed and Standardized of a Verbal Group Test of Intelligence in Oriya for the Age Group 12+ to 15+. The item areas of the test were verbal analogy, verbal reasoning, vocabulary, general information, and numerical relations. The final test was standardized on the sample of 2000 boys and girls chosen on a stratified random basis. Split-half, test-retest and other reliability coefficients were calculated for determining the reliability of the test. Age norms, percentile norms and other norms were calculated. The study resulted in developing a verbal group test of intelligence in two parallel forms. The test had five sub-test areas of 50 items and required 30 minutes for administration in the classroom situation using answer sheets. The reliability indices were split-half 0.89 and 0.90, test-retest: 0.79, 0.81, 0.80, age-wise parallel form: 0.74, 0.77, 0.73, 0.78 and K.R. Reliability Form A: 0.84 to 0.84, Form B: 0.82 to 0.86, and whole 0.90 to 0.92. The concurrent validity with Raven's Standard Progressive Matrices were Form A: 0.73, Form B: 0.52 and whole: 0.55. The concurrent validity with Cattell's Culture-Fare Test Form Scale 11 was 0.63, 0.58 and 0.58 for forms A, B, and whole test respectively. The factors identified through factor analysis were general reasoning and verbal comprehension.

Veerabhadraiah (1985) conducted a study with a main objective to construct and standardize a Verbal and Non-Verbal Group Test of Intelligence for Kannada Pupils of Standards V, VI and VII in the Age-group 10 to 13 + with special reference to the Karnataka State. The final test consists of four verbal and four non-verbal sub-tests was administered to 3250 boys and an equal number of girls drawn from 50 government and private schools as well as from rural and urban areas of 11 districts of Karnataka. Sets of norms as Deviation IQs with a mean of 100 and SD of 15 were presented for ages 10 to 13 years 11 months at half-year intervals. The reliability of the test was measured by test-retest methods (two months' interval, r=0.88) and split-half method (r=0.97). The test was validated against (i) total marks obtained in the preceding annual examination (r=0.64), (ii) teachers' estimate of intelligence (r=0.59) and (iii) M.G. Premalatha's non-verbal tests (r=0.58). Correlation between verbal and non-verbal sub-tests was found to be 0.71 and internal consistency of tests was found out by canonical correlation method using Hotelling's Principal Component Method. The test was analysed factorially and eight factors were extracted. As subsequent studies, relation between the occupation of parents and the intelligence of children was found out (r=0.41), and relation between caste and intelligence was studied (r=0.24).

Banmalidas (1987) conducted a study on Construction and Standardization of a Scientific Aptitude Test in Oriya for the 10th Class Students of Orissa. The final form of the test battery had 215 items in total whereas the area of general intelligence had 35 items, reasoning ability 48 items, operational ability 40 and scientific knowledge had 92, items. The reliability coefficients for the four components were 0.81, 0.91, 0.92 and 0.80 respectively. The validity of the test battery for making predictions was computed on the achievement scores of science and mathematics. The four sub-tests correlated significantly with science and mathematics achievement scores and the correlation coefficient ranged from 0.29 to 0.81. The norms were established on the basis of standard scores with a mean of 50 and SD of 10.

Khire (1989) conducted a study on construction of a battery of tests based on Guilford's SOl model. The main reason for conducting this study was in spite of assembling a wide variety of intelligence tests, many individual abilities remain outside the scope of measurement and many intelligence tests are not based on strong theoretical foundations. Around 4,322 subjects were considered for item analysis study and 15,411 were considered for the normative study. Effective sample size for each test ranged from 48 to 151 in item analysis study and 248 to 512 for the development of final versions. Various statistical techniques used in the study included point bi-serial correlation, pass percentages, G index of agreement, 'd' score ANOVA and 't' test. The statistical analysis for internal consistency included split-half and rational equivalence. Further, the factor analysis by principal component method and varimax rotation were also used on 196 students of grade IX boys from two schools. The indices of internal consistency and homogeneity were mostly satisfactory. Test-retest correlations ranged widely, were lower for tests of memory and higher for those of symbolic and semantic content and cognition. Test-retest correlations for composite score from a single content operation category were higher than those for individual product tests. The sex difference was not always consistent and significant.

Tarini (1994) constructed and standardized a verbal and Non-verbal Group Test of Intelligence for students of classes IX and X. The test was administered on 4500 students, 2700 boys and 1800 girls. The test constituted of four subtests viz. words, classification, word analogy, best answer and test reasoning. The Reliability coefficients of Test-Retest, split-half and rational equivalence were found to be 0.78, 0.85 and 0.91 respectively. The external validity coefficients against SEM as 0.50 against VRT as 0.84 and against VNART as 0.87. The internal validity of test with split-half reliability coefficient was found to be 0.92. Norms were established on the basis of Z-Score for male and female separately.

Awasthy (2005) developed and standardized a Mental Ability Test for School Children (12-17 Years) which include verbal and non-verbal stimuli. The sample consisted of 600 school boys of which 200 boys were used for the actual try-out of the verbal and non-verbal mental ability tests, 200 were used for establishing the reliability index, 100 were used for establishing the validity index and another 100 boys were used for the establishment of norms which was done for the age group of 15-17 years. Kuder-Richardson formula 20 was used for establishing the reliability of the tests. The reliability index for verbal mental ability test was .84 and .85 for the non-verbal mental ability test. For validity criterion Raven's Standard progressive Matrices (SPM) was used. The validity indices of the verbal mental ability test was .61 and .73 for the non-verbal test with SPM as the Criterion while it was .47 and .35

for the verbal and non-verbal tests respectively with academic performance as the criterion.

Lalhmingliana (2005) constructed and standardized a verbal Group Intelligence test in Mizo language for the age group 13 to 16+ years of Mizoram state. The test has 100 items and was administered or standardized on a sample of 3600 students. The coefficient correlation of split-half and K-R reliability were found to be 0.73. The split-half reliability of the test as a whole was found 0.84 by using Spearman-brown formula. The test was validated against the experts's opinions on rating scale. The Kuder-Richardson 21 reliability was found 0.82. The test score was correlated with two external criterion tests such as Ahuja's Group Test and Cattell's Culture Fairs Test of Intelligence and the validity of the test was studied.

Shylla (2010) constructed a verbal group intelligence test in the Khasi language for school going children of Meghalaya of the age group 14 to 16+. The test was standardized on a sample of 3000 students (1298 Boys and 1702 Girls). The re-test and split-half reliability of the test were found to be 0.86 and 0.89 respectively.

Pandya (2015) conducted a study on construction and standardization of Intelligence Test for Upper Primary Students of Gujarat State in Relation to Certain Variables. The sample was drawn by employing stratified random sampling method. The number of students taken as sample at pre-pilot try out were 60, for pilot try out 373 & for final try out 4414 studying in upper primary schools of different districts of Gujarat in the academic year 2009- 2010. The reliability of the test was calculated by test -retest and split half methods. The values of reliability coefficients vary from 0.85 to 0.96 which shows that the test is highly reliable. Validity of the intelligence test was estimated by following congruent validity method.

3-4 Summary of Reviews

A brief description of the research studies conducted in India and abroad for the development and standardization of intelligence tests is given below:

Studies conducted in Abroad		
Name of the Test/Study	**Author/Year**	**Description**
Binet and Simon	Binet and Simon (1905)	Simple 30 item test. Clinically useful, but poorly standardized
Binet and Simon	Binet and Simon (1908)	Longer than the 1905 version. Introduced a form of scoring with the concept of mental age. Still, poorly standardized
Binet and Simon	Binet and Simon (1911)	Version to include adults, but still a limited scale.
Stanford-Binet (1st ed)	Terman and Merrill (1916)	Introduction to the concept of IQ. Better standardization (N = 1,000 children and 400 adults). Emphasis upon verbal materials.
Stanford-Binet (2nd ed)	Terman and Merrill (1937)	First use of parallel forms - L&M. Better standardization; test contained 129 items.
Stanford-Binet (3rd ed)	Terman and Merrill (1960)	Parallel forms combined into a single form (L&M); modern item analysis methods deployed, extensive checks on item difficulty (N = 4,500 children). Still, more emphasis given on verbal items.
Stanford-Binet (3rd ed)	Terman and Merrill, Thorndike (1972)	Re-standardization of the Stanford-Binet (3rd Ed) on 2100 subjects
Stanford-Binet (4th ed)	Thorndike, Hagen, and Sattler (1986)	Complete restructuring of the rest into 15 subtests; excellent standardization (N = 5,013 persons ages 0-2 to 11-23).
Stanford-Binet (5th ed)	Roid (2003)	Five factors of intelligence. Measures intelligence of ages 2 to 85+
Wonderlic Personnel Test	Wonderlic (1936)	Used extensively as a screening device in employment situations for many years, and research indicates that it is a fair and valid selection device for a wide range of jobs; 50-item instrument based originally on the Otis Self-Administering Test of Mental Ability
Primary Mental Abilities (PMA) Tests	Thurstone (1938)	For use primarily at the high school level; the battery of tests consists of 11 tests, selected from the 60 tests tried out experimentally on 1154 pupils after using factor analysis.
Wechsler Bellevue	1939	Developed at Bellevue Hospital in New York with the objective of identifying psychotic and clinical disabilities. The test consisted of six verbal and five performance subtests
Wechsler-Bellevue II	1946	Designed to be an equivalent and alternate form of the Wechsler-Bellevue. The major limitation of this test was that it never got adequately standardised.
Wechsler Intelligence Scale for Children (WISC)	1949	A downward extension of the Wechsler-Bellevue II for children between the ages of 5 years and 15 years 11 months. Unfortunately, the standardization

		sample contained white population only
Wechsler Adult Intelligence Scale (WAIS)	1955	A restandardization of the Wechsler-Bellevue scale with some item revisions, for adults aged 16 years and above.
Wechsler Preschool and Primary Scale of Intelligence (WPPST)	1967	For children between the ages of 4 years and 6 years 6 months, the WPPSI was the first test to adequately sample racial minorities for the norms.
Wechsler Intelligence Scale for Children-Revised (WISC-R)	1974	A revision of the WISC, with updated items especially on Information, Vocabulary and Picture Completion. The new norms included black and other minorities in appropriate proportion. For children between the ages 6 years and 16 years 11 months.
Wechsler Adult Intelligence Scale-Revised (WAIS-R)	1981	Revised version of the WAIS, with 80 percent of the original items retained, norms updated, verbal and performance subtests alternated.
Wechsler Preschool and Primary Scale of Intelligence-Revised (WPPSI-R)	1989	Revised version of the first WPPSI scale with dated f and biased items eliminated, for children between the ages 3 years and 7 years 3 months. Object Assembly was added and the norms updated.
Wechsler Intelligence Scale for Children-III (WISC-III)	1991	Revised and renormed version of the WISC-R
Wechsler Adult Intelligence Scale-III (WAIS-III)	1997	Revised and renormed version of the WAIS and the WAIS-R. Provided scores for Verbal IQ. Performance IQ, and Full Scale IQ, along with four secondary indices (Verbal Comprehension, Working Memory, Perceptual Organization, and Processing Speed).
Wechsler Abbreviated Scale of Intelligence (WASI)	1999	Designed to meet the demand for a quick, reliable measure of intelligence in clinical, educational, and research settings. Provides scores for Verbal IQ, Performance IQ, and Full Scale IQ.
Measurement of Intelligence of Infants and Young Children	Cattell (1940)	From 2 to 30 months; the reliability of the test was calculated by odd-even number method and corrected by Spearman Brown formula.
Test of Mental Ability	Terman–McNemar (1941)	Grades 7 to 12; it consists of 7 sub-tests (verbal and non-verbal); it was a modification and replacement of the 1920 Terman Group Test of Mental Ability.
Kuhlman-Anderson Test	Kuhlman-Anderson (1963)	May be given in grades K-12; the test has verbal and nonverbal items and takes 50-75 minutes to complete.
School Ability Test	Otis-Lennon (1967)	There are seven levels of the OLSAT-8 (Kindergarten, Grade 1. Grade 2, Grade 3, Grades 4-5, Grades 6-8, and Grades 9-12); OLSAT consists of a variety of pictorial, verbal, figural, and quantitative items to measure Verbal Comprehension, Verbal Reasoning, Pictorial Reasoning, Figural Reasoning, and Quantitative Reasoning from kindergarten through grade 12
Scales of Infant and Toddler Development	Bayley (1969-2006)	Meant for children within the age range of 1 to 42 months; it consists of five scales; the Cognitive

		Scale, the Language Scale, the Motor Scale and the Social-Emotional Scale are 91, 48, 138 and 35 items respectively.
McCarthy Scales of Children Abilities (MSCA)	McCarthy (1972)	Ages of 2.5 and 8.5 years; it consists of 18 tests, giving the examiner multiple opportunities to observe the child's approach to a variety of problems and stimuli.
Tests of Mental Ability	Henmon-Nelson (1973)	For grades 3-6, 6-9, and 9-12; each level contains 90 multiple-choice items in spiral-omnibus form, with several types of verbal items
California Test of Cognitive Skills (TCS)	CTB/Mc Graw-Hill (1981)	Five grade levels (2-3,3-5,5-7,7-9,9-12); the test composed of four subtests: Sequences, Analogies, Memory and Verbal Reasoning
Cognitive Abilities Test (CogAT	Lohman and Hagen (1982)	CogAT is a multilevel test, with Levels 1 and 2 for grades K-3 and Levels A-H for grades 3-12; each level contains a Verbal Battery, a Quantitative Battery, and a Nonverbal Battery consisting of two to three subtests.
Kaufman Assessment Battery for Children (KABC)	Kaufman and Kaufman (1983a)	For 2.5 to 12.5 children; the battery yields four global scores: Sequential Processing, Simultaneous Processing, Mental Processing Composite (combining the first two) and Achievement
Differential Ability Scales (DAS)	Elliott (1990)	Four to six core subtests, from age 2 years 6 months through 17 years 11 months, are administered to each examinee; the DAS consists of 20 subtests, including 12 core subtests, 5 diagnostic subtests, and 3 achievement subtests.
Kaufman Brief Intelligence Test (KBIT)	Kaufman and Kaufman (1990b)	For ages 4 to 90 years; measure of verbal and non-verbal intelligence
Kaufman Adolescent and Adult Intelligence Test (KAIT)	Kaufman and Kaufman (1993c)	For ages 11 to 85 years or older; the battery is composed of a Crystallized Scale with subtests
Cognitive Assessment System (CAS)	Das and Naglieri (1997)	For ages 5:0 through 18:11; it yields five supplemental composite scores: Executive Function without Working Memory, Executive Function with Working Memory, Working Memory, Verbal Content, and Nonverbal Content.
Intelligence Test in Urdu language	Hashmi (2000)	For classes VI and VII of the age group 11+ to 12+; test was administered on a sample of 12,120 students, the test constitutes 10 sub-tests
A verbal group test of intelligence in Urdu	Hussain (2001)	For age group of 17-20 years; Test contained 128 items and it was standardized on 1080 candidates
Tests of Cognitive Abilities	Woodcock-Johnson (2001)	From 2 to 90+; this battery consists, in turn, of a Standard Battery of 10 tests and an Extended Battery of 10 additional tests.
Verbal and Non-Verbal Group Test of Intelligence for Southern Thai Students	Suwanvichit (2003)	Age Group 14-17; the total number of the respondents (students) was 6,995, out of 120, 76 items with example items in every part were finally selected for the inclusion in final form.
Verbal Group Test of Intelligence	Khan (2006)	Age group 14 to 16 years; the test consists of 60 items from four subtests: analogies, series (number & alphabetical), classification and word building. The test was administered on a sample of 10,000 children
Development and Validation of Intelligence Test	Hashmi, Tirmizi, Shah and Khan (2011)	Age Group 12-13 years; The theoretical base of the items is from the Thurstone Model of Intelligence; the sample included 9645 students, finally, 60 items were selected through item analysis,

		reliability and validity standards.
Development and Standardization of Intelligence Test for Children	Hussain, Jamil, Siraji and Maroof (2012)	Age group 6 to 11 years; Study was delimited to only 600 children

Studies conducted in India

Name of the Test/Study	Author/Year	Description
Group Test of Intelligence	Jalota (1951)	Classes 8 to 11 and age group 12-16 years; the test measures the verbal ability and it contains 100 items
Verbal Group Test of Intelligence	Bureau of Psychology (1953)	For 12 plus, primarily for male students of class VII; the test was standardized on 1970 twelve-year-old children
The Construction and Standardization of a Battery of Group Tests of Intelligence in Gujarati	Desai (1954)	For the Age-Group 12-18 Studying in Standards VII to XI of Secondary Schools; the test was standardized on a sample of 9525 students
Verbal Group Test of Intelligence	Bureau of Psychology (1955a)	Age Group of 13+; the test consists of 100 items and was standardized on 1000 students
Verbal Group Test of Intelligence	Bureau of Psychology (1955b)	Age Group of 14+; the test was standardized on 952 students
Test of General Mental Ability in Malayalam for School Children	Pillai (1955)	Boys and girls of all age groups from upper-middle; the test was standardized on a sample of 2000 students
Individual scale of intelligence in Hindi	Central Institute of Education (CIE) Delhi (1957)	Age group of 3 to 16 and above; Standardized on a sample of 1436 students
Revised Mental Testing (A Study of General Mental Ability with College Adults)	Tandon (1957)	For students and faculty of education, arts, science and engineering college/university students; first revision of the test was conducted on 328 students; for the Second revision of the test was conducted on 1,099 unselected college adults
A Study of Intelligence of Rajasthan Children	Mehta (1958)	Age Group 12-14 Years Reading in School Grades VII and above; revise his own intelligence test constructed in 1949, total sample consisted of 1605 students
Test for assessing general ability of school going children	Central Institute of Education (CIE) Delhi (1959)	Age group eleven to fourteen years; The final form of the test consisted of 85 items; standardized on a sample of 1214 students
Group test of intelligence in Bengali	Kapat (1960)	For children of grade V and VI; the verbal part of the test had thirty-five items and the non-verbal part forty items. Standardization of the test was done on 396 Bengali speaking children
Construction and Standardization of Group Intelligence Tests in Marathi	Pathak (1961)	For Ages 9 to 13; the final test consists of 116 items ;the test was standardized on a sample of 10,738 boys and girls
Construction and Standardization of a Group Test of General Mental Ability in Hindi	Joshi (1961)	For School and College Students; the test was standardized on students of grades VIII to XII. The final form of the test consisted of 87 items.
Preparation of a Standardized Group Test of General Mental Ability for	Pandey (l961)	For the ages 13 to 18; standardized on 2,694 students of Nepali speaking children

School Going Students in Nepali		
Construct and standardise a scale for Gujarati pupils	Bhatt (1962)	Pupils of standards V, VI and VII; standardized on a sample of 9822 students
Verbal Group Test of General Mental Ability for the Panjabi Speaking School Children	Hundal (1963)	Age-Group 13-17 years; administered on a random sample of 1,882 students
Group Test of General Mental Ability for School going Children in Panjab	Singh (1963)	Classes VIII to X; Singh's group test of general mental ability was mainly on adaptation of the Jalota's General Mental Ability Test in Hindi; standardized on a sample of 2,985 school going students
To prepare an Indian Adaptation of Wechsler's Intelligence Scale for Children.	Mallin (1964)	Age group ranging from 6 to 15 years; 656 children were selected as a sample for standardization of the test
Verbal Group Intelligence Test	Agnihotri (1965)	Age Group Eleven Plus; Final tryout of the test was on 2000 students, the test consisted of 100 items
Verbal Group Test of Intelligence in Kashmir State	Kaul (1966)	Age-Group 12+ to 16+; Standardized on a sample of 5,872 pupils, there were 148 items in the test with a time limit of 100 minutes.
Group Test of Intelligence	Patel (1966)	For the Children of Age-Group 13-16; the test consists of 100 items.
Group Test of Intelligence in English	Ahuja (1966)	For the Age-Group 13 to 17 years; Test was standardized on 10,132 students
Developing a test which would measure verbal ability through a nonlanguage or language fair medium	Chatterji and Mukherjee (1967)	Class VIII; the test was administered to about 1075 students of class VIII belonging to thirteen different schools of Calcutta.
Omnibus self-administering battery of group test of intelligence in Marathi	Oak (1967)	Classes VII to XI age group 11+; The final form of a test consists of 95 items arranged in an omnibus spiral form; the test was standardized on 7, 946 students
Group Test of Intelligence in English	Ahuja (1969)	Age-Group 9 to 13 years; Standardized on 10,373 students
Revision of the Desai's Group Test of Intelligence	Bhatt (1969)	Grades VII to XI; The final version of the test comprised 100 items of which 45 items were retained and modified from the original Desai's Group Test of Intelligence, administered on a sample of 2003 students
Omnibus type verbal group test of intelligence in Assamese	Bora (1969)	For pupils of classes VII to X; Administered on 1193 girls and 2028 boys
Standardization of Culture Free Test of Mental Ability for Assam	Trivedi (1969)	Grade X; Standardized on 1,310 pupils, the final form of the test contains 107 items in all.
Adapting Wechsler Intelligence Scale for Children (WISC) for Gujarati Population	Bhatt (1970)	Age groups from five plus to fifteen plus; Standardised on a sample of 440 (220 boys and 220 girls)
Development of an Intelligence Scale in Hindi	Yadav (1970)	Age group 8 to 12; Try-out was conducted on a stratified sample of 210 children selected from Delhi schools.
Test of Intelligence	Patel (1970)	Grades VIII to X, of age group 14 + to 16 +; there are 80 items in the test and was standardized on a sample of 4471 students
Adaptation of the Stanford-Binet Intelligence Scale	Shah (1971)	2 to 18+; Administered individually to 400 subjects

(1960 revision) for the Gujarati Population		
Verbal Test of Intelligence in Tamil	Pillai (1978)	Age group 10+ to 15+; Standardized on a sample of 5,000 students, the final test comprises 110 test items
Verbal group test to measure the general mental ability of students of Assamese medium schools	Thakur (1979)	Classes V to VIII; the final version of the test was administered to 5,282 students, 100 items selected for the test
Construction and Standardization of General Ability test for Gujarati speaking students	Patel (1981)	For Standards XI and XII; Standardization sample consisted of 5,725 students
Verbal Reasoning Test	Shah (1981)	For Students of Standard VI and Standard VII; final test was administered to 9,382 students
Verbal Reasoning Test	Bhat (1981)	For Grades VIII and IX; total sample of study comprised 5,449 students, the final form of the test consists of 60 items
Group test of intelligence in Oriya	Rathor (1983)	Age group 8 + to 12 +; after item analysis 85 items were included in the verbal test and 64 items in the non-verbal test, standardization purposes, 2500 students
Verbal group test of intelligence in Oriya	Mishra (1984)	Age group of 12 to 15 years; the final try out test constituted of 100 test items of seven item areas in five sub-test forms.
A Battery of Tests for Measuring Intelligence of Indian Children	Nair (1984)	Age Group Two Months and Six Years; Study was conducted on 1084 (529 girls and 555 boys) children
A Verbal Group Test of Intelligence in Oriya	Mishra (1985)	Age Group 12+ to 15+; Standardized on the sample of 2000 boys and girls, the test had five sub-test areas of 50 items and required 30 minutes for administration in the classroom situation
A Verbal and Non-Verbal Group Test of Intelligence for Kannada Pupils	Veerabhadraiah (1985)	Standards V, VI and VII in the Age-group 10 to 13 +; the final test consists of four verbal and four non-verbal sub-tests, administered to 3250 boys
Scientific Aptitude Test in Oriya	Banmalidas (1987)	10th Class Students; the final form of the test battery had 215 items in total whereas the area of general intelligence had 35 items, reasoning ability 48 items, operational ability 40 and scientific knowledge had 92, items.
Construction of a battery of tests based on Guilford's SOl model.	Khire (1989)	VIII to X; around 4,322 subjects were considered for item analysis study and 15,411 were considered for the normative study
A verbal and Non-verbal Group Test of Intelligence	Tarini (1994)	Classes IX and X; test was administered on 4500 students, 2700 boys and 1800 girls
Mental Ability Test for School Children	Awasthy (2005)	12-17 Years; sample consisted of 600 school boys
A verbal Group Intelligence test in Mizo language	Lalhmingliana (2005)	Age group 13 to 16+ years; the test has 100 items and was administered or standardized on a sample of 3600 students.
Verbal group intelligence test in the Khasi language	Shylla (2010)	Age group 14 to 16+; test was standardized on a sample of 3000 students (1298 Boys and 1702 Girls)
Intelligence Test for Upper Primary Students of Gujarat State	Pandya (2015)	Upper Primary Students; For final try out 4414 studying in upper primary schools

From the research studies conducted in India it is observed that many tests were standardised in regional languages like Desai (1954); Pillai (1955); Kapat (1960); Pathak (1961); Pandey (l961); Bhatt (1962); Hundal (1963); Oak (1967); Bora (1969); Shah (1971); Pillai (1978); Rathor (1983); Mishra (1984); Mishra (1985); Veerabhadraiah (1985); Banmalidas (1987); Lalhmingliana (2005); and Shylla (2010) developed and standardized their tests in Gujarati, Malayalam, Bengali, Marathi, Nepali, Punjabi, Assamese, Tamil, Oriya, Mizo and Khasi. In comparison to the work done in abroad regarding development of intelligence tests the work done in India is seems to be less. A close scrutiny of earlier research studies depicts that the studies conducted by Hashmi (2000) and Hashmi, Tirmizi, Shah and Khan (2011) in abroad were based on Thurstone Model of Intelligence. On the other hand, the investigator found only one study conducted in India by Khire (1989) based on Guilford's SOl model. Hence, very few tests are constructed on the basis of theory. From the review of the work done on intelligence tests, it was found that most of them are standardized in different states of the country but none is standardised in Sikkim state.

3-5 The Present Study

From the reviews of related literature, it is observed that a number of studies conducted in abroad and India with respect to the construction and standardization of the verbal group test of intelligence. But the investigator of the present study could not find out a single study based on any theory of intelligence conducted in the state of Sikkim for the age group of 14 to 18. No intelligence test is available with local norms. Therefore, keeping in mind the above, the investigator decided to conduct a study on “Construction and Standardization of a Verbal Group Test of Intelligence for the Students of Sikkim”.

CHAPTER – IV

METHOD AND PROCEDURE

A research design is a plan, structure and strategy of investigation so conceived as to obtain answers to research questions or problems. The plan is the complete scheme or programme of the research. It includes an outline of what the investigator will do from writing the hypotheses and their operational implications to the final analysis of data. (Kerlinger 1986, p. 279). The objective of the present investigation was to construct and standardize a verbal group test of intelligence for the secondary/senior secondary school students of Sikkim. To serve this purpose, it was required to draw an adequate sample of secondary/senior secondary school students; construct and standardize an intelligence test for measuring the characteristics under study; and collect the related data with the help of constructed tool. The details regarding these aspects of the study are given as under.

4-1: Research Method

While selecting a research method the investigator of the study has to keep in mind certain aspects like students' availability and most importantly the nature and objectives of the study. The aim of present investigation was to construct and standardize a verbal group test of intelligence for the secondary/senior secondary school students of Sikkim. The present study focused on to describe and interpret what conditions or relationships exist at present in case of secondary/senior secondary school students of Sikkim with respect to the variable intelligence. The further purpose of the study is to collect detailed description of existing phenomena with the intent of employing the same to justify current conditions and to make intelligent plans for improving them.

Hence, it is decided to use descriptive method of research in the present case which is relevant and justified in view of the objectives of the study.

4-2: Population

A population refers to any collection of specified group of human beings or of non-human entities such as objects, educational institutions, time units, geographical areas, prices of wheat or salaries drawn by individuals (Koul, 2009, p. 206). A population is that portion of the universe to which the researcher has access. In the words of Best and Kahn (2006, p. 13) population is a group of individuals who have one or more characteristics are common and that are of interest to the researcher. For the present study the population comprises the students studying in different classes like 9^{th}, 10^{th}, +1 and +2 of Secondary/Senior Secondary Schools situated in four (East, West, North and South) districts of Sikkim state and belongs to the age group of 14 to 18. The total number of students enrolled in the above classes (2016-17*) were approximately as follows:

Table 4.1: Enrolment of Students in Class IX-XII (2016-17)

State	Enrolment		Total
	Class IX-X	Class XI-XII	
Sikkim	25,472	16,038	41,510

***Source**: Unified District Information System for Education 2016-17, Sikkim http://udise.schooleduinfo.in/dashboard/Secondary#/*

4-3: Sample

In the present study the sample was drawn from the students studying in different classes like 9^{th}, 10^{th}, +1 and +2 of Secondary/Senior Secondary Schools situated in four (East, West, North and South) districts of Sikkim state. From the selected district, 200 (100 boys and 100 girls) students from each class were taken on the basis of stratified random sampling technique. The total sample consists of 800 secondary/senior secondary school students – 400 boys and 400 girls. The sample for the present investigation was drawn by employing the following sampling techniques described below:

-- For the preliminary try-out, the test was administered on a very small size of sample of 80 (40 boys and 40 girls) students selected randomly studying in classes IX, X, XI and XII (age 14 to 18).

-- For the first try-out of a sample of 400 students comprising of 200 boys and 200 girls representing classes, IX, X, XI and XII (age 14 to 18) was drawn by employing stratified random sampling technique from the secondary/senior secondary schools situated in the state of Sikkim.

-- For the final try-out, a sample of 800 students comprising of 400 boys and 400 girls was drawn by employing stratified random sampling technique from the population of 4 districts of Sikkim state. The detail of sampling distribution is given below:

Table 4.2: Details of Sampling Distribution:

District	School	Class	Boys	Girls	Total
East	Bojoghari Government Senior Secondary School	9	20	7	27
		10	17	--	17
		11	25	25	50
		12	10	13	23
	Modern Government Senior Secondary School	9	5	18	23
		10	--	8	8
		11	--	--	--
		12	15	12	27
	West Point Government Senior Secondary School	9	--	--	--
		10	8	17	25
		11	--	--	--
		12	--	--	--
West	Hee Yangthang Government Senior Secondary School	9	22	3	25
		10	6	12	18
		11	12	3	15
		12	1	16	17
	Tashiding Government Senior Secondary School	9	--	13	13
		10	1	5	6
		11	7	22	29
		12	24	3	27

	Tikpur Government Secondary School	9	3	9	12
		10	7	2	9
		11	--	--	--
		12	--	--	--
	Kripasalyan Government Senior Secondary School	9	--	--	--
		10	11	6	17
		11	6	--	6
		12	--	6	6
North	Phodong Government Senior Secondary School	9	5	16	21
		10	--	--	--
		11	10	9	19
		12	--	--	--
	Mangshila Government Senior Secondary School	9	5	7	12
		10	3	5	8
		11	14	14	28
		12	17	4	21
	Jawahar Navodaya Vidyalaya, Phodong	9	--	--	--
		10	12	10	22
		11	--	--	--
		12	--	14	14
	Kalzang Gyatso Government Senior Secondary School	9	15	2	17
		10	10	10	20
		11	1	2	3
		12	8	7	15
South	Namthang Government Senior Secondary School	9	11	15	26
		10	4	12	16
		11	25	25	50
		12	--	--	--
	Sumbuk Government Senior Secondary School	9	5	4	9
		10	8	5	13
		11	--	--	--
		12	11	3	14
	Sadam Government Senior Secondary School	9	7	3	10
		10	7	4	11
		11	--	--	--
		12	6	14	20
	Temi Government Senior Secondary School	9	2	3	5
		10	6	4	10
		11	--	--	--
		12	8	8	16
			400	**400**	**800**

Table 4.3: District and Class-wise Distribution of the Sample

District	East			West			North			South			Grand Total
Class	**B**	**G**	**T**	**B**	**G**	**T**	**B**	**G**	**T**	**B**	**G**	**T**	
9	25	25	50	25	25	50	25	25	50	25	25	50	**200**
10	25	25	50	25	25	50	25	25	50	25	25	50	**200**
11	25	25	50	25	25	50	25	25	50	25	25	50	**200**
12	25	25	50	25	25	50	25	25	50	25	25	50	**200**
Total	**100**	**100**	**200**	**100**	**100**	**200**	**100**	**100**	**200**	**100**	**100**	**200**	**800**

Table 4.4: Age-wise Distribution of the Sample

Age	East	West	North	South	Total
14	11	10	22	19	**62**
15	52	38	39	24	**153**
16	48	59	63	40	**210**
17	55	54	49	66	**224**
18	34	39	27	51	**151**
Total	**200**	**200**	**200**	**200**	**800**

4-4: Tools Used

To test the hypotheses or answer the questions the researchers must gather data with the help of relevant tools. Tools plays a very vital role in any scientific research and it is processed only with the help of certain well-designed tools. Tools are the instruments which helps the researcher to gather the important information or data from the related variables under the study. To collect the requisite data for present study the investigator used the following tools:

i) Verbal Group Test of Intelligence constructed and standardized by the investigator.

ii) Group Test of Intelligence constructed and standardized by Dr. G. C. Ahuja.

i) Verbal Group Test of Intelligence constructed and standardized by the investigator

The investigator constructed and standardized a verbal group test of intelligence based on Thrustone’s primary mental abilities in English language to assess the intelligence level of students studying in different classes like 9th, 10th, +1 and +2 of secondary/senior secondary schools situated in Sikkim state and belongs to the age group of 14 to 18. The intelligence test consists of 30 items pertaining to five sub-tests like verbal comprehension, word fluency, number, memory and reasoning. The detailed description of the construction of the intelligence test is given in Chapter 5. In short the test contained the following five sub-tests:

Table 4.5
Number of Sub-Tests, Number of Items and Time Limits for each Sub-Test

Sr. No.	**Sub-Tests**	**No. of Items**	**Time Limit**
1	Verbal Comprehension	5	5
2	Word Fluency	5	5
3	Number	5	5
4	Memory	10	5
5	Reasoning	5	5
	Total	**30**	**25 minutes**

The details of estimation of reliability and validity of the above constructed intelligence test are presented in Chapter 6. The establishment of norms prepared on the basis of gender, age and for different classes are also described in the Chapter 6.

ii) Group Test of Intelligence constructed and standardized by Dr. G. C. Ahuja

Group Test of Intelligence constructed and standardized by Dr. G. C. Ahuja is meant for assessing the general mental ability of pupils in the age group 13 to 17 + years studying in classes VIII - XI through English Medium Secondary Schools of Greater Bombay.

The Test consists of the following eight subtests with 135 items:

Table 4.6: Number of Items and Time-Limits for each Sub-test

Sr. No.	Sub-tests	Number of Items	Time Limit	Remarks (if any)
I	Following Directions	9	4 minutes	Additional Test
II	Classification	20	4 minutes	
III	Analogy	20	4 minutes	
IV	Arithmetic Reasoning	6	4 minutes	
V	Vocabulary	40	4 minutes	
VI	Comprehension	8	4 minutes	
VII	Series	12	4 minutes	
VIII	Best Answers	20	4 minutes	
		135	**32 minutes**	

There are eight sub-tests in the above test. The first one is an additional test and was meant only for practice. The performance of this additional test was not taken into account. The rests of the seven sub-tests i.e., from II to VIII are the final tests. The reliability of the test has been studied by two methods: (i) the test re-test method and (ii) the split-half method. The reliability coefficient by two methods was found to be 0.84 and 0.95 respectively. The practical or empirical validity of the test was studied with reference to scholastic marks, teacher's judgment and with other intelligence tests. The validity-coefficient with scholastic marks and teacher's judgment was found to be 0.53 and 0.61 respectively. Further, the validity-coefficient with other test of intelligence varied from 0.55 to 0.80. The internal validity and factorial validity of the test was also studied. The internal consistency correlation between the subtest and the total test scores were computed. The factorial validity was studied by Thurstone's centriod method and verified by Spearman's formula of 'g' saturation. It came out to be uni factor test. Age-wise norms and grade-wise norms were also calculated. The Deviation IQs for the entire sample was established. Tables of DIQ in age-wise and grade-wise for the entire sample were also ascertained.

4-5: Procedure for Data Collection

Keeping in view the objectives of the present study the investigator had collected the data with the prior permission of the headmasters/principals of the concerned institutions as mentioned in the table 4.2. Before administering the tools, the students were given all the necessary instructions. The sheets were collected back after administering the tools. After completing the administration of the tools, the investigator thanked the headmasters/principals, class teacher and the students for their whole hearted cooperation. The collected booklets were scored and the data thus obtained were tabulated for further analysis. To make the collection of data easier and faster, the investigator, approached the Director (School Education), Education Department, Government of Sikkim, requested to provide permission letter to the investigator to conduct the tests smoothly and allow collecting the research related data from the different schools of four districts of Sikkim. This had really helped the investigator to communicate with the Heads/Principals of schools, who had conveniently allowed the investigator to administer the above mentioned tools to all the sampled students.

4-6: Statistical Techniques Used

In view of the objectives of the study, the following statistical techniques were used to analyze the data.

1. The investigator of the present study used the following formula of correcting the difficulty index of an item for chance success as suggested by Garrett (1981, p. 364) for scoring procedure

$$P_c = \frac{R - W/(K-1)}{N - HR}$$

2. In item analysis for the difficulty value and discriminative power of an item the following formulas were used:

$$DV = (P_u + P_l)/2$$

$$DP = P_u - P_l$$

3. For estimating the reliability of the test the (a) Split-half and (b) Kuder-Richardson reliability methods were used. For calculating the Split-half reliability of the present test the following Pearson's Product Moment and Spearman-Brown Prophecy formulae were applied.

$$\boldsymbol{r} = \frac{\boldsymbol{N}\sum \boldsymbol{xy} - \sum \boldsymbol{X}.\sum \boldsymbol{Y}}{\sqrt{\{\boldsymbol{N}\sum \boldsymbol{X}^2 - (\sum \boldsymbol{X})^2\}\{\boldsymbol{N}\sum \boldsymbol{Y}^2 - (\sum \boldsymbol{Y})^2\}}}$$

Spearman- Brown prophecy formula:

$$r_{tt} = \frac{2r11/12}{1+r11/12}$$

K-R 21:

$$r_{11} = \frac{n\boldsymbol{\sigma}^2t\text{-}M(n\text{-}M)}{\boldsymbol{\sigma}^2t(n\text{-}1)}$$

4. For estimating the validity of the test the following two methods were adopted:
a) Content Validity of the test was rated by the expert's judgment.
b) Concurrent Validity of the test was studied by correlating the present test scores with one external criterion test i.e. Ahuja Group Test of Intelligence and was calculated by Pearson's Product Moment Method.

5. For Testing the Normality age-wise and class-wise, the normality of the distribution of the scores were calculated by the Mean, Median, Standard Deviation, P_{10}, P_{90}, Skewness and Kurtosis and Kolmogorov-Smirnov (K-S) test of normality.

6. For establishing the Norms of the test Z-Score and Percentile Ranks were used to derive for the test age-wise and class-wise.

7. To study the differences in the level of intelligence of the students with respect to their age-wise, class-wise and gender-wise the technique of t- test was used.

CHAPTER – V

CONSTRUCTION OF THE TEST

5-1	Planning
5-2	Preparation
5-3	Preliminary Try Out
5-4	First Try Out
5-5	Item Analysis
5-6	Items Retained for the Final form of the Test
5-7	Final Form of the Test

The objective of the present investigation was to construct and standardized a verbal group test of intelligence for the secondary/senior secondary school students of Sikkim. To serve this purpose, it was required to construct a suitable tool for measuring the characteristics under study; and collect the relevant data with the help of this tool. Test construction is merely an art rather than a science. The process of constructing a good test is deliberate and time consuming, it demands an understanding of the objectives being assessed, the examinees and their test taking behaviour. The present chapter deals with the steps involved in the construction of the Intelligence Test. It involves the following steps:

1. Planning
2. Preparation
3. Preliminary Try Out
4. Try Out
5. Item Analysis, and
6. Final form of the Test

5-1 Planning

Planning plays a very crucial role while constructing any test. Test planning encompasses all of the many and varied operations that go into producing a test. Not only does it involve the preparation of an outline or table specifying the content or operations to be covered by the test, but it must also involve careful attention to item difficulty, to types of items, to directions to the examiner, to arrangements for tryout, to problems of test reproduction, to provision for expert review, to the provision of adequate equipment and facilities, to the procurement of personnel, and so forth (Vaughn, 1951, p. 159). Hence, the following steps were undertaken in planning process of the construction of the Intelligences Test.

(a) Nature of the Test

From the review of various tests, it was observed that they contain some of the sub-tests with the ability components like verbal opposites, verbal and non-verbal analogies, best reasons, disarranged sentences, proverbs, information, memory, spatial relations, cube relations, arithmetic problems, vocabulary, verbal and non-verbal classification, number series, picture series, etc. Thurstone (1938) challenged the concept of a g-factor. He analysed the data from 56 different tests of mental abilities and identified a number of primary mental abilities that comprise intelligence, as opposed to one general factor. In spite of assembling a wide variety of intelligence tests, many individual abilities remain outside the scope of measurement and many intelligence tests are not based on strong theoretical foundations. Hence, the present test includes items on Five Primary Mental Abilities of Thurstone out of his Seven Primary Mental Abilities which are as follows:

- Verbal comprehension--the ability to define and understand words.
- Word fluency--the ability to produce words rapidly.
- Number--the ability to solve arithmetic problems.
- Memory--the ability to memorize and recall.
- Reasoning--the ability to find rules.

(i) Verbal comprehension

It involves the ability to understand verbal material. This factor represents the scope of a person's passive vocabulary and in his most often measured by tests such as vocabulary and reading comprehension. This is the ability to define and understand words, concepts, ideas, and verbal reasoning etc.

Example: Find the Synonym of:

ABANDON

A. Abscond B. Discontinue C. Neglect D. Condense

(ii) Word fluency

This ability i.e. word fluency is involved in rapidly producing words, sentences, and other verbal material. It is measured by tests such as one that requires the examinee to produce as many as many words as possible beginning with a particular letter in a short amount of time.

Example:

Write five words starting and ending with "M".

(iii) Number

This ability is involved in rapid arithmetic computation and in solving simple arithmetic word problems. The simplest measure of this ability is a test checking sums for addition problems.

Example:

Which of the following is not true?

A. $0 \div 2 = 0$ B. $-25 \div 5 = -5$ C. $12 \div 0 = 12$ D. $4 \div 1 = 4$

(iv) Memory

The ability to memorize and recall. It is the ability to memorize events, list of words, mathematical formulas, dates, definitions etc.

Example:

Photosynthesis occurs in which part of the plant cell?

A. Mitochondria B. Nucleus
C. Chloroplast D. Plastids

(v) Reasoning

This is the ability to determine a rule or principle from individual instances, probably involved in most human problem solving. The ability is generally measured by number or letter series that has several embedded rules. It is measured by tests, such as letter series, number series, and word classifications, in which the testees must indicate which of several words does not belong with the others.

Example:

If it was Monday on January 1, 1980, then what was on February 1, 1980?

A. Thursday	B. Tuesday
C. Friday	D. Sunday

(b) Types of Items

The second step of test construction is concerned with the planning of the types of items to be included. Beam (1953) defined item as 'a single task or question that usually cannot be broken down into any smaller units'. For the present study, the investigator decided to make use of two types of test items. The vast majority of the test items are with multiple choice items because they are most common, flexible and effective. A multiple choice item consists of a stem, a key and a list of distractors. The list of suggested solutions may include the words, numbers, symbols, or phrases and recalled based alternatives (Linn and Gronlund, 2003, p. 211). It consists of three parts-a stem, a key and a number of distracters. The stem can be either a direct question or an incomplete statement; the key is the correct answer and the distracters are plausible but incorrect answers. The examinee is asked to choose one of the alternatives for his answer. Multiple choice items have the following advantages:

-- They can measure cognitive levels better than true-false items because examinees do not score for merely knowing whether the statement is true or false but for knowing which is the correct answer.

-- They are objective in scoring because the key for the correct answer is prepared along with the test.

-- They reduce the effect of guessing because there are three or four choices and they have high reliability and validity.

-- They are not difficult for students to understand and use.

-- They help to measure the student's capacity for interpretation and discrimination.

-- Using a number of reasonable alternatives makes the results amenable to diagnosis.

-- The test items take less time to complete.

The second type of test items, very minimum in number, is to write the correct answers/ words in a given statement.

(c) Length of the Test

The Investigator of the present study decided that the students will have to respond to take the test within the school hours. Hence, the investigator decided that the length of the test should be within a period of school hour i.e. 35 minutes for attempting all the 30 items including reading the instructions for the test before beginning the test.

(d) Scoring Procedure

The main concern about scoring a test is the ease by which it can be done. In this regard, the efficiency of scoring makes a multiple choice test very popular with teachers. For this purpose, items have been scored using a conventional number right (NR) scoring method (Bereby-Meyer et al., 2002; Kurz, 1999). Correct answers are scored with a positive value of 1 whereas, incorrect answers and absent or omitted answers with a value of zero. The total sum of the scores for correct responses is the final grand total test score. The same above mentioned scoring procedure may be applied in case for the word fluency sub-test. For scoring the right and wrong answers, the investigator has assigned 0.25 marks for the right answer and 0 for the wrong answers. The correct writing of all the four words received 1 mark each. Further, to avoid fractions in the total of marks and to make the calculation of scores simple in words fluency sub-test it is decided to multiply each question marks by 4 to make a round figure. For example, if a student writes only 3 correct words, then he will get 0.25x3 =0.75 marks. So, to make it in round figure we will multiply it with 4 like 0.75x4= 3.

It is important to find out the number of testees who get the right answer through correct knowledge or correct reasoning and to rule out answers which are based upon guesswork. In correcting for chance success, we assume that (i) wrong answers are due to absence of knowledge and that (ii) to one who does not know the right answer, all of the response options are equally attractive. Keeping in mind these assumptions, it is reasonable to expect that some of the individuals those who really did not know the right answer selected it by chance. To avoid any problems of guess work for the scoring procedure, the investigator decided to apply the formula of correcting the difficulty index of an item for chance success as has been suggested by Garrett (1981, pp.364-365):

$$P_c = \frac{R - W/(K-1)}{N - HR}$$

(to correct a difficulty index for chance success)

in which

Pc = the percent who actually know the right answer
R = the number who get the right answer
W = the number who get the wrong answer
N = the number of examinees in the sample

HR = the number of examinees who do not reach the item (and hence do not try it)

k = the number of options or choices

For the present test, scoring was done with the help of a scoring key (Appendix-D) prepared by the investigator. The verbal group test of intelligence in all consists of a total number of 30 items and the maximum scores for these items may be obtained by an individual is 45 marks. The score thus obtained was used for estimation of reliability, validity, for the purpose of item analysis and establishing the norms.

5-2 Preparation

The next step after planning is writing appropriate items for the test. The following steps were considered under preparation in the present study:

(a) Preparation of test items

(b) Preparation of direction to test items

(c) Reviewing and editing of the test items

(d) Preparation of scoring key and answer sheets

(a) Preparation of Test Items

Preparation or writing of items in any test is an important task. Item writing is essentially a creative art. Therefore, a due care was taken in preparing the test items. The following principles were kept in mind for preparing appropriate test items:

-- Test items must be clear and comprehensive. There should be no ambiguity regarding its meaning for both the item writer as well as the examinees who take the test.

-- The language of the items chosen should be precise and accurate so that the content and not the form of the items determines the answer.

-- The items which have hidden meaning should not be included.

- -- While writing any item it should be kept in mind that the vocabulary used in the items is simple and it should be easily understood by all.
- -- A regular sequence in pattern of correct responses should be avoided.
- -- There must be minimum writing on the part of the student.
- -- It is desirable that the preliminary draft included more test items than the number which is actually needed in the final form.
- -- Each item allowed only one correct answer.
- -- As far as possible it should not encourage any guesswork by the subject.
- -- The item should not be too easy or too difficult.
- -- The meaning of the item should not be dependent upon other items. The answer of any item should not be obtained by referring to another item.

For writing the test items it required a rich source of ideas. While preparing the test items, the investigator went through thoroughly the nature of all the five primary mental abilities as given by L.L Thurstone. The investigator has also referred the other sources available like textbooks, journals, Intelligence tests constructed and standardized by other researchers, books related to psychological testing and IQ, related psychological tests, related dissertations/thesis available in the field and magazines. The investigator has also consulted the different subject experts specialized in this field to share their views in this matter. On the basis of clear understanding of all the five primary mental abilities, the investigator prepared the initial draft of the test with 165 items. On the basis of all the above information collected, the investigator prepared around 165 items. These items were then tried out on 20 students of classes IX, X, XI and

XII. After a thorough study of the responses collected from the 20 respondents, the following 108 items were retained for preliminary try-out:

Table 5.1 No. of sub-tests and items retained for preliminary try-out

Sr. No.	Name of Sub-tests	No. of Items retained
1	Verbal Comprehension	25
2	Word Fluency	8
3	Number	25
4	Memory	25
5	Reasoning	25
	Total	108

(b) Preparation of Direction to Test Items

For the present test, the investigator had prepared detailed instructions in the front page of the test booklet and in the beginning of all the sub-tests. The following important information contained in the instructions:

-- The total time allowed for completing the test.

-- The procedure for recording answers.

-- Doubt clearance, if any, before starting the test.

-- Total number of items in the test.

(c) Reviewing and editing of the test items

After writing the test items of the present test, the next important step is to review and edit the items to provide a final shape for preliminary try-out. The main purpose of this step is to take a final decision concerning several matters like: length of the test or sub-tests, time-limits, sequence of items of the test, or any technical flaws that may have occurred, instructions provided in the test etc. When all these problems were sorted out, reviewed and edited, the test items were prepared in test booklet form and were made ready for a preliminary try-out phase. The test items were also reviewed by seeking the experts’ opinion in the specialized field and with the help of language experts in order to remove any sort of linguistic ambiguity contained in the items. The suggestions and comments given by the experts were integrated and necessary changes were made accordingly.

(d) Preparation of scoring key and answer sheets

After writing the test items and ready for preliminary try-out the next step taken was to prepare the scoring key and the answer sheet. The investigator prepared a separate answer sheet and scoring key to facilitate objective scoring (Appendices C and D). For scoring the answers, a separate answer sheet was prepared keeping in mind that the test booklets may be reused. The answer sheet was prepared by providing spaces against the number of each item. The students were instructed at the beginning of taking the test to pick up the correct option corresponding to the correct answer. To make the scoring easier, sub-test wise proper space for scoring has been provided on the right hand side of each response in the answer sheet and space for overall total for each of the sub-test on front side of the answer sheet. Hence, the total scores of each of the sub-tests can be obtained very easily.

5-3 Preliminary Try-Out

Since the test is prepared by individual or group of persons and experts, it cannot be entirely error free. Therefore, preparation of the test requires try-out. The main purposes of trying-out are:

-- to identify the poor constructed items and to select the good items and reject the poor items.

-- to identify the defective or ambiguous items.

-- to identify the non-functioning or implausible distracters.

-- to provide data for determining the difficulty level of items.

-- to determine the number of items to be included in the final form of the test.

-- to determine the time limit.

-- to determine the discriminating value of the items.

In this preliminary try-out step of the test the investigator administer the test on a small number of students for the purpose of identifying the short comings in the test without analysing the data for individual items. The main objective of this preliminary try-out was to find out the defective or ambiguous items and to find out the effectiveness of the alternatives. For the preliminary try-out, the test was administered on a sample of 80 (40 boys and 40 girls) students selected randomly studying in classes IX, X, XI and XII (age 14 to 18). During the preliminary try-out, the investigator collected in a group setting. However, before administration of the test, a proper seating arrangement was done and needed emotional rapport was also established with the students. Thereafter, necessary instructions were given pertaining to the nature of the test, recording the responses and a request was made to attempt all the items. The time limit was not set at this stage. They were also told regarding the importance of their willing and sincere co-operation in the data collection to the research study. Every effect was made by the investigator to get the data objectively as much as was possible. The investigator asked the students they may feel free to approach the investigator without any hesitation if they face any problem in any of the test items. During the administration of the test the investigator observed that the students were showing interest in attempting the test as the test was completely new to them. On the basis of observation, individual's reactions and the feedback received from the students the investigator improved and modifies the items accordingly. A few vague items were deleted, while some items were modified or rearranged. Finally, a total of 67 (Verbal Comprehension-15, Word Fluency-7, Number-15, Memory-15, and Reasoning-15) items were retained for the first try out.

5-4 First Try-Out

The main objectives of this first try-out in the present study was to find out weak and defective items viz. over-difficult, over-easy, and those whose distracters are non-functioning; to find out the difficulty level of each item so that selection of items can be made to ensure appropriate distribution of difficulty levels throughout the test; to find out the discrimination power of each item so that only valid items can be selected for the final test; to determine the time limits for the test and to judge the adequacy of the instructions to both administrators of the test and pupils taking it and to establish the reliability and validity of the test.

For the first try-out of a sample of 400 students comprising of 200 boys and 200 girls representing classes, IX, X, XI and XII (age 14 to 18) was drawn from the secondary/senior secondary schools situated in Sikkim. The details about sample selection has been described in chapter 4. The following important measures were adopted during the administration of the test:

-- Necessary information was given pertaining to the nature and importance of the test to the students.

-- A proper seating arrangement was made to make the students sit comfortably and record their responses without cheating.

-- The investigator directed the students that they may feel free to clear their doubt, if any, without any hesitation if they face any problem in any of the test items.

-- Then, the investigator distributed the test booklets and answer sheets to the students.

-- The investigator directed the students to read necessary instructions carefully given in front of the test booklet and in each of the sub-test pertaining to the nature of the test and procedure for recording the responses.

- -- Lastly, the investigator instructed the students to note down the time taken in each sub-test on the space provided on the answer sheet.

5-5 Item Analysis

To judge the quality of an item i.e. whether it may be retained in the test or not is called item analysis. The major aim of item analysis is to help improve the test by revising or discarding ineffective items (Aiken and Marnat, 2006, p. 65). Item analysis is a statistical technique which is used for selecting and rejecting the items of a test on the basis of their difficulty values and discriminative power (Sharma, 2007, p. 47). Standardized tests can be improved through the selection, substitution, or revision of items. Item analysis makes it possible to shorten a test and at the same time to increase its validity and reliability (Anastasi and Urbina, 1997, p. 160). According to Sharma (2007, p. 48) the main objectives of item analysis technique are:

- -- To select the appropriate items for the final draft and reject items which do not contribute in the functioning of the test. Some items are to be modified
- -- The discriminative power of an item may be obtained with the help of item analysis to differentiate between capable and less capable examinees on all the items preliminary draft of the test. The items are classified on the basis of the indexes- positive, negative and no discrimination. The negative items and items having no discrimination power are rejected out rightly.
- -- The reliability and validity to test depends on these characteristics of a test. The functioning of a test is increased by these techniques.

-- It provides the basis for preparing the final draft of a test, in final draft items are arranged in difficulty order. The easiest items are given in the beginning and most difficult items are provided at the end.

There are varieties of procedures to be used for carrying out item analysis. In the construction of present test two main indices viz., item difficulty and item discrimination were calculated.

(i) Difficulty Value of the Items

Difficulty value of the item is an important part of the test construction. The difficulty value of an item is defined as the proportion of percentage of the examinees who have answered the item correctly (Guilford). Annastasi (1997) suggested that the difficulty of an item may be determined in several ways:

(a) By judging competent examinees who rank the items in order of difficulty.

(b) By how quickly the item can be solved.

(c) By the number of the examinees in the group who get the item right.

The first two procedures were considered during the preparatory stage of the test construction. The third procedure is a standard method of determination of the difficulty value of items statistically. In this method proportion (P) of the examinee passing an item is calculated which indicates the index of item difficulty.

(ii) Discrimination Power of the Items

An item which differentiates between students having greater and lesser amounts of knowledge has sound item discrimination. Index of discrimination is that ability of an item on the basis of which the discrimination is made between good and poor items. The term "discriminative power" of an item has been used for item reliability and item validity (Sharma, 2007, p. 51). Item reliability may be defined as the degree to which an item distinguishes between high and low groups; they are high and low on the basis of the same test scores.

(c) Selection of Items

To calculate the item difficulty and item discrimination power of the items in present test Kelley's method of item analysis was employed. Kelley demonstrated that when extreme groups, each consisting of 27% of the total group were used, the ratio of the difference in abilities of the group to the standard error of their difference i.e. the degree of uncertainty about the size of real difference was found to be maximum. Thus, by accepting the two tails and rejecting the middle 46% we can minimize our labour without scarifying the precision of our result. To compute the difficulty value and discrimination power of an item of the intelligences test the following procedure was followed:

The answer sheets of 400 students were arranged in a descending order, (i.e. from the highest to the lowest score). Thereafter, three groups were formed as follows:

(i) Upper 27% of total sheets (i.e. 108 sheets)

(ii) Middle 46% of total sheets (i.e.184 sheets)

(iii) Lower 27% of total sheets (i.e. 108 sheets)

As per Kelley's method, the middle group of 46% was rejected and only the two extreme groups (i.e. upper 27% and lower 27%) was taken into consideration for calculating the difficulty value and discriminative power of an item.

The investigator applied the following formula of correcting the difficulty index of an item for chance success as has been suggested by Garrett (1981, pp.364-365):

$$P_c = \frac{R - W/(K-1)}{N - HR}$$

(to correct a difficulty index for chance success)

in which

Pc = the percent who actually know the right answer

R = the number who get the right answer

W = the number who get the wrong answer

N = the number of examinees in the sample

HR = the number of examinees who do not reach the item (and hence do not try it)

k = the number of options or choices

Now, for each item the proportion of the students who passed an item in the upper and the lower groups was determined. The difficulty value and discrimination power of an item was then calculated by using the following formula as suggested by Davis.

$$DV = (P_u + P_l)/2$$

$$DP = P_u - P_l$$

Where,

P_u = Proportion of correct answers on the item of upper group examinees

P_l = Proportion of correct answers on the item of lower group examinees

By using the above formulae, the difficulty value and discriminative power of all the 67 items were calculated as given in Table 5.2 to 5.6.

Table 5.2 Showing the Difficulty Value and Discrimination indices for the Sub-test I (Verbal Comprehension) administered on 400 students

Sub test - I: Verbal Comprehension (VC)

Item No.	Upper Group 27%				Lower Group 27%				Difficulty Value (DV) 0.30 - 0.70	Discrimination Power (DP) Above .40	Selected Items (*)
	R	W	HR	P_u	R	W	HR	P_l	$P_u + P_l / 2$	$P_u - P_l$	
1	80	28	0	0.65	58	48	2	0.40	0.53	0.26	
2	66	42		0.48	40	64	4	0.18	0.33	0.30	
3	75	33		0.59	59	43	6	0.44	0.52	0.15	
4	83	25		0.69	63	36	9	0.52	0.60	0.18	
5	91	17		0.79	50	58		0.28	0.54	0.51	*
6	71	36	1	0.55	73	27	8	0.64	0.60	-0.08	
7	91	15	2	0.81	41	55	12	0.24	0.52	0.58	*
8	82	21	5	0.73	49	45	14	0.36	0.54	0.37	
9	67	37	4	0.53	9	82	17	-0.20	0.16	0.73	
10	101	7		0.91	53	48	7	0.37	0.64	0.55	*
11	65	40	3	0.49	32	64	12	0.11	0.30	0.38	
12	66	42		0.48	60	44	4	0.44	0.46	0.04	
13	98	9	1	0.89	28	74	6	0.03	0.46	0.86	*
14	92	15	1	0.81	73	35		0.57	0.69	0.25	
15	94	14		0.83	45	62	1	0.23	0.53	0.60	*

Table 5.3 Showing the Difficulty Value and Discrimination indices for the Sub-test II (Word Fluency) administered to 400 students

Sub test - II: Word Fluency (WF)

Item No.	Upper Group 27%				Lower Group 27%				Difficulty Value (DV) 0.30 - 0.70	Discrimination Power (DP) Above .40	Selected Items (*)
	R	W	HR	P_u	R	W	HR	P_l	$P_u + P_l / 2$	$P_u - P_l$	
1	76	28	4	0.64	34	67	7	0.12	0.38	0.53	*
2	91	14	3	0.82	49	50	9	0.33	0.57	0.50	*
3	78	24	6	0.69	55	42	11	0.42	0.55	0.26	
4	94	14		0.83	41	62	5	0.20	0.51	0.63	*
5	69	30	9	0.60	64	30	14	0.57	0.59	0.02	
6	84	23	1	0.71	28	70	10	0.04	0.38	0.67	*
7	79	27	2	0.66	33	63	12	0.12	0.39	0.54	*

Table 5.4 Showing the Difficulty Value and Discrimination indices for the Sub-test III (Number) administered to 400 students

Sub test - III: Number (N)

Item No.	Upper Group 27%				Lower Group 27%				Difficulty Value (DV) 0.30 - 0.70	Discrimination Power (DP) Above .40	Selected Items (*)
	R	W	HR	P_u	R	W	HR	P_l	$P_u + P_l / 2$	$P_u - P_l$	
1	43	57	8	0.24	34	72	2	0.09	0.17	0.15	
2	65	41	2	0.48	25	83		-0.02	0.23	0.51	
3	89	19		0.77	56	58	4	0.32	0.54	0.44	*
4	63	45		0.44	44	64		0.21	0.33	0.23	
5	74	30	4	0.62	65	37	6	0.52	0.57	0.10	
6	51	57		0.30	55	53		0.35	0.32	-0.05	
7	95	13		0.84	49	54	5	0.30	0.57	0.54	*
8	66	41	1	0.49	39	69		0.15	0.32	0.34	
9	83	25		0.69	38	68	2	0.14	0.42	0.55	*
10	71	37		0.54	74	34		0.58	0.56	-0.04	
11	45	63		0.22	50	47	11	0.35	0.29	-0.13	
12	54	52	2	0.35	35	73		0.10	0.221	0.25	
13	92	16		0.80	41	67		0.17	0.49	0.63	*
14	68	40		0.51	42	58	8	0.23	0.37	0.28	
15	98	9	1	0.89	63	40	5	0.48	0.69	0.41	*

Table 5.5 Showing the Difficulty Value and Discrimination indices for the Sub-test IV (Memory) administered to 400 students

Sub test - IV: Memory (M)

Item No.	Upper Group 27%				Lower Group 27%				Difficulty Value (DV) 0.30 - 0.70	Discrimination Power (DP) Above .40	Selected Items (*)
	R	W	HR	P_u	R	W	HR	P_l	$P_u + P_l / 2$	$P_u - P_l$	
1	77	30	1	0.63	46	59	3	0.25	0.44	0.38	
2	84	24		0.70	34	67	7	0.12	0.41	0.59	*
3	101	4	3	0.95	31	65	12	0.10	0.52	0.85	*
4	73	35		0.57	25	76	7	-0.03	0.28	0.57	
5	77	29	2	0.64	45	63		0.22	0.43	0.41	*
6	89	19		0.77	33	67	8	0.17	0.44	0.66	*
7	66	37	5	0.52	62	32	14	0.55	0.53	-0.03	
8	95	13		0.84	43	63	2	0.21	0.52	0.63	*
9	87	15	6	0.80	59	44	5	0.4	0.62	0.37	
10	79	27	2	0.66	38	64	6	0.16	0.41	0.50	*
11	84	23	1	0.71	44	62	2	0.22	0.47	0.49	*
12	99	8	1	0.90	51	56	1	0.30	0.60	0.60	*
13	56	52		0.36	40	64	4	0.18	0.27	0.18	
14	90	18		0.78	36	71	1	0.12	0.45	0.67	*
15	87	18	3	0.77	52	53	3	0.33	0.55	0.44	*

Table 5.6 Showing the Difficulty Value and Discrimination indices for the Sub-test V (Reasoning) administered to 400 students

Sub test - V: Reasoning (R)

Item No.	Upper Group 27%				Lower Group 27%				Difficulty Value (DV) 0.30 - 0.70	Discrimination Power (DP) Above .40	Selected Items (*)
	R	W	HR	P_u	R	W	HR	P_l	$P_u + P_l / 2$	$P_u - P_l$	
1	67	39	2	0.51	45	62	1	0.23	0.37	0.28	
2	98	7	3	0.91	34	67	7	0.12	0.51	0.80	*
3	85	19	4	0.76	54	46	8	0.39	0.57	0.37	
4	76	32		0.60	32	74	2	0.07	0.34	0.54	*
5	86	16	6	0.79	53	41	14	0.42	0.60	0.37	
6	91	17		0.79	51	57		0.30	0.54	0.49	*
7	87	16	5	0.79	65	43		0.47	0.63	0.32	
8	75	25	8	0.67	48	48	12	0.33	0.50	0.33	
9	96	11	1	0.86	60	48		0.41	0.64	0.46	*
10	65	43		0.47	33	68	7	0.10	0.29	0.37	
11	72	36		0.56	40	60	8	0.20	0.38	0.36	
12	100	6	2	0.92	37	68	3	0.14	0.53	0.79	*
13	77	31		0.62	53	44	11	0.40	0.51	0.22	
14	63	41	4	0.47	49	53	6	0.31	0.39	0.17	
15	59	43	6	0.44	55	49	4	0.37	0.40	0.07	

5-6 Items Retained for the Final form of the Test

After analysing each and every item by following the process of item analysis it is essential to select good items who have appropriate difficulty level and whose discriminating power is also satisfactory. These items may only be retained in the final form of the test. As suggested by Stanley and Hopkins (1978, p.270) the items whose difficulty value found in between 0.30 and 0.70 and discriminative power 0.40 and above were retained in the final form of the test. The items having negative or zero discriminative power were also not included in the test. The items which did not fulfil the criteria as mentioned above were omitted. As a result, a total number of 37 items out of 67 were rejected. Finally, the test contains 30 items. The following table shows the difficulty value and discriminative power of an item in five sub-tests retained for the final form of the test.

Table 5.7 Showing the number of items retained in each Sub-tests having DV 0.30-0.70 and DP above 0.40

Sub-Test No.	Abbreviation	Items retained having DV 0.30-0.70 and DP above 0.40	Total No. of Items retained in each sub-tests
I	VC	5, 7, 10, 13, 15	5
II	WF	1, 2, 4, 6, 7	5
III	N	3, 7, 9, 13, 15	5
IV	M	2, 3, 5, 6, 8, 10, 11, 12, 14, 15	10
V	R	2, 4, 6, 9, 12	5
	Total		**30**

Verbal Comprehension (VC), Word Fluency (WF), Number (N), Memory (M), Reasoning (R)

Table 5.8 Showing the Difficulty Value and Discriminative Power of the items retained for the final form in sub-test wise in order of increasing difficulty values

Sub test - I: Verbal Comprehension (VC)

Sr. No.	No. of Items	Difficulty Value 0.30-0.70	Discriminative Power above 0.40
1	10	0.64	0.55
2	5	0.54	0.51
3	15	0.53	0.60
4	7	0.52	0.58
5	13	0.46	0.86

Sub test - II: Word Fluency (WF)

Sr. No.	No. of Items	Difficulty Value 0.30-0.70	Discriminative Power above 0.40
1	2	0.57	0.50
2	4	0.51	0.63
3	7	0.39	0.54
4	6	0.38	0.67
5	1	0.38	0.53

Sub test - III: Number (N)

Sr. No.	No. of Items	Difficulty Value 0.30-0.70	Discriminative Power above 0.40
1	15	0.69	0.41
2	7	0.57	0.54
3	3	0.54	0.44
4	13	0.49	0.63
5	9	0.42	0.55

Sub test - IV: Memory (M)

Sr. No.	No. of Items	Difficulty Value 0.30-0.70	Discriminative Power above 0.40
1	12	0.60	0.60
2	15	0.55	0.44
3	8	0.52	0.63
4	3	0.52	0.85
5	11	0.47	0.49
6	14	0.45	0.67
7	6	0.44	0.66
8	5	0.43	0.41
9	10	0.41	0.50
10	2	0.41	0.59

Sub test - V: Reasoning (R)

Sr. No.	No. of Items	Difficulty Value 0.30-0.70	Discriminative Power above 0.40
1	9	0.64	0.46
2	6	0.54	0.49
3	12	0.53	0.79
4	2	0.51	0.80
5	4	0.34	0.54

5-7 Final Form of the Test

The final form of the intelligence test comprises 30 items. For determining the time taken for each sub-test, the investigator has asked the students during the first try out to record their time taken for each sub-test on the top of each sub-test. The time limit in any intelligence test plays a very important role. It was most essential to give enough time to complete all the 30 items to all the students. On the basis of their recorded time in the answer-sheet, the average time taken by 400 students was calculated for each sub-test. However, the time to read the instructions and to fill up the personal information has been not included in the time limit. For this purpose an extra time of 10 minutes were provided to the students. Thus, the final form of the test after item analysis and time taken in each sub-test was given as follows:

Table 5.9: Total No. of Items retained and Time Taken in each Sub-Test

Sr. No.	Sub-Test	No. of Items retained	Time taken (in Minutes)
1	Verbal Comprehension	5	5
2	Word Fluency	5	5
3	Number	5	5
4	Memory	10	5
5	Reasoning	5	5
Total		30	25 Minutes

CHAPTER – VI

STANDARDIZATION OF THE TEST

6-1 Introduction

Standardization literally means brought to a level or standard (Bhatnagar and Bhatnagar, 2010, p. 132). It is a sophisticated and complex process involving number of important procedures. Anastasi and Urbina (1997, p. 7) described that standardization implies uniformity of procedures in administering and scoring the test. The term standardized test refers to a test that has been expertly constructed, usually with try-out, analysis and revision; includes explicit instructions for uniform (standard) administration and scoring; and provide tables of norms for score interpretation purposes, derived from administering the test in uniform fashion to a defined sample of persons (Ebel and Frisbie, 1991, p. 286). Standardization of the test refers to the establishment of a standard procedure for administering and scoring of the test and to establish validity, reliability and a set of norms for the test. The present chapter deals with the process of standardization (establishing the reliability, validity and norms of the test) of the intelligence test constructed by the investigator as described in detail in chapter 5.

To estimate the reliability, validity and to establish norms, the intelligences test constructed by the investigator had been administered on a sample of 800 secondary/senior secondary students comprising of 400 boys and 400 girls selected randomly from the population of 4 districts of Sikkim state.

6-2 Estimation of Reliability

By reliability we mean the accuracy of the data in the sense of their stability, repeatability, or precision. A perfectly reliable data-collection instrument is one which, if administered twice under the same circumstance, would provide identical data (Fox, 1969, p. 353). In the words of Freeman 1965, pp. 66-67):

> The term *reliability* has two closely related but somewhat different connotations in psychological testing. First, it refers to the extent to which a test is *internally consistent*, that is, consistency of results obtained *throughout the test* when administered once. In other words, how accurately is the test measuring at a particular time? Second, reliability refers to the extent to which a measuring device yields consistent results upon *testing and retesting*. That is, how dependable is it for predictive purposes?

In the words of Anastasi (1997, p. 79) reliability refers to the consistency of scores obtained by the same persons when re-examined with the same test on different occasion, or with different set of equivalent items, or under other examining conditions.

We have various methods are available for determining the reliability of a test like test-retest, equivalent form, split-half and Kuder-Richardson reliability method etc. But in the present study for determining the reliability of the test the investigator used the following two methods:

-- Split-Half Reliability Method

-- Kuder-Richardson Reliability Method

(i) Split-Half Reliability Method

For determining the Split-Half Reliability, the present test was administered on a sample of 800 secondary/senior secondary students as described in chapter 3. After administering the test, it is divided into two equal parts. The scores of the entire sample of 800 secondary/senior secondary students were divided into two equivalent halves of odd and even items. The following table 6.1 shows the I.Q. scores of odd and even no. of items.

TABLE 6.1 SCATTER DIAGRAM OF ODD AND EVEN NO. OF ITEMS ON INTELLIGENCE TEST

	Class Interval	Scores on Odd items							
		0-3	4-6	7-9	10-12	13-15	16-18	19-21	fy
Scores on Even items	22-24				5	2	4	5	16
	19-21			2	22	19	18	14	75
	16-18		2	5	14	30	41	15	107
	13-15		4	8	37	53	18	11	131
	10-12		14	42	77	43	29	8	213
	7-9	1	32	59	39	15	7	4	157
	4-6	15	23	12	9	4	5	1	69
	0-3	25	6		1				32
	fx	41	81	128	204	166	122	58	800

After obtaining two scores on odd and even number of test items, co-efficient of correlation was computed for the two sets of scores by using the formula:

$$\boldsymbol{r} = \frac{\boldsymbol{N}\sum \boldsymbol{xy} - \sum \boldsymbol{X}.\sum \boldsymbol{Y}}{\sqrt{\{\boldsymbol{N}\sum \boldsymbol{X}^2 - (\sum \boldsymbol{X})^2\}\{\boldsymbol{N}\sum \boldsymbol{Y}^2 - (\sum \boldsymbol{Y})^2\}}}$$

where

X and Y = Raw scores in the test X and Y

XY = Sum of the products of each X score multiplied with its corresponding Y score

N = Total No. of cases or scores

The correlation between these two scores gives an estimate of reliability of a test only half as long as the original. From the reliability coefficient of half test, the reliability coefficient of the whole test was estimated by using the Spearman- Brown prophecy formula which is given below:

$$r_{tt} = \frac{2r11/12}{1+r11/12}$$

where

r_{tt} = the reliability of the total test
$r_{11/12}$ = the coefficient of correlation between the two half tests.

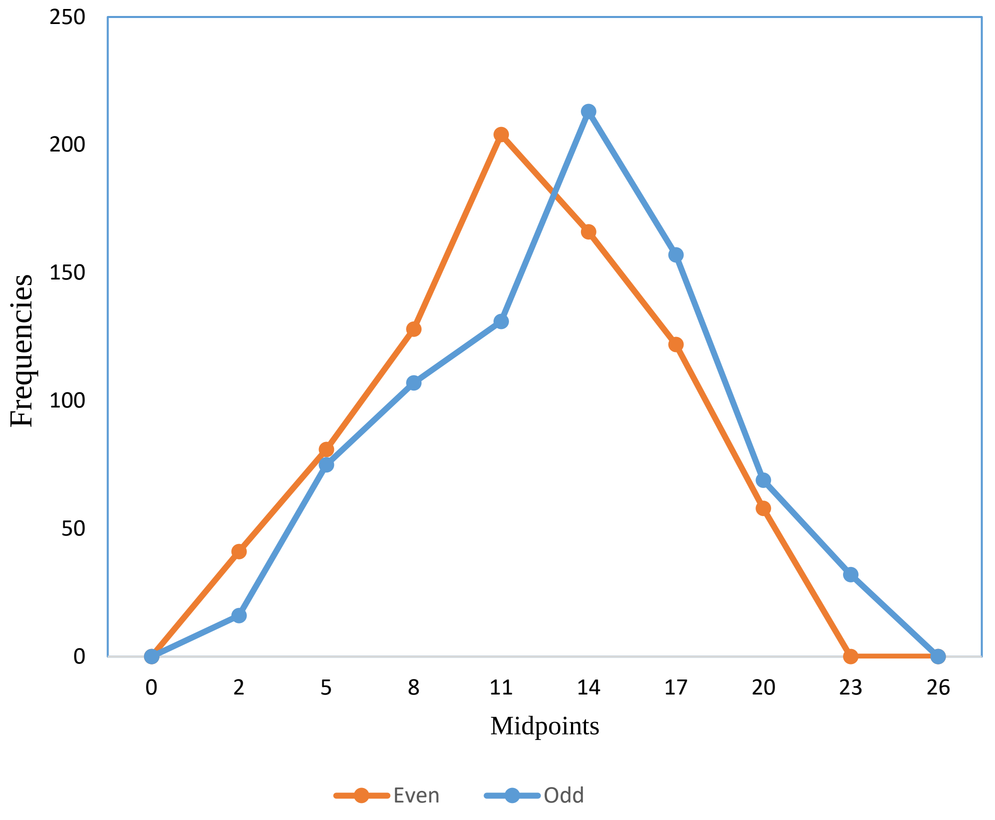
The coefficient of correlation between the two sets of scores obtained from the two halves was computed by Product Moment Method and was found to be 0.65. From the reliability of the half test, the self-correlation of the whole test was then estimated by Spearman-Brown Prophecy formula. The coefficient of correlation was found to be 0.78 as given in Table 6.2.

Table 6.2: Split-half Reliability Coefficient of the Present Test

N	r_{tt}	P
800	0.78	.01*

The obtained split-half reliability coefficient was significant at .01* level. ‘It is clear that even a small r may be significant if computed from a very large sample' (Garrett). The above value of coefficient of correlation shows a very high degree of positive correlation between the two sets of half scores.

Fig. 6.1:Frequency Polygon of Scores obtained for Estimation of Split-half Reliability



(ii) Kuder-Richardson Reliability Method

Kuder-Richardson method enables to compute the inter-correlation of the items of the test and correlation of each item with all the items of the test. Kuder-Richardson method can be uses if items are of the same difficulty level, relationship between the items are equal, the different items in the test measures the same ability and the test is homogeneous in nature but not necessarily the same persons solve each item correctly. Kuder-Richardson has developed several formulas for estimating the reliability index of a test.

In the present study, the investigator used the following formula of K-R 21:

$$r_{11} = \frac{n\boldsymbol{\sigma}^2 t\text{-}M(n\text{-}M)}{\boldsymbol{\sigma}^2{}_t(n\text{-}1)}$$

where

r_{11} = reliability of the whole test
n = number of items in the test
σ_t = the S D of the test scores
M = the mean of the test scores.

The Kuder-Richardson reliability of the present test was calculated by the above formula. The Kuder-Richardson reliability coefficient of the present test was found to be 0.96 as given in Table 6.3

Table 6.3: Kuder-Richardson Reliability of the Present Test

N	r_{11}	P
800	0.96	.01*

The obtained Kuder-Richardson reliability coefficient was significant at .01* level. It is clear that even a small r may be significant if computed from a very large sample' (Garrett). This indicates a very high degree of positive correlation.

6-3 Estimation of Validity

The test, as a data collection tool, must produce information that is not only relevant but free from systematic errors; that is, it must produce valid information (Koul, 2009, p. 220). Freeman, (1965, p. 88) mentioned that an index of validity shows the degree to which a test measures what is purports to measure, when compared with accepted criteria. The construction and use of a test imply that the instrument has been evaluated against criteria regarded by experts as the best evidence of the traits to be measured by the test.

(i) Face Validity

According to Freeman (1965, p. 90) face validity is a term used to characterize test materials that appear to measure what the test's author desires to measure i.e. the test comprises items that seem to be related to the variable being measured. Aggarwal

(2015, p.267) states that face validity has something to do with the mere appearance of a test. A test is said to have face validity when by appearance it "looks like" measuring what it is intended to measure. In the present test, the face validity was confirmed based on the opinion, suggestions and comments provided by the experts that it does measure the level of intelligence of secondary/senior secondary school students.

(ii) Content Validity

Koul (2009, p. 221) mentioned that this form of validity is based upon judgement of several subject experts and test specialists, careful analyses of instructional objectives, and actual subject matter studied. This analysis is rational as well as judgemental, and therefore, the content validity is sometimes also named as rational or logical validity. According to Anastasi and Urbina (1997, p.107) content-description validation procedures involve essentially the systematic examination of the test content to determine whether it covers a representative sample of the behaviour domain to be measured. An appraisal of the content validity of a test involves careful and detailed examination of the actual test tasks (Aggarwal, 2015, p.267).

The content-validity of the present test was obtained through the expert's opinion. The investigator constructed a rating scale consisting of six questions to check the content validity of the tool. A rating scale was constructed by the investigator to check the content validity of the present test. The test items constructed by the investigator for the present intelligence test had given to the 18 experts belongs to the field of education and psychology with necessary directions and requested to rate the items critically for their relevance, appropriateness, language and clarity. The investigator received response only from 14 of the 18 experts.

The investigator also discussed each test item in the five sub-tests with the few experts and noted down all the suggestions. The suggestions and corrections of the 14 experts assisted in the selection of the test items and their modifications. As such, the opinions obtained from the experts were analyzed with respect to the different items included in the test. The data pertaining to the overall opinions of the experts obtained item wise has been presented in table 6.4.

Table – 6.4: Percentage wise analysis of content validity of items obtained from 14 experts

1	How far the items listed in the present test are related to the intellectual abilities of children?			
	1	2	3	4
	To a great extent	To quite an extent	To some extent	Not at all
	9 (64%)	3 (22%)	2 (14%)	0
2	To what extent items listed in the test would be able to measure the level of Intelligence of children?			
	1	2	3	4
	To a great extent	To quite an extent	To some extent	Not at all
	7 (50%)	4 (29%)	3 (21%)	0
3	To what extent the test items represented the different sub-tests of the test?			
	1	2	3	4
	To a great extent	To quite an extent	To some extent	Not at all
	9 (64%)	4 (29%)	1 (7%)	0
4	To what extent the test items are suitable for the students of the age group 14 to 17 + in terms of the content presented?			
	1	2	3	4
	To a great extent	To quite an extent	To some extent	Not at all
	8 (57%)	3 (21%)	3 (22%)	0
5	To what extent the test items are suitable for the students of the age group 14 to 17 + in terms of difficulties of the items?			
	1	2	3	4
	To a great extent	To quite an extent	To some extent	Not at all
	9 (64%)	3 (22%)	2 (14%)	0
6	To what extent the test items are suitable for the students of the age group 14 to 17 + in terms of language used?			
	1	2	3	4
	To a great extent	To quite an extent	To some extent	Not at all
	8 (57%)	3 (22%)	3 (21%)	0

It is evident from the above table 6.4 that at serial number 1out of 14 experts responded 64% to a great extent, 22% to quite an extent, 14% to some extent and 0% to not at all respectively. From these observations it is clear that the items listed in the present test are related to the intellectual abilities of children.

Table 6.4 at serial number 2 reveals that out of 14 experts responded 50% to a great extent, 29% to quite an extent, 21% to some extent and 0% to not at all respectively. From these observations it is clear that the items listed in the present test are able to measure the level of Intelligence of children.

It is evident from the above table 6.4 at serial number 3 that out of 14 experts responded 64% to a great extent, 29% to quite an extent, 7% to some extent and 0% to not at all respectively. From these observations it is clear that the items represented the different sub-tests of the test?

Table 6.4 at serial number 4 reveals that out of 14 experts responded 57% to a great extent, 21% to quite an extent, 22% to some extent and 0% to not at all respectively. From these observations it is clear that the test items are suitable for the age group 14 to 17 + in terms of the content presented.

It is evident from the above table 6.4 at serial number 5 that out of 14 experts responded 64% to a great extent, 22% to quite an extent, 14% to some extent and 0% to not at all respectively. From these observations it is clear that the test items are suitable for the students of the age group 14 to 17 + in terms of difficulties of the items.

Table 6.4 at serial number 6 reveals that out of 14 experts responded 57% to a great extent, 22% to quite an extent, 21% to some extent and 0% to not at all respectively.

From these observations it is clear that the test items are suitable for the age group 14 to 17 + in terms of language used.

The overall assessment reveals that the items by and large were representative of the mental ability of the school going children of age-group 14 to 17 + to a great extent and the test was able to measure the level of intelligence. Further, the test covered the various components of intellectual abilities to a great extent and items were suitable for school going children in terms of content, difficulty and language.

(iii) Concurrent Validity

Concurrent validity is the extent to which the test performance is related to some other independent criterion of performance. Whenever a criterion measure is available at the time of testing, the concurrent validity of the test can be determined (Aiken and Marnat, 2006, p.98). According to Aggarwal (2015, p. 267) concurrent validity is evaluated by showing how well the test scores correspond to already accepted measure of performance or status made at the same time. Freeman (1965, p. 96) mentioned that at present, psychologists prefer the term "concurrent validity" to indicated the process of validating the new test by correlating it, or otherwise comparing it for agreement, with some present source of information.

For determining the concurrent validity, the scores of the present test were correlated with the external criterion test viz. Ahuja's Group Test of Intelligence and the correlation was calculated by using Pearson's Product Moment method:

$$\boldsymbol{r} = \frac{\boldsymbol{N\sum xy - \sum X.\sum Y}}{\sqrt{\{\boldsymbol{N\sum X^2 - (\sum X)^2}\}\{\boldsymbol{N\sum Y^2 - (\sum Y)^2}\}}}$$

where

X and Y	= Raw scores in the test X and Y
XY	= Sum of the products of each X score multiplied with its corresponding Y score
N	= Total No. of cases or scores

Relationship between the scores of present test and Ahuja's Group Test of Intelligence of School Students

To find out the relationship between the scores of present test and Ahuja's Group Test of Intelligence of School Students, the obtained scores of both tests were subjected to the analysis of their coefficient of correlation. For this purpose, the investigator has applied Product Moment Coefficient of correlation to find out the relationship between the scores of two tests. As such the data is obtained, have been presented in table 6.5.

Table- 6.5

Product Moment Coefficient of Correlation between the scores of present test and Ahuja's Group Test of Intelligence of School Students

Group	**N**	**df**	**r**	**P**
Scores of the Present Test	800	798	0.64	.01*
Scores of Ahuja's Group Test of Intelligence				

It is evident from the table 6.5 that the value of product moment coefficient of correlation between the scores of present test and Ahuja's Group Test of Intelligence of School Students came out to be 0. 64 which is significant at 0.01* level. This indicates that the scores of the two tests are related significantly with each other.

6-4 Establishment of Norms

A norm is a symbol of average or typical performance obtained by a group of students. Norms provide a reference against which to compare performances and indicate where a student stands in relation to other students in the population. The main aim of standardizing any test is to determine the distribution of raw scores in the standardization sample (norm group). The obtained raw scores are then converted to some form of derive scores, or norms (Aiken and Marnat, 2006, p.75). According to Freeman (1965, p. 121) a norm is the average or typical score (mean or median) on a particular test made by a specified population. Aggarwal (2015, p. 66) defines norms are the levels attained by a particular group of persons on a test.

Thus, it is clear from the above views of the different psychologists/educationists that a raw score has little or no meaning unless it is interpreted with respect to norms. Norms in the educational science are the reference points with which we can compare the performance of a student with some criteria or with the performance of other students in the group and thus interpret (give meaning) to test scores. Raw score itself does not give us any information other than the number of points received by each student. It gives us some meaning when it is compared with some criteria or with scores of other students. So, because without meaning the scores are useless, they have to be interpreted by some methods.

The data collected from the sample of 800 students (400 boys and 400 girls) was used for derivation of norms. Before deriving the norms, the normality of the frequency distribution was tested age-wise and grade-wise as given below:

(i) Testing the Normality of Sample Distribution:

Before establishing the norms for the present test, it was quite essential to test whether the data is normally distributed or not. For this purpose, the Kolmogorov Smirnov test was applied on the data. The detailed description of the results of Kolmogorov-Smirnov test is given below:

One-Sample Kolmogorov-Smirnov Test on Scores of Intelligence of Secondary/Senior Secondary School Students

One-Sample Kolmogorov-Smirnov Test		
		Intelligence
N		800
Normal Parameters[a,b]	Mean	23.4088
	Std. Deviation	8.75271
Most Extreme Differences	Absolute	.048
	Positive	.029
	Negative	-.048
Kolmogorov-Smirnov Z		1.348
Asymp. Sig. (2-tailed)		.053
a. Test distribution is Normal.		
b. Calculated from data.		

The scores on the variable of intelligence of Secondary/Senior Secondary School Students were subjected towards the Kolmogorov-Smirnov (K-S) test of normality and p value was found to be 1.348 which is greater than 0.05 (1.348>0.05).

Decision rule: If p>0.05, the data are normal or accept H_0

If p<0.05, the data are not normal or reject H_0

Hence, the sample data are not significantly different than a normal distribution. Therefore, the scores distribution is normal.

Further, the total number of items in the present test is 30 and the maximum score that can be obtained is 45. The highest score obtained on the present test was 43 and the lowest was 0. This range within which all the scores were distributed was divided into ten class intervals, each interval being of five units. The raw scores thus obtained from 800 students were presented age-wise and grade-wise in Table 6.6 to 6.11. In order to judge the normality of the distribution of the scores, the value of Mean, Median, S D, P_{10}, P_{90}, Skewness and Kurtosis that were calculated was presented in Table 6.12 and 6.13.

Table 6.6: Age-Wise distribution of scores: Total sample (N= 800)

Age/Class Interval	14	15	16	17	18	Total
0-4	0	4	5	7	5	21
5-9	3	8	13	11	8	43
10-14	4	20	25	19	18	86
15-19	15	25	47	36	29	152
20-24	9	33	40	43	28	153
25-29	21	25	37	47	21	151
30-34	9	23	23	41	24	120
35-39	1	14	16	16	14	61
40-44	0	1	4	4	4	13
45-49	0	0	0	0	0	0
Total	62	153	210	224	151	800
Mean	22.94	22.18	21.81	23.28	22.57	23.41
Median	24.50	22.00	21.00	24.00	23.00	24.00
SD	7.46	9.13	8.95	9.02	9.58	8.75
Skewness	-.390	-.135	.044	-.477	-.148	-.361
Kurtosis	-.687	-.633	-.440	-.111	-.495	-.154

Table 6.7: Age-Wise Distribution of Test Scores for Boys (N= 400)

Age/Class Interval	14	15	16	17	18	Total
0-4	0	3	3	5	4	15
5-9	3	5	6	5	3	22
10-14	2	9	14	13	10	48
15-19	4	9	24	19	13	69
20-24	3	13	17	18	21	72
25-29	10	9	16	25	13	73
30-34	6	11	14	19	17	67
35-39	0	6	8	10	5	29
40-44	0	0	2	1	2	5
45-49	0	0	0	0	0	0
Total	28	65	104	115	88	400
Mean	22.79	21.28	21.78	22.64	22.81	22.24
Median	25.00	22.00	21.00	24.00	23.00	23.00
SD	8.55	9.69	9.14	9.41	9.33	9.28

Table 6.8: Age-Wise Distribution of Test Score for Girls (N= 400)

Age/Class Interval	14	15	16	17	18	Total
0-4	0	1	2	2	1	6
5-9	0	3	7	6	5	21
10-14	2	11	11	6	8	38
15-19	11	16	23	17	16	83
20-24	6	20	23	25	7	81
25-29	11	16	21	22	8	78
30-34	3	12	9	22	7	53
35-39	1	8	8	6	9	32
40-44	0	1	2	3	2	8
45-49	0	0	0	0	0	0
Total	34	88	106	109	63	400
Mean	23.06	22.84	21.84	23.95	22.24	22.80
Median	23.00	22.50	21.50	24.00	20.00	23.00
SD	6.56	8.68	8.82	8.58	9.99	8.75

Table 6.9: Class-Wise Distribution of Test Score for Total Sample (N= 800)

Class/Class Interval	IX	X	XI	XII	Total
0-4	3	2	10	6	21
5-9	13	9	15	6	43
10-14	22	27	19	18	86
15-19	50	39	41	22	152
20-24	40	35	45	33	153
25-29	38	44	25	44	151
30-34	24	27	27	42	120
35-39	10	16	16	19	61
40-44	0	1	2	10	13
45-49	0	0	0	0	0
Total	200	200	200	200	800
Mean	21.29	22.36	21.33	25.11	23.41
Median	21.00	22.00	21.50	26.00	24.00
SD	8.25	8.40	9.44	9.43	8.75
Skewness	-.043	-.052	-.236	-.522	-.361
Kurtosis	-.415	-.636	-.454	-.097	-.154

Table 6.10: Class-Wise Distribution of Test Scores for Boys (N= 400)

Class/Class Interval	IX	X	XI	XII	Total
0-4	3	1	5	6	15
5-9	5	8	6	3	22
10-14	8	20	13	7	48
15-19	24	16	17	12	69
20-24	18	15	23	16	72
25-29	23	17	11	22	73
30-34	17	12	15	23	67
35-39	2	10	9	8	29
40-44	0	1	1	3	5
45-49	0	0	0	0	0
Total	100	100	100	100	400
Mean	21.75	21.32	21.63	24.27	22.24
Median	22.50	20.50	22.00	26.00	23.00
SD	8.12	9.36	9.46	9.93	9.28

Table 6.11: Class-Wise Distribution of Test Scores for Girls (N= 400)

Class/Class Interval	IX	X	XI	XII	Total
0-4	0	1	5	0	6
5-9	8	1	9	3	21
10-14	14	7	6	11	38
15-19	26	23	24	10	83
20-24	22	20	22	17	81
25-29	15	27	14	22	78
30-34	7	15	12	19	53
35-39	8	6	7	11	32
40-44	0	0	1	7	8
45-49	0	0	0	0	0
Total	100	100	100	100	400
Mean	20.83	23.40	21.02	25.95	22.80
Median	20.00	24.00	21.00	26.00	23.00
SD	8.40	7.22	9.47	8.87	8.75

Table 6.12: Details of the statistics of the test for normality (Age-wise)

	14	15	16	17	18	Total
Mean	22.94	22.18	21.81	23.28	22.57	23.41
Median	24.50	22.00	21.00	24.00	23.00	24.00
SD	7.46	9.13	8.95	9.02	9.58	8.75
P_{10}	13.00	10.00	11.00	11.00	10.00	12.00
P_{90}	32.00	34.60	34.00	34.00	35.00	34.90
Skewness	-.390	-.135	.044	-.477	-.148	-.361
Kurtosis	-.687	-.633	-.440	-.111	-.495	-.154

Table 6.13: Details of the statistics of the test for Normality (Class-wise)

	IX	X	XI	XII	Total
Mean	21.29	22.36	21.33	25.11	23.41
Median	21.00	22.00	21.50	26.00	24.00
SD	8.25	8.40	9.44	9.43	8.75
P_{10}	11.00	11.10	8.00	12.00	12.00
P_{90}	32.90	34.00	34.00	36.00	34.90
Skewness	-.043	-.052	-.236	-.522	-.361
Kurtosis	-.415	-.636	-.454	-.097	-.154

It is evident from the above Tables 6.12 and 6.13 that the Mean, Median, SD, Percentiles of the scores of each Age-group and Class lie very closely to one another, which is required for normal distribution. The skewness of the curve is found to be -3.61 which shows that the distribution is negatively skewed. Further, the value of kurtosis is found to be -.154 which shows that the distribution is platykurtic.

Fig. 6.2: GRAPH SHOWING THE MEAN SCORES FOR DIFFERENT AGES 14-18 (Total Sample, N= 800)

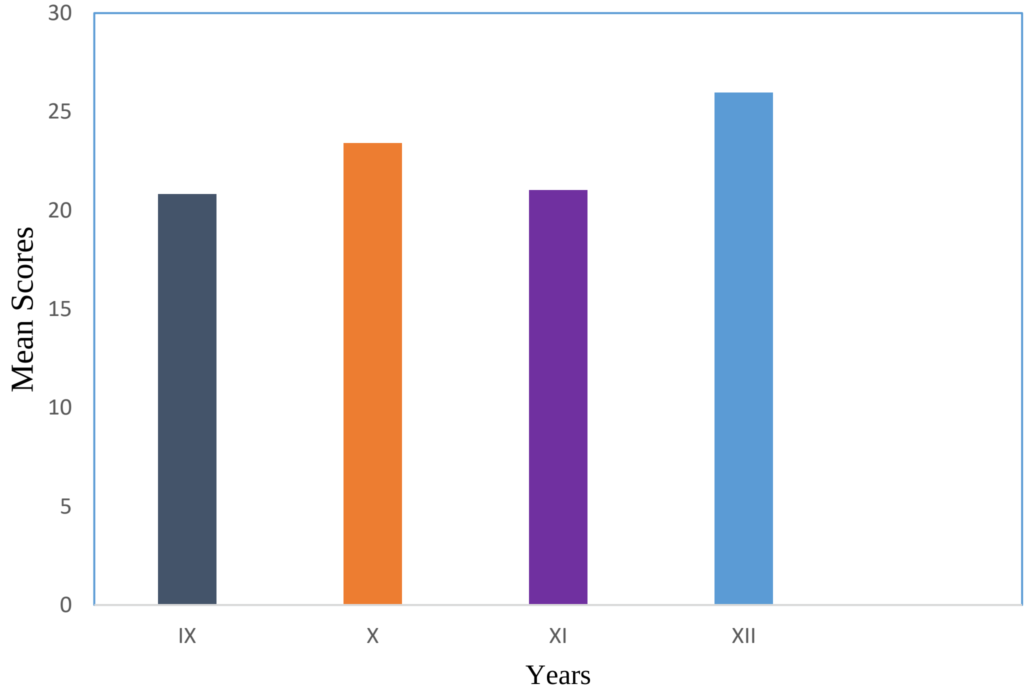


Fig. 6.3: GRAPH SHOWING THE MEAN SCORES FOR DIFFERENT AGES 14-18 (Boys, N= 400)

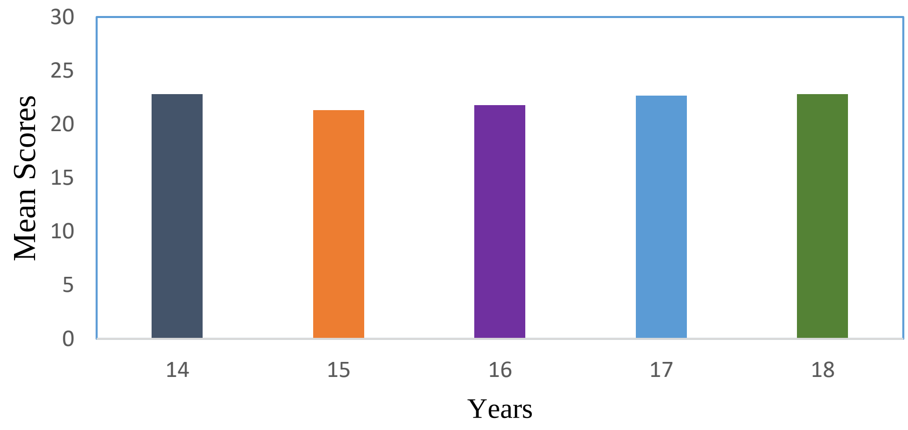


Fig. 6.4: GRAPH SHOWING THE MEAN SCORES FOR DIFFERENT AGES 14-18 (Girls, N= 400)

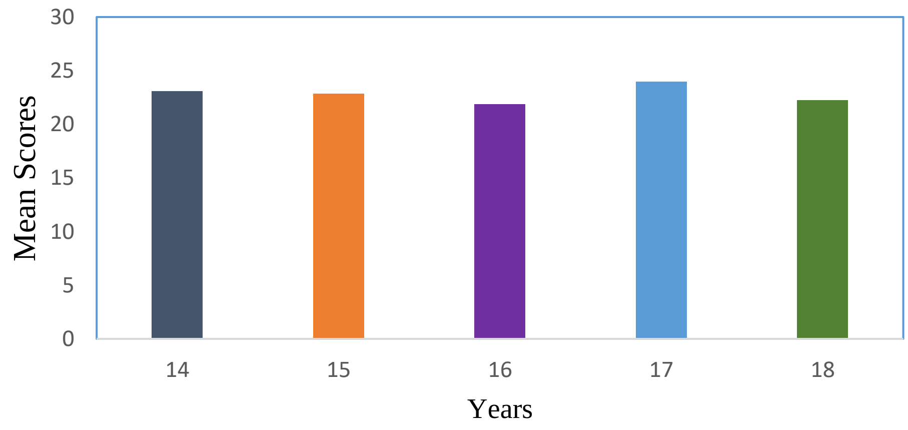


Fig. 6.5: GRAPH SHOWING THE MEAN SCORES FOR DIFFERENT CLASSES IX-XII (Total Sample, N= 800)

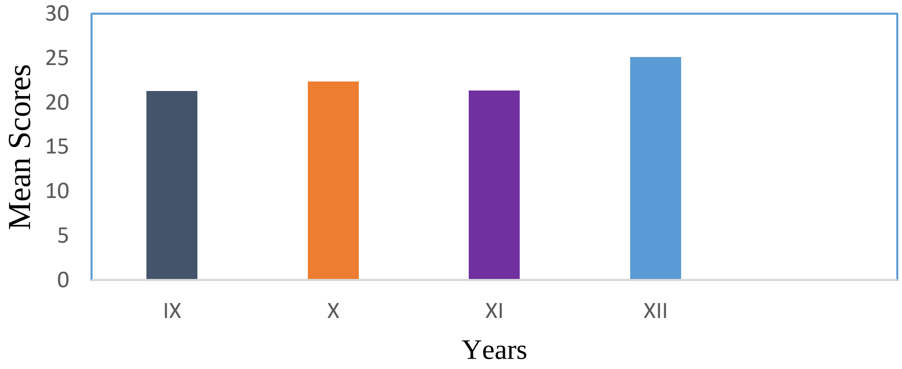


Fig. 6.6: GRAPH SHOWING THE MEAN SCORES FOR DIFFERENT CLASSES IX-XII (Boys, N= 400)

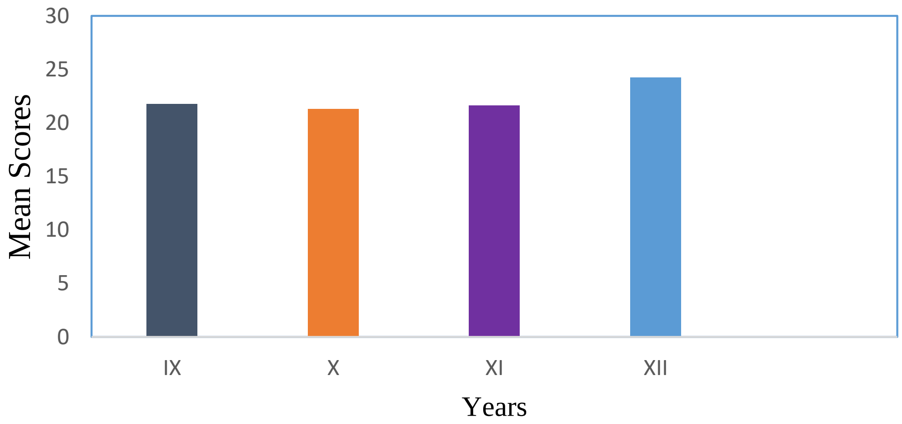


Fig. 6.7: GRAPH SHOWING THE MEAN SCORES FOR DIFFERENT CLASSES IX-XII (Girls, N= 400)

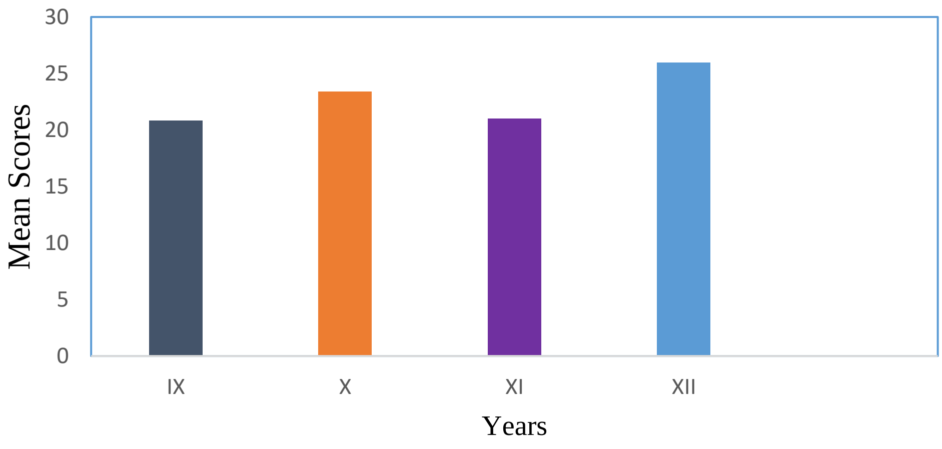


Fig. 6.8: Frequency Polygon of Scores obtained for Derivation of Norms of the Test (N = 800)

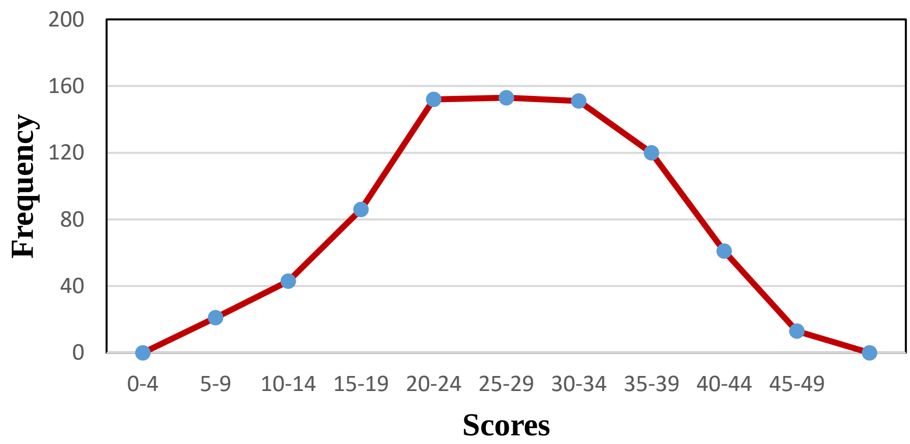


Fig. 6.9: Frequency Polygon of scores obtained for Boys and Girls of age 14

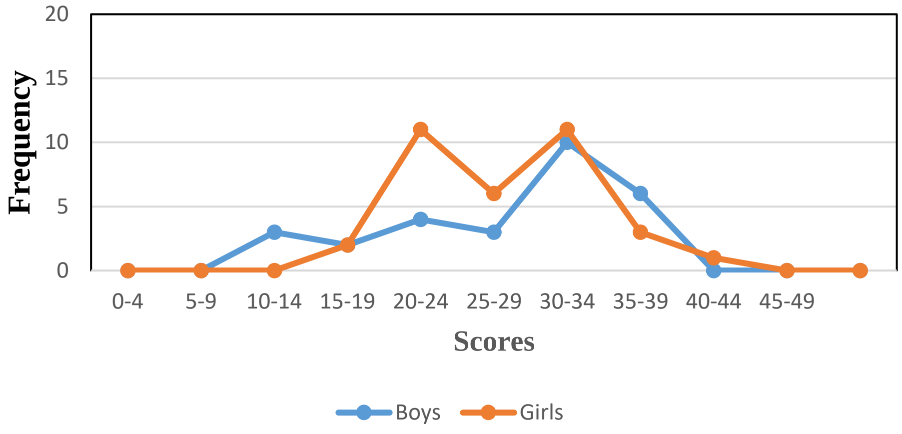
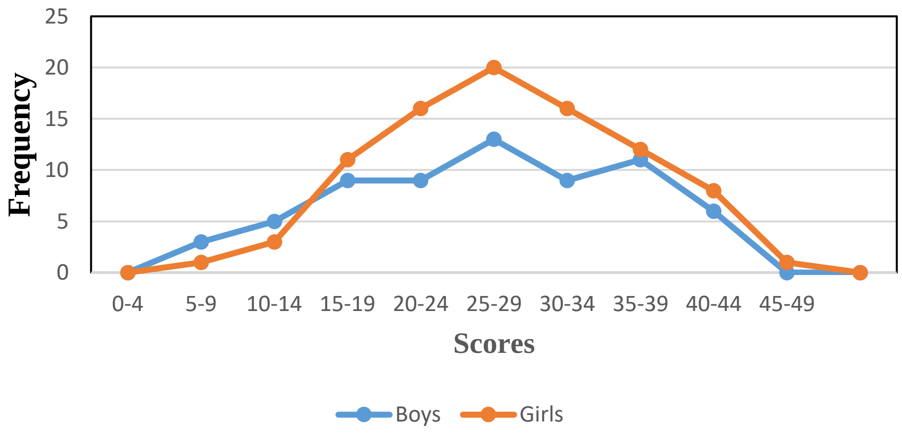


Fig. 6.10: Frequency Polygon of scores obtained for Boys and Girls of age 15



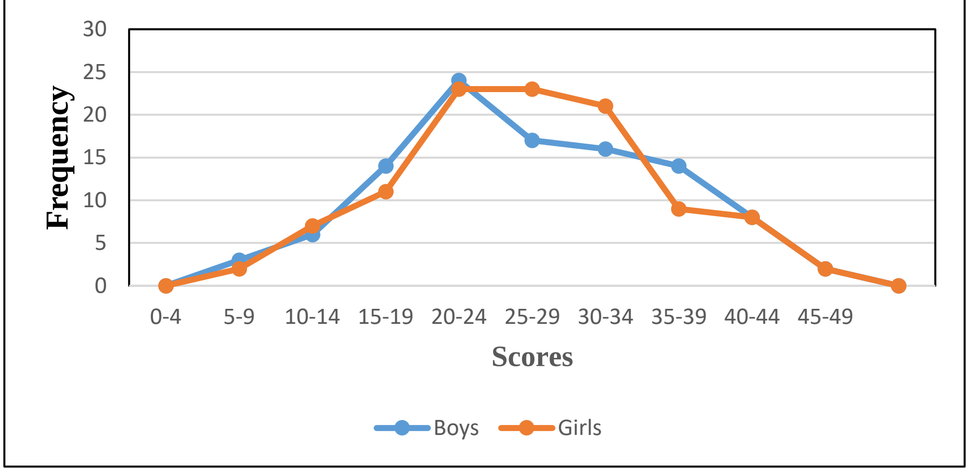


Fig. 6.11: Frequency Polygon of scores obtained for Boys and Girls of age 16

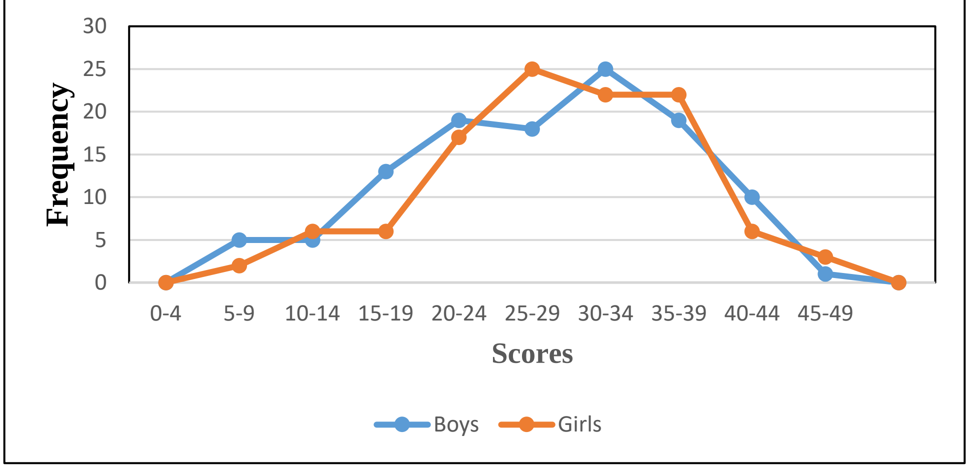


Fig. 6.12: Frequency Polygon of scores obtained for Boys and Girls of age 17

Fig. 6.13: Frequency Polygon of scores obtained for Boys and Girls of age 18

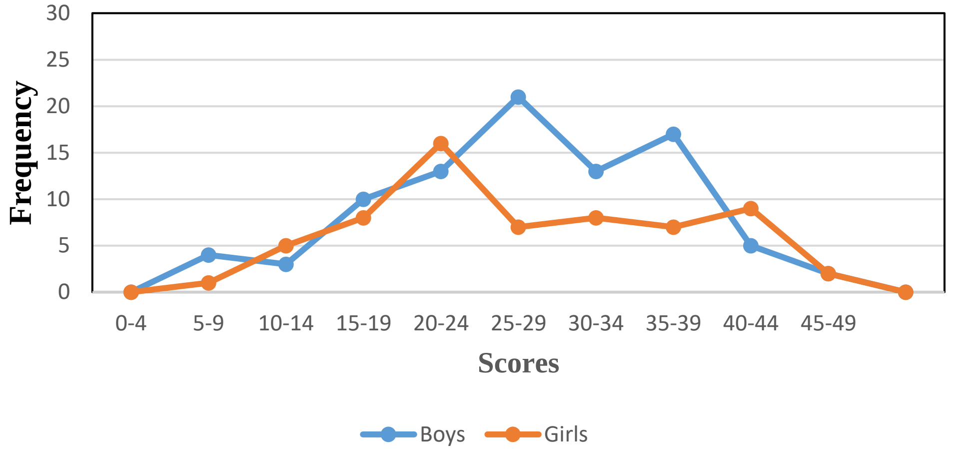
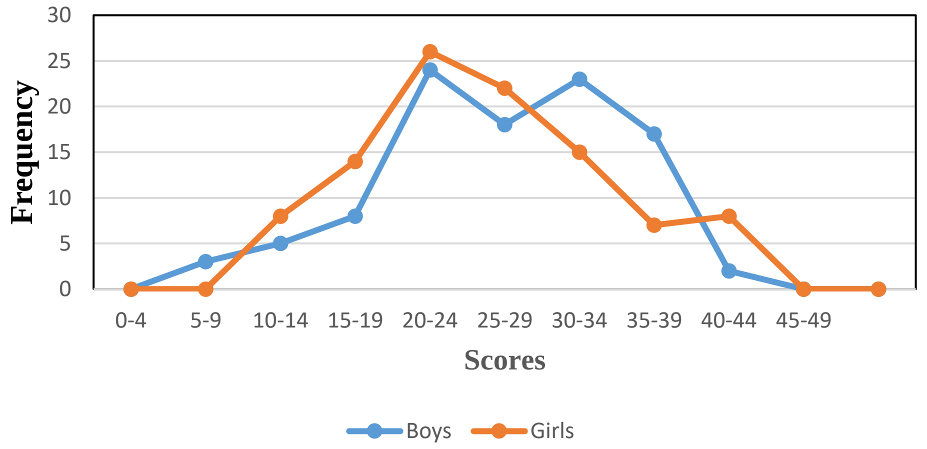


Fig. 6.14: Frequency Polygon of scores obtained for Boys and Girls of Class IX



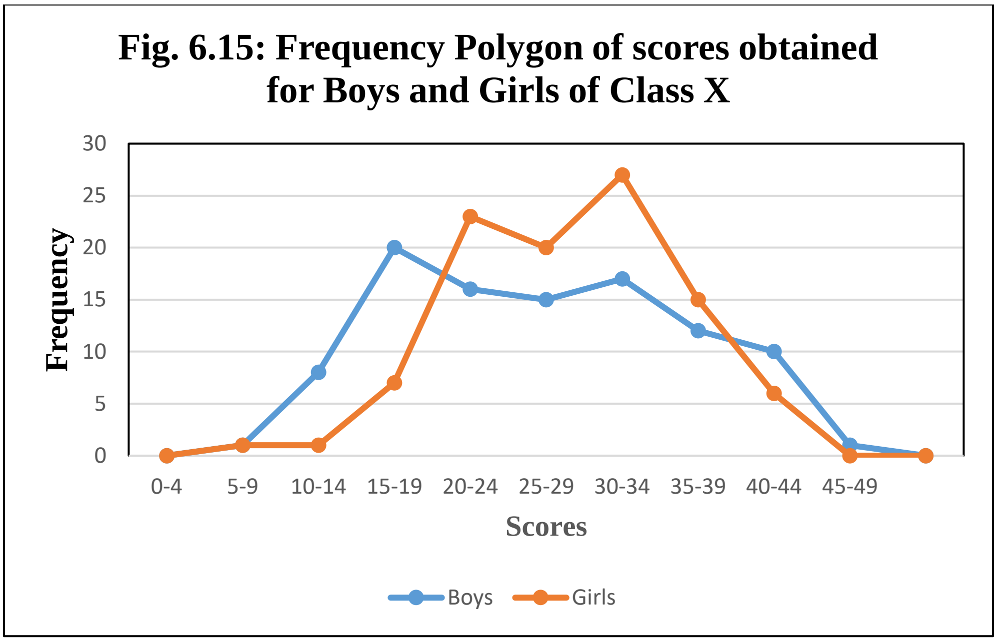


Fig. 6.15: Frequency Polygon of scores obtained for Boys and Girls of Class X
Frequency
30
25
20
15
10
5
0
0-4
5-9
10-14
15-19
20-24
25-29
30-34
35-39
40-44
45-49
Scores
Boys
Girls

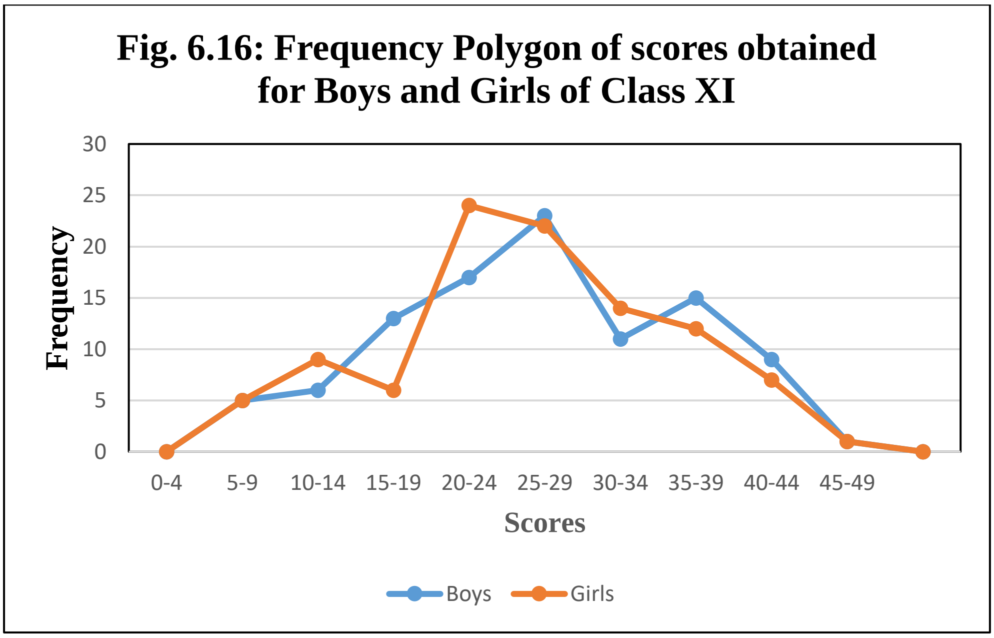
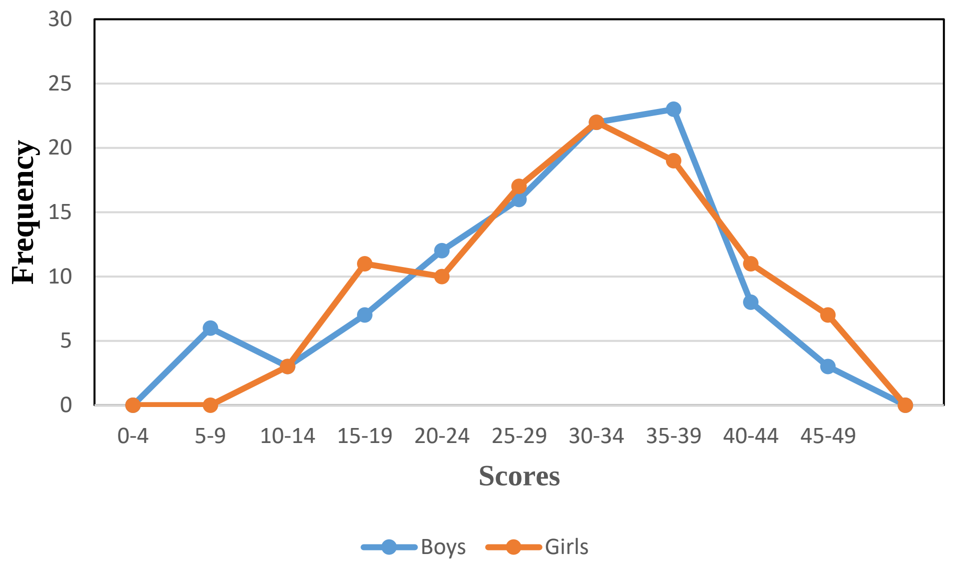


Fig. 6.16: Frequency Polygon of scores obtained for Boys and Girls of Class XI
Frequency
30
25
20
15
10
5
0
0-4
5-9
10-14
15-19
20-24
25-29
30-34
35-39
40-44
45-49
Scores
Boys
Girls

Fig. 6.17: Frequency Polygon of scores obtained for Boys and Girls of Class XII



(ii) Derivation of Norms:

For the present test, Sigma score norms, Percentile norms, T-score norms, DIQ and Stanine scores have been derived.

SIGMA SCORE (Z):

Sigma (Z) scores are expressed in terms of standard deviations from their means. In other words, deviations from the mean expressed in SD units are called Sigma Scores. Sigma Scores are also known as 'Z-Score'.

In the present test, the Sigma (Z) Scores were calculated by applying the following formula:

$$Z = \frac{X - M}{\sigma}$$

Z = Standard score in σ units
X = Raw score of an individual
M = Mean of test score
σ = Standard Deviation of the test scores

The sigma score for each raw score of the present test were given in Table 6.14-6.31.

PERCENTILE NORMS:

Percentile Norms are expressed in percentile ranks. According to Mangal (2002, p. 60) the term percentile rank may be defined as the number representing the percentage of the total number of cases lying below the given score. Percentile scores have several advantages. In the words of Anastasi and Urbina (1997, p. 58) they are easy to compute and can be readily understood, even by relatively untrained persons. Moreover, percentiles are universally applicable. They can be used equally well with adults and children and are suitable for any type of test, whether it measures aptitude or personality variable.

To calculate the individual's percentile norms on a test, the deviation of scores were first expressed in sigma score as already described above. With the help of these scores percentile norms were then established by seeing area under the standard normal distribution table of Z-Score. The percentile norms for each raw score were given in Table 6.14-6.31.

T -SCORE NORMS:

Normalized standard scores are generally called T scores. T Scaling was devised by McCall and first used by him in the construction of a series of reading tests designed for use in the elementary grades (Garret, 2007, p. 314). According to Bhatnagar and Bhatnagar (2010, p. 63) in order to avoid decimals and minus signs from Z-score these T-score norms are prepared. T-score is an improvement over Z-score. In T-scores mean is 50 and σ is 10. These scores are always positive. If normalized standard score is multiplied by 10 and added to or subtracted from 50, it is converted into T -Score. For this first Z-score is computed and then T-score is obtained by using the following formula:

$$\text{T-Score} = 50 \pm 10 \text{ (Z score)}$$

The values of T -scores for each raw score were calculated for different age groups of students and class group separately and presented in separate Tables 6.14-6.31.

DEVIATION INTELLIGENCE QUOTIENT (DIQ):

In this method mean is assumed to be 100 and SD = 16. Thus, if a student gets a score of 84, it will be said that his score is one standard deviation is below mean. And if the score is 116 then it will be one standard deviation above the mean.

Deviation Intelligence Quotient is a normalized standard score which does not involve the mental age of a child. It is not the ratio of mental and chronological ages. The standardized sample mean is 100 and S.D is usually 16. The deviation IQs unlike regular IQs are based entirely upon the performance of the children of similar chronological ages and experiences. The raw scores of an intelligence test are transformed into the DIQs. The procedure of transformation is based upon the principle of standard scores. The raw scores were transformed into DIQs with the help of the following formula:

$$\text{DIQ} == 100 + 16\ (\boldsymbol{\sigma})$$

The most important trailed or practised intelligence tests in India and overseas that deploy the Deviation IQ approach are Wechsler Adult Intelligence Scale (WAIS), Wechsler Intelligence Scale for Children (WISC), Cognitive Assessment System (CAS), Kaufman Brief Intelligence Test (KBIT), and Detroit Tests of Learning Aptitude (Anastasi and Urbina, 1997, p. 64).

For the present test, the deviation IQs are computed with a mean of 100 and SD of 16.

The DIQ scores for each raw score were calculated and presented for different age groups and class group in Table 6.14-6.31. The separate Tables for DIQ scores in classified forms for all age groups and gender-wise were also worked out and presented in Table 6.32 – 6.38.

Interpretation Table for Deviation Intelligence Quotient (DIQ):

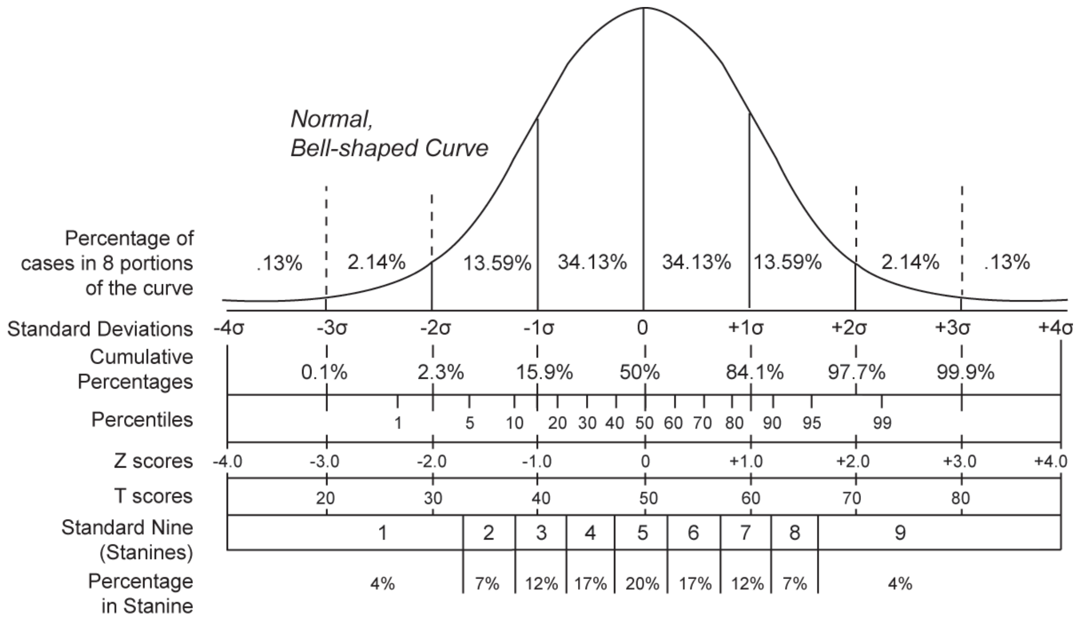
The DIQs for the entire sample was classified in the following 7 groups as suggested classification of revised Stanford Binet test for interpreting the DIQ of the children (Chauhan, 2007, p. 297).

Classification for interpreting DIQs of the entire sample No.= 800

DIQ Scores	Total	%	Classification
Below 70	28	3.50	Mentally Defective
70-79	63	7.88	Borderline Defective
80-89	129	16.13	Low Average
90-109	344	43.00	Normal/Average
110-119	134	16.75	High Average
120-139	102	12.75	Superior
140 & above	0	0.00	Very Superior
Total	800	100.00	

STANINE SCORE:

The word stanine is derived from stay Nine. In this method distribution is divided into nine parts where stanine 5 is in the middle of the distribution. In this case the mean is assumed to be 5 and SD = 2 (1.96). Mangal (2002, p. 272) mentioned that stanine scale was first used during World War II by the United States Army Air Force Aviation Psychology Programme for converting their test scores into standard nine categories. In such a procedure, they tried a coarse grouping of obtained scores int nine categories by assigning the integers 1 to 9 from the lowest to the highest.



Source:https://upload.wikimedia.org/wikipedia/commons/b/bb/Normal_distribution_and_scales.gif

The raw scores of tests are divided into the above 9 standards, their limits are calculated with the help of normal curve. It is assumed that the raw scores of the test are normally distributed (Sharma, 2007, p. 190). The detail distribution of Stanine Scores is given below:

Distribution of Stanine Scores

Stanine	Description	Percentage	Limits in σ of Stanine
1,9	Bottom and Top	4% Each	(1st) (-1.75 σ and below) (9th) (+ 1.75 σ and above)
2,8	Above bottom and below top	7% Each	(2nd) (- 1.25 σ to - 1.75 σ) (8th) (+ 1.25 σ *to* - 1.75 σ)
3,7	Near to second or eighth	12% Each	(3rd) (- .75 σ to 1.25 σ) (7th) (+ .75 σ to 1.25 σ)
4,6	Above or below mean	17% Each	(4th) (-.25 σ to - .75 σ) (6th) (+ .25 σ to + .75 σ)
5	Middle or Mean	20%	(5th) (- .25 σ to + .25 σ)
	Total	100	

The limits of the stanine are calculated by using the following formula probability curve (Sharma, 2007, p. 192). For example, Mean was 23.41 and SD 8.75 in the total sample of the present test.

X5	=	M	+0.25	=	23.41	+0.25	X	8.75	=	26
X4	=	M	-0.25	=	23.41	-0.25	X	8.75	=	21
X6	=	M	+0.75	=	23.41	+0.75	X	8.75	=	30
X3	=	M	-0.75	=	23.41	-0.75	X	8.75	=	17
X7	=	M	+1.25	=	23.41	+1.25	X	8.75	=	34
X2	=	M	-1.25	=	23.41	-1.25	X	8.75	=	12
X8	=	M	+1.75	=	23.41	+1.75	X	8.75	=	39
X1	=	M	-1.75	=	23.41	-1.75	X	8.75	=	8

By using the above formula, Stanine norms for each raw score were calculated and presented in table no. 6.14 to 6.31.

Table 6.14: Table Showing Z-Scores, Percentile Ranks, T-Scores, DIQs, and Stanine Scores for the Raw Score of Boys Age 14 Years

X	Z	PR	T	DIQ	SS
1	-2.55	0.4660	24.515	59.223	1
2	-2.43	0.8200	25.684	61.095	1
3	-2.31	1.0720	26.854	62.966	1
4	-2.20	1.3900	28.023	64.837	1
5	-2.08	2.2750	29.193	66.709	1
6	-1.96	2.5000	30.363	68.580	1
7	-1.85	3.2160	31.532	70.451	1
8	-1.73	4.1820	32.702	72.323	2
9	-1.61	5.3700	33.871	74.194	2
10	-1.50	6.6810	35.041	76.066	2
11	-1.38	8.3790	36.211	77.937	2
12	-1.26	10.3830	37.380	79.808	2
13	-1.15	12.5070	38.550	81.680	3
14	-1.03	15.1510	39.719	83.551	3
15	-0.91	18.1410	40.889	85.422	3
16	-0.79	21.4760	42.058	87.294	3
17	-0.68	24.8250	43.228	89.165	4
18	-0.56	28.7740	44.398	91.036	4
19	-0.44	32.9970	45.567	92.908	4
20	-0.33	37.0700	46.737	94.779	4
21	-0.21	41.6830	47.906	96.650	5
22	-0.09	46.4140	49.076	98.522	5
23	0.02	50.7980	50.246	100.393	5
24	0.14	55.5670	51.415	102.264	5
25	0.26	60.2570	52.585	104.136	6
26	0.38	64.8030	53.754	106.007	6
27	0.49	68.7930	54.924	107.878	6
28	0.61	72.9070	56.094	109.750	6
29	0.73	76.7300	57.263	111.621	6
30	0.84	79.9550	58.433	113.492	7
31	0.96	83.1470	59.602	115.364	7
32	1.08	85.9930	60.772	117.235	7
33	1.19	88.2980	61.942	119.106	7
34	1.31	90.4900	63.111	120.978	8
35	1.43	92.3640	64.281	122.849	8
36	1.55	92.3640	65.450	124.721	8
37	1.66	93.9430	66.620	126.592	8
38	1.78	95.1540	67.789	128.463	9
39	1.90	96.2460	68.959	130.335	9
40	2.01	97.7780	70.129	132.206	9
41	2.13	98.3410	71.298	134.077	9
42	2.25	98.7780	72.468	135.949	9
43	2.36	99.0860	73.637	137.820	9
44	2.48	99.3430	74.807	139.691	9
45	2.60	99.5340	75.977	141.563	9
(X-Raw Score, Z-Sigma Score, PR-Percentile Rank, T-T scores, DIQ-Deviation of Intelligence Quotient, SS-Stanine Score)					

Table 6.15: Table Showing Z-Scores, Percentile Ranks, T-Scores, DIQs, and Stanine Scores for the Raw Score of Boys Age 15 Years

X	Z	PR	T	DIQ	SS
1	-2.09	1.8310	29.071	66.514	1
2	-1.99	2.3300	30.103	68.165	1
3	-1.89	2.9380	31.135	69.816	1
4	-1.78	3.7540	32.167	71.467	1
5	-1.68	4.6480	33.199	73.119	2
6	-1.58	5.7050	34.231	74.770	2
7	-1.47	7.0780	35.263	76.421	2
8	-1.37	8.5340	36.295	78.072	2
9	-1.27	10.2040	37.327	79.723	2
10	-1.16	12.3020	38.359	81.375	3
11	-1.06	14.4570	39.391	83.026	3
12	-0.96	16.8530	40.423	84.677	3
13	-0.85	19.7660	41.455	86.328	3
14	-0.75	22.6630	42.487	87.979	4
15	-0.65	25.7850	43.519	89.631	4
16	-0.54	29.4600	44.551	91.282	4
17	-0.44	32.9970	45.583	92.933	4
18	-0.34	36.6930	46.615	94.584	4
19	-0.24	40.5170	47.647	96.235	5
20	-0.13	44.8280	48.679	97.886	5
21	-0.03	48.8030	49.711	99.538	5
22	0.07	52.7900	50.743	101.189	5
23	0.18	57.1420	51.775	102.840	5
24	0.28	61.0260	52.807	104.491	6
25	0.38	64.8030	53.839	106.142	6
26	0.49	68.7930	54.871	107.794	6
27	0.59	72.2400	55.903	109.445	6
28	0.69	75.4900	56.935	111.096	6
29	0.80	78.8140	57.967	112.747	7
30	0.90	81.5940	58.999	114.398	7
31	1.00	84.1340	60.031	116.050	7
32	1.11	86.6500	61.063	117.701	7
33	1.21	88.6860	62.095	119.352	7
34	1.31	90.4900	63.127	121.003	8
35	1.42	92.2000	64.159	122.654	8
36	1.52	93.5740	65.191	124.306	8
37	1.62	94.7380	66.223	125.957	8
38	1.73	95.8180	67.255	127.608	8
39	1.83	96.6380	68.287	129.259	9
40	1.93	97.3200	69.319	130.910	9
41	2.04	97.9320	70.351	132.561	9
42	2.14	98.3820	71.383	134.213	9
43	2.24	98.7450	72.415	135.864	9
44	2.34	99.0360	73.447	137.515	9
45	2.45	99.2860	74.479	139.166	9
(X-Raw Score, Z-Sigma Score, PR-Percentile Rank, T-T scores, DIQ-Deviation of Intelligence Quotient, SS-Stanine Score)					

Table 6.16: Table Showing Z-Scores, Percentile Ranks, T-Scores, DIQs, and Stanine Scores for the Raw Score of Boys Age 16 Years

X	Z	PR	T	DIQ	SS
1	-2.27	1.1600	27.265	63.624	1
2	-2.16	1.5390	28.359	65.374	1
3	-2.05	2.0180	29.453	67.125	1
4	-1.95	2.5590	30.547	68.875	1
5	-1.84	3.2880	31.641	70.626	1
6	-1.73	4.1820	32.735	72.376	2
7	-1.62	5.2620	33.829	74.127	2
8	-1.51	6.5520	34.923	75.877	2
9	-1.40	8.0760	36.018	77.628	2
10	-1.29	9.8530	37.112	79.379	2
11	-1.18	11.9000	38.206	81.129	3
12	-1.07	14.2310	39.300	82.880	3
13	-0.96	16.8530	40.394	84.630	3
14	-0.85	19.7660	41.488	86.381	3
15	-0.74	22.9650	42.582	88.131	4
16	-0.63	26.4350	43.676	89.882	4
17	-0.52	30.1530	44.770	91.632	4
18	-0.41	34.0900	45.864	93.383	4
19	-0.30	38.2090	46.958	95.133	4
20	-0.19	42.4650	48.053	96.884	5
21	-0.09	46.4140	49.147	98.635	5
22	0.02	50.7980	50.241	100.385	5
23	0.13	55.1720	51.335	102.136	5
24	0.24	59.4830	52.429	103.886	5
25	0.35	63.6830	53.523	105.637	6
26	0.46	67.7240	54.617	107.387	6
27	0.57	71.5660	55.711	109.138	6
28	0.68	75.1750	56.805	110.888	6
29	0.79	78.5240	57.899	112.639	7
30	0.90	81.5940	58.993	114.390	7
31	1.01	84.3750	60.088	116.140	7
32	1.12	86.8640	61.182	117.891	7
33	1.23	89.0650	62.276	119.641	7
34	1.34	90.9880	63.370	121.392	8
35	1.45	92.6470	64.464	123.142	8
36	1.56	94.0620	65.558	124.893	8
37	1.67	95.2540	66.652	126.643	8
38	1.77	96.1640	67.746	128.394	9
39	1.88	96.9950	68.840	130.144	9
40	1.99	97.6700	69.934	131.895	9
41	2.10	98.2140	71.028	133.646	9
42	2.21	98.6450	72.123	135.396	9
43	2.32	98.9830	73.217	137.147	9
44	2.43	99.2450	74.311	138.897	9
45	2.54	99.4460	75.405	140.648	9

(X-Raw Score, Z-Sigma Score, PR-Percentile Rank, T-T scores, DIQ-Deviation of Intelligence Quotient, SS-Stanine Score)

Table 6.17: Table Showing Z-Scores, Percentile Ranks, T-Scores, DIQs, and Stanine Scores for the Raw Score of Boys Age 17 Years

X	Z	PR	T	DIQ	SS
1	-2.30	1.0720	27.003	63.205	1
2	-2.19	1.4260	28.066	64.905	1
3	-2.09	1.8310	29.129	66.606	1
4	-1.98	2.3850	30.191	68.306	1
5	-1.87	3.0740	31.254	70.006	1
6	-1.77	3.8360	32.317	71.707	1
7	-1.66	4.8460	33.379	73.407	2
8	-1.56	5.9380	34.442	75.107	2
9	-1.45	7.3530	35.505	76.808	2
10	-1.34	9.0120	36.567	78.508	2
11	-1.24	10.7490	37.630	80.208	3
12	-1.13	12.9240	38.693	81.909	3
13	-1.02	15.3860	39.756	83.609	3
14	-0.92	17.8790	40.818	85.309	3
15	-0.81	20.8970	41.881	87.010	3
16	-0.71	23.8850	42.944	88.710	4
17	-0.60	27.4250	44.006	90.410	4
18	-0.49	31.2070	45.069	92.111	4
19	-0.39	34.8270	46.132	93.811	4
20	-0.28	39.3580	47.194	95.511	4
21	-0.17	43.2510	48.257	97.211	5
22	-0.07	47.2100	49.320	98.912	5
23	0.04	51.5950	50.383	100.612	5
24	0.14	55.5670	51.445	102.312	5
25	0.25	59.8710	52.508	104.013	5
26	0.36	64.0580	53.571	105.713	6
27	0.46	67.7240	54.633	107.413	6
28	0.57	71.5660	55.696	109.114	6
29	0.68	75.1750	56.759	110.814	7
30	0.78	78.2300	57.821	112.514	7
31	0.89	81.3270	58.884	114.215	7
32	0.99	83.8910	59.947	115.915	7
33	1.10	86.4330	61.010	117.615	7
34	1.21	88.6860	62.072	119.316	7
35	1.31	90.4900	63.135	121.016	8
36	1.42	92.2200	64.198	122.716	8
37	1.53	93.6990	65.260	124.417	8
38	1.63	94.8450	66.323	126.117	8
39	1.74	95.9070	67.386	127.817	8
40	1.84	96.7120	68.448	129.518	9
41	1.95	97.4410	69.511	131.218	9
42	2.06	98.0300	70.574	132.918	9
43	2.16	98.4610	71.637	134.619	9
44	2.27	98.8400	72.699	136.319	9
45	2.38	99.1340	73.762	138.019	9

(X-Raw Score, Z-Sigma Score, PR-Percentile Rank, T-T scores, DIQ-Deviation of Intelligence Quotient, SS-Stanine Score)

Table 6.18: Table Showing Z-Scores, Percentile Ranks, T-Scores, DIQs, and Stanine Scores for the Raw Score of Boys Age 18 Years

X	Z	PR	T	DIQ	SS
1	-2.34	0.9640	26.624	62.598	1
2	-2.23	1.2870	27.696	64.313	1
3	-2.12	1.7000	28.767	66.028	1
4	-2.02	2.1690	29.839	67.743	1
5	-1.91	2.8070	30.911	69.458	1
6	-1.80	3.5930	31.983	71.173	1
7	-1.69	4.5510	33.055	72.887	2
8	-1.59	5.5920	34.126	74.602	2
9	-1.48	6.9440	35.198	76.317	2
10	-1.37	8.5340	36.270	78.032	2
11	-1.27	10.2040	37.342	79.747	2
12	-1.16	12.3020	38.414	81.462	3
13	-1.05	14.6860	39.486	83.177	3
14	-0.94	17.3610	40.557	84.892	3
15	-0.84	20.0450	41.629	86.607	3
16	-0.73	23.2700	42.701	88.322	4
17	-0.62	26.7630	43.773	90.036	4
18	-0.52	30.1530	44.845	91.751	4
19	-0.41	34.0900	45.916	93.466	4
20	-0.30	38.2090	46.988	95.181	4
21	-0.19	42.4650	48.060	96.896	5
22	-0.09	46.4140	49.132	98.611	5
23	0.02	50.7980	50.204	100.326	5
24	0.13	55.1720	51.275	102.041	5
25	0.23	59.0950	52.347	103.756	5
26	0.34	63.3070	53.419	105.471	6
27	0.45	67.3640	54.491	107.185	6
28	0.56	71.2260	55.563	108.900	6
29	0.66	74.5370	56.635	110.615	6
30	0.77	77.9350	57.706	112.330	7
31	0.88	81.0570	58.778	114.045	7
32	0.98	83.6460	59.850	115.760	7
33	1.09	86.2140	60.922	117.475	7
34	1.20	88.4930	61.994	119.190	7
35	1.31	90.4900	63.065	120.905	8
36	1.41	92.0730	64.137	122.620	8
37	1.52	93.5740	65.209	124.334	8
38	1.63	94.8450	66.281	126.049	8
39	1.74	95.9070	67.353	127.764	8
40	1.84	96.7120	68.424	129.479	9
41	1.95	97.4410	69.496	131.194	9
42	2.06	98.0300	70.568	132.909	9
43	2.16	98.4610	71.640	134.624	9
44	2.27	98.8400	72.712	136.339	9
45	2.38	99.1340	73.783	138.054	9

(X-Raw Score, Z-Sigma Score, PR-Percentile Rank, T-T scores, DIQ-Deviation of Intelligence Quotient, SS-Stanine Score)

Table 6.19: Table Showing Z-Scores, Percentile Ranks, T-Scores, DIQs, and Stanine Scores for the Raw Score of Girls Age 14 Years

X	Z	PR	T	DIQ	SS
1	-3.36	0.0390	16.372	46.195	1
2	-3.21	0.0660	17.896	48.634	1
3	-3.06	0.1110	19.421	51.073	1
4	-2.91	0.1810	20.945	53.512	1
5	-2.75	0.2190	22.470	55.951	1
6	-2.60	0.4660	23.994	58.390	1
7	-2.45	0.7140	25.518	60.829	1
8	-2.30	1.0720	27.043	63.268	1
9	-2.14	1.6180	28.567	65.707	1
10	-1.99	2.3300	30.091	68.146	1
11	-1.84	3.2880	31.616	70.585	1
12	-1.69	4.5510	33.140	73.024	2
13	-1.53	6.3010	34.665	75.463	2
14	-1.38	8.3790	36.189	77.902	2
15	-1.23	10.9350	37.713	80.341	3
16	-1.08	14.0070	39.238	82.780	3
17	-0.92	17.8790	40.762	85.220	3
18	-0.77	22.0650	42.287	87.659	3
19	-0.62	26.7630	43.811	90.098	4
20	-0.47	31.9180	45.335	92.537	4
21	-0.31	37.8280	46.860	94.976	4
22	-0.16	43.6440	48.384	97.415	5
23	-0.01	49.6010	49.909	99.854	5
24	0.14	55.5670	51.433	102.293	5
25	0.30	61.7910	52.957	104.732	6
26	0.45	67.3640	54.482	107.171	6
27	0.60	72.5750	56.006	109.610	6
28	0.75	77.3370	57.530	112.049	6
29	0.91	81.8590	59.055	114.488	7
30	1.06	85.5430	60.579	116.927	7
31	1.21	88.6860	62.104	119.366	7
32	1.36	91.3090	63.628	121.805	8
33	1.52	93.5740	65.152	124.244	8
34	1.67	95.2540	66.677	126.683	8
35	1.82	96.5620	68.201	129.122	9
36	1.97	97.5580	69.726	131.561	9
37	2.13	98.3410	71.250	134.000	9
38	2.28	98.8700	72.774	136.439	9
39	2.43	99.4300	74.299	138.878	9
40	2.58	99.5060	75.823	141.317	9
41	2.73	99.6830	77.348	143.756	9
42	2.89	99.8070	78.872	146.195	9
43	3.04	99.8820	80.396	148.634	9
44	3.19	99.9290	81.921	151.073	9
45	3.34	99.9580	83.445	153.512	9
(X-Raw Score, Z-Sigma Score, PR-Percentile Rank, T-T scores, DIQ-Deviation of Intelligence Quotient, SS-Stanine Score)					

Table 6.20: Table Showing Z-Scores, Percentile Ranks, T-Scores, DIQs, and Stanine Scores for the Raw Score of Girls Age 15 Years

X	Z	PR	T	DIQ	SS
1	-2.52	0.5870	24.839	59.742	1
2	-2.40	0.8200	25.991	61.585	1
3	-2.29	1.1010	27.143	63.429	1
4	-2.17	1.5000	28.295	65.272	1
5	-2.06	1.9700	29.447	67.115	1
6	-1.94	2.6190	30.599	68.959	1
7	-1.82	3.4380	31.751	70.802	1
8	-1.71	4.3630	32.903	72.645	2
9	-1.59	5.5920	34.055	74.488	2
10	-1.48	6.9440	35.207	76.332	2
11	-1.36	8.6910	36.359	78.175	2
12	-1.25	10.5650	37.512	80.018	2
13	-1.13	12.9240	38.664	81.862	3
14	-1.02	15.3860	39.816	83.705	3
15	-0.90	18.4060	40.968	85.548	3
16	-0.79	21.4760	42.120	87.392	3
17	-0.67	25.1430	43.272	89.235	4
18	-0.56	28.7740	44.424	91.078	4
19	-0.44	32.9970	45.576	92.922	4
20	-0.33	37.0700	46.728	94.765	4
21	-0.21	41.6830	47.880	96.608	5
22	-0.10	46.0170	49.032	98.452	5
23	0.02	49.2020	50.184	100.295	5
24	0.13	55.1720	51.336	102.138	5
25	0.25	59.8710	52.488	103.982	5
26	0.36	64.0580	53.641	105.825	6
27	0.48	68.4390	54.793	107.668	6
28	0.59	72.2400	55.945	109.512	6
29	0.71	76.1150	57.097	111.355	6
30	0.82	79.3890	58.249	113.198	7
31	0.94	82.6390	59.401	115.042	7
32	1.06	85.5430	60.553	116.885	7
33	1.17	87.9000	61.705	118.728	7
34	1.29	90.1470	62.857	120.571	8
35	1.40	91.9240	64.009	122.415	8
36	1.52	93.5740	65.161	124.258	8
37	1.63	94.8450	66.313	126.101	8
38	1.75	95.9940	67.465	127.945	8
39	1.86	96.8560	68.618	129.788	9
40	1.98	97.6150	69.770	131.631	9
41	2.09	98.1690	70.922	133.475	9
42	2.21	98.6450	72.074	135.318	9
43	2.32	98.9830	73.226	137.161	9
44	2.44	99.2660	74.378	139.005	9
45	2.55	99.4610	75.530	140.848	9
(X-Raw Score, Z-Sigma Score, PR-Percentile Rank, T-T scores, DIQ-Deviation of Intelligence Quotient, SS-Stanine Score)					

Table 6.21: Table Showing Z-Scores, Percentile Ranks, T-Scores, DIQs, and Stanine Scores for the Raw Score of Girls Age 16 Years

X	Z	PR	T	DIQ	SS
1	-2.36	0.9140	26.372	62.195	1
2	-2.25	1.2220	27.506	64.009	1
3	-2.14	1.6180	28.639	65.823	1
4	-2.02	2.1690	29.773	67.637	1
5	-1.91	2.8070	30.907	69.451	1
6	-1.80	3.5930	32.041	71.265	1
7	-1.68	4.6480	33.175	73.079	2
8	-1.57	5.8210	34.308	74.893	2
9	-1.46	7.2150	35.442	76.707	2
10	-1.34	9.0120	36.576	78.522	2
11	-1.23	10.9350	37.710	80.336	3
12	-1.12	13.1360	38.844	82.150	3
13	-1.00	15.8660	39.977	83.964	3
14	-0.89	18.6730	41.111	85.778	3
15	-0.78	21.7700	42.245	87.592	3
16	-0.66	25.4630	43.379	89.406	4
17	-0.55	29.1160	44.512	91.220	4
18	-0.44	32.9970	45.646	93.034	4
19	-0.32	37.4480	46.780	94.848	4
20	-0.21	41.6830	47.914	96.662	5
21	-0.10	46.0170	49.048	98.476	5
22	0.02	50.7980	50.181	100.290	5
23	0.13	55.1720	51.315	102.104	5
24	0.24	59.4830	52.449	103.918	5
25	0.36	64.0580	53.583	105.732	6
26	0.47	68.0820	54.717	107.547	6
27	0.59	72.2400	55.850	109.361	6
28	0.70	75.8040	56.984	111.175	6
29	0.81	79.1030	58.118	112.989	7
30	0.93	82.3810	59.252	114.803	7
31	1.04	85.0830	60.385	116.617	7
32	1.15	87.4930	61.519	118.431	7
33	1.27	89.7960	62.653	120.245	8
34	1.38	91.6210	63.787	122.059	8
35	1.49	93.1890	64.921	123.873	8
36	1.61	94.6300	66.054	125.687	8
37	1.72	95.7280	67.188	127.501	8
38	1.83	96.6380	68.322	129.315	9
39	1.95	97.4410	69.456	131.129	9
40	2.06	98.0300	70.590	132.943	9
41	2.17	98.5000	71.723	134.757	9
42	2.29	98.8990	72.857	136.571	9
43	2.40	99.1800	73.991	138.386	9
44	2.51	99.3960	75.125	140.200	9
45	2.63	99.5730	76.259	142.014	9

(X-Raw Score, Z-Sigma Score, PR-Percentile Rank, T-T scores, DIQ-Deviation of Intelligence Quotient, SS-Stanine Score)

Table 6.22: Table Showing Z-Scores, Percentile Ranks, T-Scores, DIQs, and Stanine Scores for the Raw Score of Girls Age 17 Years

X	Z	PR	T	DIQ	SS
1	-2.67	0.3790	23.252	57.203	1
2	-2.56	0.5230	24.417	59.068	1
3	-2.44	0.7340	25.583	60.932	1
4	-2.33	0.9900	26.748	62.797	1
5	-2.21	1.3550	27.914	64.662	1
6	-2.09	1.8310	29.079	66.527	1
7	-1.98	2.3850	30.245	68.392	1
8	-1.86	3.1440	31.410	70.256	1
9	-1.74	4.0930	32.576	72.121	2
10	-1.63	5.1550	33.741	73.986	2
11	-1.51	6.5520	34.907	75.851	2
12	-1.39	8.2260	36.072	77.716	2
13	-1.28	10.0270	37.238	79.580	2
14	-1.16	12.3020	38.403	81.445	3
15	-1.04	14.9170	39.569	83.310	3
16	-0.93	17.6190	40.734	85.175	3
17	-0.81	20.8970	41.900	87.040	3
18	-0.69	24.5100	43.065	88.904	4
19	-0.58	28.0960	44.231	90.769	4
20	-0.46	32.2760	45.396	92.634	4
21	-0.34	36.6930	46.562	94.499	4
22	-0.23	40.9050	47.727	96.364	5
23	-0.11	45.6200	48.893	98.228	5
24	0.01	50.3990	50.058	100.093	5
25	0.12	54.7760	51.224	101.958	5
26	0.24	59.4830	52.389	103.823	5
27	0.36	64.0580	53.555	105.688	6
28	0.47	68.0820	54.720	107.552	6
29	0.59	72.2400	55.886	109.417	6
30	0.71	76.1150	57.051	111.282	6
31	0.82	79.3890	58.217	113.147	7
32	0.94	82.6390	59.382	115.012	7
33	1.05	85.3140	60.548	116.877	7
34	1.17	87.9000	61.713	118.741	7
35	1.29	90.1470	62.879	120.606	8
36	1.40	91.9240	64.044	122.471	8
37	1.52	93.5740	65.210	124.336	8
38	1.64	94.9500	66.375	126.201	8
39	1.75	95.9940	67.541	128.065	8
40	1.87	96.9260	68.706	129.930	9
41	1.99	97.6700	69.872	131.795	9
42	2.10	98.2140	71.037	133.660	9
43	2.22	98.6790	72.203	135.525	9
44	2.34	99.0360	73.368	137.389	9
45	2.45	99.2860	74.534	139.254	9

(X-Raw Score, Z-Sigma Score, PR-Percentile Rank, T-T scores, DIQ-Deviation of Intelligence Quotient, SS-Stanine Score)

Table 6.23: Table Showing Z-Scores, Percentile Ranks, T-Scores, DIQs, and Stanine Scores for the Raw Score of Girls Age 18 Years

X	Z	PR	T	DIQ	SS
1	-2.13	1.6590	28.739	65.982	1
2	-2.03	2.1180	29.740	67.584	1
3	-1.93	2.6800	30.741	69.185	1
4	-1.83	3.3620	31.742	70.787	1
5	-1.73	4.1820	32.743	72.388	2
6	-1.63	5.1550	33.744	73.990	2
7	-1.53	6.3010	34.745	75.592	2
8	-1.43	7.6360	35.746	77.193	2
9	-1.33	9.1760	36.747	78.795	2
10	-1.23	10.9350	37.748	80.396	3
11	-1.13	12.9240	38.749	81.998	3
12	-1.03	15.1510	39.750	83.600	3
13	-0.92	17.8790	40.751	85.201	3
14	-0.82	20.6110	41.752	86.803	3
15	-0.72	23.5760	42.753	88.404	4
16	-0.62	26.7630	43.754	90.006	4
17	-0.52	30.1530	44.755	91.608	4
18	-0.42	33.7240	45.756	93.209	4
19	-0.32	37.4480	46.757	94.811	4
20	-0.22	41.2940	47.758	96.412	5
21	-0.12	45.2240	48.759	98.014	5
22	-0.02	49.2020	49.760	99.616	5
23	0.08	53.1880	50.761	101.217	5
24	0.18	57.1420	51.762	102.819	5
25	0.28	61.0260	52.763	104.420	6
26	0.38	64.8030	53.764	106.022	6
27	0.48	68.4390	54.765	107.624	6
28	0.58	71.9040	55.766	109.225	6
29	0.68	75.1750	56.767	110.827	6
30	0.78	78.2300	57.768	112.428	7
31	0.88	81.0570	58.769	114.030	7
32	0.98	83.6460	59.770	115.632	7
33	1.08	85.9930	60.771	117.233	7
34	1.18	88.1000	61.772	118.835	7
35	1.28	89.9730	62.773	120.436	8
36	1.38	91.6210	63.774	122.038	8
37	1.48	93.0560	64.775	123.640	8
38	1.58	94.2950	65.776	125.241	8
39	1.68	95.3520	66.777	126.843	8
40	1.78	96.2460	67.778	128.444	9
41	1.88	96.9950	68.779	130.046	9
42	1.98	97.6150	69.780	131.648	9
43	2.08	98.1240	70.781	133.249	9
44	2.18	98.5370	71.782	134.851	9
45	2.28	98.8700	72.783	136.453	9

(X-Raw Score, Z-Sigma Score, PR-Percentile Rank, T-T scores, DIQ-Deviation of Intelligence Quotient, SS-Stanine Score)

Table 6.24: Table Showing Z-Scores, Percentile Ranks, T-Scores, DIQs, and Stanine Scores for the Raw Score of Boys Class IX

X	Z	PR	T	DIQ	SS
1	-2.56	0.5230	24.446	59.113	1
2	-2.43	0.7550	25.677	61.084	1
3	-2.31	0.1044	26.909	63.054	1
4	-2.19	0.1426	28.140	65.025	1
5	-2.06	1.9700	29.372	66.995	1
6	-1.94	2.6190	30.603	68.966	1
7	-1.82	3.4380	31.835	70.936	1
8	-1.69	4.5510	33.067	72.906	2
9	-1.57	5.8210	34.298	74.877	2
10	-1.45	7.3530	35.530	76.847	2
11	-1.32	9.3420	36.761	78.818	2
12	-1.20	11.5070	37.993	80.788	3
13	-1.08	14.0070	39.224	82.759	3
14	-0.95	17.1060	40.456	84.729	3
15	-0.83	20.3270	41.687	86.700	3
16	-0.71	23.8850	42.919	88.670	4
17	-0.58	28.0960	44.150	90.640	4
18	-0.46	32.2760	45.382	92.611	4
19	-0.34	36.6930	46.613	94.581	4
20	-0.22	41.2940	47.845	96.552	5
21	-0.09	46.4140	49.076	98.522	5
22	0.03	51.1970	50.308	100.493	5
23	0.15	55.9620	51.539	102.463	5
24	0.28	61.0260	52.771	104.434	6
25	0.40	65.5420	54.002	106.404	6
26	0.52	69.8470	55.234	108.374	6
27	0.65	74.2150	56.466	110.345	6
28	0.77	77.9350	57.697	112.315	7
29	0.89	81.3270	58.929	114.286	7
30	1.02	84.6140	60.160	116.256	7
31	1.14	87.2860	61.392	118.227	7
32	1.26	89.6170	62.623	120.197	8
33	1.39	91.7740	63.855	122.168	8
34	1.51	93.4480	65.086	124.138	8
35	1.63	94.8450	66.318	126.108	8
36	1.75	95.9940	67.549	128.079	8
37	1.88	96.9950	68.781	130.049	9
38	2.00	97.7250	70.012	132.020	9
39	2.12	98.3000	71.244	133.990	9
40	2.25	98.7780	72.475	135.961	9
41	2.37	99.1110	73.707	137.931	9
42	2.49	99.3610	74.938	139.902	9
43	2.62	99.5600	76.170	141.872	9
44	2.74	99.6930	77.401	143.842	9
45	2.86	99.7880	78.633	145.813	9

(X-Raw Score, Z-Sigma Score, PR-Percentile Rank, T-T scores, DIQ-Deviation of Intelligence Quotient, SS-Stanine Score)

Table 6.25: Table Showing Z-Scores, Percentile Ranks, T-Scores, DIQs, and Stanine Scores for the Raw Score of Boys Class X

X	Z	PR	T	DIQ	SS
1	-2.17	1.5000	28.291	65.265	1
2	-2.06	1.9700	29.359	66.974	1
3	-1.96	2.5000	30.427	68.684	1
4	-1.85	3.2160	31.496	70.393	1
5	-1.74	4.0930	32.564	72.103	2
6	-1.64	5.0500	33.632	73.812	2
7	-1.53	6.3010	34.701	75.521	2
8	-1.42	7.7800	35.769	77.231	2
9	-1.32	9.3420	36.838	78.940	2
10	-1.21	11.3140	37.906	80.650	3
11	-1.10	13.5670	38.974	82.359	3
12	-1.00	15.8660	40.043	84.068	3
13	-0.89	18.6730	41.111	85.778	3
14	-0.78	21.7700	42.179	87.487	3
15	-0.68	24.8250	43.248	89.197	4
16	-0.57	28.4340	44.316	90.906	4
17	-0.46	32.2760	45.385	92.615	4
18	-0.35	36.3170	46.453	94.325	4
19	-0.25	40.1290	47.521	96.034	4
20	-0.14	44.4330	48.590	97.744	5
21	-0.03	48.8030	49.658	99.453	5
22	0.07	52.7900	50.727	101.162	5
23	0.18	57.1420	51.795	102.872	5
24	0.29	61.4090	52.863	104.581	6
25	0.39	65.1730	53.932	106.291	6
26	0.50	69.1460	55.000	108.000	6
27	0.61	72.9070	56.068	109.709	6
28	0.71	76.1150	57.137	111.419	6
29	0.82	79.3890	58.205	113.128	7
30	0.93	82.3810	59.274	114.838	7
31	1.03	84.8490	60.342	116.547	7
32	1.14	87.2860	61.410	118.256	7
33	1.25	89.4350	62.479	119.966	7
34	1.35	91.1490	63.547	121.675	8
35	1.46	92.7850	64.615	123.385	8
36	1.57	94.1790	65.684	125.094	8
37	1.68	95.3520	66.752	126.803	8
38	1.78	96.2460	67.821	128.513	9
39	1.89	97.0620	68.889	130.222	9
40	2.00	97.7250	69.957	131.932	9
41	2.10	98.2140	71.026	133.641	9
42	2.21	98.6450	72.094	135.350	9
43	2.32	98.9830	73.162	137.060	9
44	2.42	99.2240	74.231	138.769	9
45	2.53	99.4300	75.299	140.479	9

(X-Raw Score, Z-Sigma Score, PR-Percentile Rank, T-T scores, DIQ-Deviation of Intelligence Quotient, SS-Stanine Score)

Table 6.26: Table Showing Z-Scores, Percentile Ranks, T-Scores, DIQs, and Stanine Scores for the Raw Score of Boys Class XI

X	Z	PR	T	DIQ	SS
1	-2.18	1.4630	28.192	65.108	1
2	-2.08	1.8760	29.249	66.799	1
3	-1.97	2.4420	30.307	68.490	1
4	-1.86	3.1440	31.364	70.182	1
5	-1.76	3.9200	32.421	71.873	2
6	-1.65	4.9470	33.478	73.564	2
7	-1.55	6.0570	34.535	75.256	2
8	-1.44	7.4930	35.592	76.947	2
9	-1.34	9.0120	36.649	78.638	2
10	-1.23	1.9350	37.706	80.330	3
11	-1.12	13.1360	38.763	82.021	3
12	-1.02	15.3860	39.820	83.712	3
13	-0.91	18.1410	40.877	85.404	3
14	-0.81	20.8970	41.934	87.095	3
15	-0.70	24.1960	42.992	88.786	4
16	-0.60	27.4250	44.049	90.478	4
17	-0.49	31.2070	45.106	92.169	4
18	-0.38	35.1970	46.163	93.860	4
19	-0.28	38.9740	47.220	95.552	4
20	-0.17	43.2510	48.277	97.243	5
21	-0.07	47.2100	49.334	98.934	5
22	0.04	51.5950	50.391	100.626	5
23	0.14	55.5670	51.448	102.317	5
24	0.25	59.8710	52.505	104.009	5
25	0.36	64.0580	53.562	105.700	6
26	0.46	67.7240	54.619	107.391	6
27	0.57	71.5660	55.677	109.083	6
28	0.67	74.8570	56.734	110.774	6
29	0.78	78.2300	57.791	112.465	7
30	0.88	81.0570	58.848	114.156	7
31	0.99	83.8910	59.905	115.848	7
32	1.10	86.4330	60.962	117.539	7
33	1.20	88.4930	62.019	119.230	7
34	1.31	90.4900	63.076	120.922	8
35	1.41	92.0730	64.133	122.613	8
36	1.52	93.5740	65.190	124.304	8
37	1.62	94.7380	66.247	125.996	8
38	1.73	95.8180	67.304	127.687	8
39	1.84	96.7120	68.362	129.378	9
40	1.94	97.3810	69.419	131.070	9
41	2.05	97.9820	70.476	132.761	9
42	2.15	98.4220	71.533	134.452	9
43	2.26	98.8090	72.590	136.144	9
44	2.36	99.0860	73.647	137.835	9
45	2.47	99.3240	74.704	139.526	9

(X-Raw Score, Z-Sigma Score, PR-Percentile Rank, T-T scores, DIQ-Deviation of Intelligence Quotient, SS-Stanine Score)

Table 6.27: Table Showing Z-Scores, Percentile Ranks, T-Scores, DIQs, and Stanine Scores for the Raw Score of Boys Class XII

X	Z	PR	T	DIQ	SS
1	-2.34	0.9640	26.566	62.506	1
2	-2.24	1.2550	27.573	64.117	1
3	-2.14	1.6180	28.580	65.728	1
4	-2.04	2.0680	29.587	67.339	1
5	-1.94	2.6190	30.594	68.951	1
6	-1.84	3.2880	31.601	70.562	1
7	-1.74	4.0930	32.608	72.173	2
8	-1.64	5.0500	33.615	73.784	2
9	-1.54	6.1780	34.622	75.396	2
10	-1.44	7.4930	35.629	77.007	2
11	-1.34	9.0120	36.636	78.618	2
12	-1.24	10.7490	37.644	80.230	3
13	-1.13	12.9240	38.651	81.841	3
14	-1.03	15.1510	39.658	83.452	3
15	-0.93	17.6190	40.665	85.063	3
16	-0.83	20.3270	41.672	86.675	3
17	-0.73	23.2700	42.679	88.286	4
18	-0.63	26.4350	43.686	89.897	4
19	-0.53	29.8060	44.693	91.509	4
20	-0.43	33.3600	45.700	93.120	4
21	-0.33	37.0700	46.707	94.731	4
22	-0.23	49.0500	47.714	96.342	5
23	-0.13	44.8280	48.721	97.954	5
24	-0.03	48.8030	49.728	99.565	5
25	0.07	52.7900	50.735	101.176	5
26	0.17	56.7490	51.742	102.788	5
27	0.27	60.6420	52.749	104.399	6
28	0.38	64.8030	53.756	106.010	6
29	0.48	68.4390	54.763	107.621	6
30	0.58	71.9040	55.770	109.233	6
31	0.68	75.1750	56.777	110.844	6
32	0.78	78.2300	57.784	112.455	7
33	0.88	81.0570	58.792	114.067	7
34	0.98	83.6460	59.799	115.678	7
35	1.08	85.9930	60.806	117.289	7
36	1.18	88.1000	61.813	118.900	7
37	1.28	89.9730	62.820	120.512	8
38	1.38	91.6210	63.827	122.123	8
39	1.48	93.0560	64.834	123.734	8
40	1.58	94.2950	65.841	125.345	8
41	1.68	95.3520	66.848	126.957	8
42	1.79	96.3270	67.855	128.568	9
43	1.89	97.0620	68.862	130.179	9
44	1.99	97.6700	69.869	131.791	9
45	2.09	98.1690	70.876	133.402	9

(X-Raw Score, Z-Sigma Score, PR-Percentile Rank, T-T scores, DIQ-Deviation of Intelligence Quotient, SS-Stanine Score)

Table 6.28: Table Showing Z-Scores, Percentile Ranks, T-Scores, DIQs, and Stanine Scores for the Raw Score of Girls Class IX

X	Z	PR	T	DIQ	SS
1	-2.36	0.9140	26.393	62.229	1
2	-2.24	1.2550	27.583	64.133	1
3	-2.12	1.7000	28.774	66.038	1
4	-2.00	2.2750	29.964	67.943	1
5	-1.88	3.0050	31.155	69.848	1
6	-1.77	3.8360	32.345	71.752	1
7	-1.65	4.9470	33.536	73.657	2
8	-1.53	6.3010	34.726	75.562	2
9	-1.41	7.9270	35.917	77.467	2
10	-1.29	9.8530	37.107	79.371	2
11	-1.17	12.1000	38.298	81.276	3
12	-1.05	14.6860	39.488	83.181	3
13	-0.93	17.6190	40.679	85.086	3
14	-0.81	20.8970	41.869	86.990	3
15	-0.69	24.5100	43.060	88.895	4
16	-0.58	28.0960	44.250	90.800	4
17	-0.46	32.2760	45.440	92.705	4
18	-0.34	36.6930	46.631	94.610	4
19	-0.22	41.2940	47.821	96.514	5
20	-0.10	46.0170	49.012	98.419	5
21	0.02	50.7980	50.202	100.324	5
22	0.14	55.5670	51.393	102.229	5
23	0.26	60.2570	52.583	104.133	6
24	0.38	64.8030	53.774	106.038	6
25	0.50	69.1460	54.964	107.943	6
26	0.62	73.2370	56.155	109.848	6
27	0.73	76.7300	57.345	111.752	6
28	0.85	80.2340	58.536	113.657	7
29	0.97	83.3980	59.726	115.562	7
30	1.09	86.2140	60.917	117.467	7
31	1.21	88.6860	62.107	119.371	7
32	1.33	90.8240	63.298	121.276	8
33	1.45	92.6470	64.488	123.181	8
34	1.57	94.1790	65.679	125.086	8
35	1.69	95.4490	66.869	126.991	8
36	1.81	96.4850	68.060	128.895	9
37	1.93	97.3200	69.250	130.800	9
38	2.04	97.9320	70.440	132.705	9
39	2.16	98.4610	71.631	134.610	9
40	2.28	98.8700	72.821	136.514	9
41	2.40	99.1800	74.012	138.419	9
42	2.52	99.4130	75.202	140.324	9
43	2.64	99.5850	76.393	142.229	9
44	2.76	99.7110	77.583	144.133	9
45	2.88	99.8010	78.774	146.038	9

(X-Raw Score, Z-Sigma Score, PR-Percentile Rank, T-T scores, DIQ-Deviation of Intelligence Quotient, SS-Stanine Score)

Table 6.29: Table Showing Z-Scores, Percentile Ranks, T-Scores, DIQs, and Stanine Scores for the Raw Score of Girls Class X

X	Z	PR	T	DIQ	SS
1	-3.10	0.0970	18.975	50.360	1
2	-2.96	0.1540	20.360	52.576	1
3	-2.83	0.2330	21.745	54.792	1
4	-2.69	0.3570	23.130	57.008	1
5	-2.55	0.5390	24.515	59.224	1
6	-2.41	0.7980	25.900	61.440	1
7	-2.27	1.1600	27.285	63.657	1
8	-2.13	1.6590	28.670	65.873	1
9	-1.99	2.3300	30.055	68.089	1
10	-1.86	3.1440	31.440	70.305	1
11	-1.72	4.2720	32.825	72.521	2
12	-1.58	5.7050	34.211	74.737	2
13	-1.44	7.4930	35.596	76.953	2
14	-1.30	9.6800	36.981	79.169	2
15	-1.16	12.3020	38.366	81.385	3
16	-1.02	15.3860	39.751	83.601	3
17	-0.89	18.6730	41.136	85.817	3
18	-0.75	22.6630	42.521	88.033	3
19	-0.61	27.0930	43.906	90.249	4
20	-0.47	31.9180	45.291	92.465	4
21	-0.33	37.0700	46.676	94.681	4
22	-0.19	42.4650	48.061	96.898	5
23	-0.06	47.6080	49.446	99.114	5
24	0.08	53.1880	50.831	101.330	5
25	0.22	58.7060	52.216	103.546	5
26	0.36	64.0580	53.601	105.762	6
27	0.50	69.1460	54.986	107.978	6
28	0.64	73.8910	56.371	110.194	6
29	0.78	78.2300	57.756	112.410	7
30	0.91	81.8590	59.141	114.626	7
31	1.05	85.3140	60.526	116.842	7
32	1.19	88.2980	61.911	119.058	7
33	1.33	90.8240	63.296	121.274	8
34	1.47	92.9220	64.681	123.490	8
35	1.61	94.6300	66.066	125.706	8
36	1.75	95.9940	67.452	127.922	8
37	1.88	96.9950	68.837	130.139	9
38	2.02	97.8310	70.222	132.355	9
39	2.16	98.4610	71.607	134.571	9
40	2.30	98.9280	72.992	136.787	9
41	2.44	99.2660	74.377	139.003	9
42	2.58	99.5060	75.762	141.219	9
43	2.71	99.6640	77.147	143.435	9
44	2.85	99.7810	78.532	145.651	9
45	2.99	99.8610	79.917	147.867	9
(X-Raw Score, Z-Sigma Score, PR-Percentile Rank, T-T scores, DIQ-Deviation of Intelligence Quotient, SS-Stanine Score)					

Table 6.30: Table Showing Z-Scores, Percentile Ranks, T-Scores, DIQs, and Stanine Scores for the Raw Score of Girls Class XI

X	Z	PR	T	DIQ	SS
1	-2.11	1.7430	28.860	66.175	1
2	-2.01	2.2220	29.916	67.865	1
3	-1.90	2.8720	30.971	69.554	1
4	-1.80	3.5930	32.027	71.244	1
5	-1.69	4.5510	33.083	72.933	2
6	-1.59	5.5920	34.139	74.623	2
7	-1.48	6.9440	35.195	76.313	2
8	-1.37	8.5340	36.251	78.002	2
9	-1.27	10.2040	37.307	79.692	2
10	-1.16	12.3020	38.363	81.381	3
11	-1.06	14.4570	39.419	83.071	3
12	-0.95	17.1060	40.475	84.760	3
13	-0.85	19.7660	41.531	86.450	3
14	-0.74	22.9650	42.587	88.139	4
15	-0.64	26.1090	43.643	89.829	4
16	-0.53	29.8060	44.699	91.518	4
17	-0.42	33.7240	45.755	93.208	4
18	-0.32	37.4480	46.811	94.898	4
19	-0.21	41.6830	47.867	96.587	5
20	-0.11	45.6200	48.923	98.277	5
21	0.00	50.0000	49.979	99.966	5
22	0.10	53.9830	51.035	101.656	5
23	0.21	58.3170	52.091	103.345	5
24	0.31	62.1720	53.147	105.035	6
25	0.42	66.2760	54.203	106.724	6
26	0.53	70.1940	55.259	108.414	6
27	0.63	73.5650	56.315	110.104	6
28	0.74	77.0350	57.371	111.793	6
29	0.84	79.9550	58.427	113.483	7
30	0.95	82.8940	59.483	115.172	7
31	1.05	85.3140	60.539	116.862	7
32	1.16	87.6980	61.595	118.551	7
33	1.27	89.7960	62.650	120.241	8
34	1.37	91.4660	63.706	121.930	8
35	1.48	93.0560	64.762	123.620	8
36	1.58	94.2950	65.818	125.309	8
37	1.69	95.4490	66.874	126.999	8
38	1.79	96.3270	67.930	128.689	9
39	1.90	97.1280	68.986	130.378	9
40	2.00	97.7250	70.042	132.068	9
41	2.11	98.2570	71.098	133.757	9
42	2.22	98.6790	72.154	135.447	9
43	2.32	98.9830	73.210	137.136	9
44	2.43	99.2450	74.266	138.826	9
45	2.53	99.4300	75.322	140.515	9

(X-Raw Score, Z-Sigma Score, PR-Percentile Rank, T-T scores, DIQ-Deviation of Intelligence Quotient, SS-Stanine Score)

Table 6.31: Table Showing Z-Scores, Percentile Ranks, T-Scores, DIQs, and Stanine Scores for the Raw Score of Girls Class XII

X	Z	PR	T	DIQ	SS
1	-2.81	0.2480	21.871	54.994	1
2	-2.70	0.3470	22.999	56.798	1
3	-2.59	0.4800	24.126	58.602	1
4	-2.47	0.6760	25.254	60.406	1
5	-2.36	0.9140	26.381	62.210	1
6	-2.25	1.2220	27.508	64.014	1
7	-2.14	1.6180	28.636	65.817	1
8	-2.02	2.1690	29.763	67.621	1
9	-1.91	2.8070	30.891	69.425	1
10	-1.80	3.5930	32.018	71.229	1
11	-1.69	4.5510	33.145	73.033	2
12	-1.57	5.8210	34.273	74.837	2
13	-1.46	7.2150	35.400	76.640	2
14	-1.35	8.8510	36.528	78.444	2
15	-1.23	10.9350	37.655	80.248	3
16	-1.12	13.1360	38.782	82.052	3
17	-1.01	15.6250	39.910	83.856	3
18	-0.90	18.4060	41.037	85.660	3
19	-0.78	21.7700	42.165	87.463	3
20	-0.67	25.1430	43.292	89.267	4
21	-0.56	28.7740	44.419	91.071	4
22	-0.45	32.6360	45.547	92.875	4
23	-0.33	37.0700	46.674	94.679	4
24	-0.22	41.2940	47.802	96.483	5
25	-0.11	45.6200	48.929	98.286	5
26	0.01	50.3990	50.056	100.090	5
27	0.12	54.7760	51.184	101.894	5
28	0.23	59.0950	52.311	103.698	5
29	0.34	63.3070	53.439	105.502	6
30	0.46	67.7240	54.566	107.306	6
31	0.57	71.5660	55.693	109.109	6
32	0.68	75.1750	56.821	110.913	6
33	0.79	78.5240	57.948	112.717	7
34	0.91	81.8590	59.076	114.521	7
35	1.02	84.6140	60.203	116.325	7
36	1.13	87.0760	61.330	118.129	7
37	1.25	89.4350	62.458	119.932	7
38	1.36	91.3090	63.585	121.736	8
39	1.47	92.9220	64.713	123.540	8
40	1.58	94.2950	65.840	125.344	8
41	1.70	95.5430	66.967	127.148	8
42	1.81	96.4850	68.095	128.952	9
43	1.92	97.2570	69.222	130.755	9
44	2.03	97.8820	70.349	132.559	9
45	2.15	98.4220	71.477	134.363	9

(X-Raw Score, Z-Sigma Score, PR-Percentile Rank, T-T scores, DIQ-Deviation of Intelligence Quotient, SS-Stanine Score)

6-5 Classification of Intelligence

The level of intelligence of the present test was studied by the same data collected on the sample of 800 which have been used for estimating the reliability, validity and establishing the norms. The levels of intelligence of the entire sample No = 800 in terms of the classification DIQs were described in Table 6.32 to 6.39 gender-wise and age-wise. The Histogram indicating the distribution level of intelligence for the entire sample gender-wise and age- wise were presented in Fig. 6.18 to 6.23.

Table 6.32: Classification of Gender-wise DIQs of the entire Sample No. =800

DIQ Scores	Boys	%	Girls	%	Total	%	Classification
Below 70	15	3.75	13	3.25	28	3.50	Mentally Defective
70-79	33	8.25	30	7.50	63	7.88	Borderline Defective
80-89	61	15.25	68	17.00	129	16.13	Low Average
90-109	173	43.25	171	42.75	344	43.00	Normal/Average
110-119	74	18.50	60	15.00	134	16.75	High Average
120-139	44	11.00	58	14.50	102	12.75	Superior
140 & above	0	0.00	0	0.00	0	0.00	Very Superior
Total	400	100.00	400	100.00	800	100.00	

Table 6.33: Classification of Age-wise Distribution of DIQs of the Total sample No.= 800 (14-18years)

DIQ Scores	14	15	16	17	18	Total	Classification
Below 70	2	4	6	11	5	28	Mentally Defective
70-79	5	16	14	17	11	63	Borderline Defective
80-89	13	25	41	28	22	129	Low Average
90-109	20	63	95	99	67	344	Normal/Average
110-119	18	25	23	40	28	134	High Average
120-139	4	20	31	29	18	102	Superior
140 & above	0	0	0	0	0	0	Very Superior
Total	62	153	210	224	151	800	

Table 6.34: Classification of Gender-wise DIQs for the Age 14 years (N=62)

DIQ Scores	Boys	%	Girls	%	Total	%	Classification
Below 70	1	3.57	1	2.94	2	3.23	Mentally Defective
70-79	3	10.71	2	5.88	5	8.06	Borderline Defective
80-89	5	17.86	8	23.53	13	20.97	Low Average
90-109	8	28.57	12	35.29	20	32.26	Normal/Average
110-119	10	35.71	8	23.53	18	29.03	High Average
120-139	1	3.57	3	8.82	4	6.45	Superior
140 & above	0	0.00	0	0.00	0	0.00	Very Superior
Total	28	100.00	34	100.00	62	100.00	

Table 6.35: Classification of Gender-wise DIQs for the Age 15 years (N=153)

DIQ Scores	Boys	%	Girls	%	Total	%	Classification
Below 70	2	3.08	2	2.27	4	2.61	Mentally Defective
70-79	8	12.31	8	9.09	16	10.46	Borderline Defective
80-89	10	15.38	15	17.05	25	16.34	Low Average
90-109	25	38.46	38	43.18	63	41.18	Normal/Average
110-119	14	21.54	11	12.50	25	16.34	High Average
120-139	6	9.23	14	15.91	20	13.07	Superior
140 & above	0	0.00	0	0.00	0	0.00	Very Superior
Total	65	100.00	88	100.00	153	100.00	

Table 6.36: Classification of Gender-wise DIQs for the Age 16 years (N=210)

DIQ Scores	Boys	%	Girls	%	Total	%	Classification
Below 70	3	2.88	3	2.83	6	2.86	Mentally Defective
70-79	7	6.73	7	6.60	14	6.67	Borderline Defective
80-89	23	22.12	18	16.98	41	19.52	Low Average
90-109	41	39.42	54	50.94	95	45.24	Normal/Average
110-119	16	15.38	7	6.60	23	10.95	High Average
120-139	14	13.46	17	16.04	31	14.76	Superior
140 & above	0	0.00	0	0.00	0	0.00	Very Superior
Total	104	100.00	106	100.00	210	100.00	

Table 6.37: Classification of Gender-wise DIQs for the Age 17 years (N=224)

DIQ Scores	Boys	%	Girls	%	Total	%	Classification
Below 70	6	5.22	5	4.59	11	4.91	Mentally Defective
70-79	8	6.96	9	8.26	17	7.59	Borderline Defective
80-89	14	12.17	14	12.84	28	12.50	Low Average
90-109	51	44.35	48	44.04	99	44.20	Normal/Average
110-119	20	17.39	20	18.35	40	17.86	High Average
120-139	16	13.91	13	11.93	29	12.95	Superior
140 & above	0	0.00	0	0.00	0	0.00	Very Superior
Total	115	100.00	109	100.00	224	100.00	

Table 6.38: Classification of Gender-wise DIQs for the Age 18 years (N=151)

DIQ Scores	Boys	%	Girls	%	Total	%	Classification
Below 70	4	4.55	1	1.59	5	3.31	Mentally Defective
70-79	6	6.82	5	7.94	11	7.28	Borderline Defective
80-89	12	13.64	10	15.87	22	14.57	Low Average
90-109	38	43.18	29	46.03	67	44.37	Normal/Average
110-119	21	23.86	7	11.11	28	18.54	High Average
120-139	7	7.95	11	17.46	18	11.92	Superior
140 & above	0	0.00	0	0.00	0	0.00	Very Superior
Total	88	100.00	63	100.00	151	100.00	

It is evident from the above tables that the level of intelligence was normally distributed in all age levels. As regards to the distribution of intelligence for the entire sample (gender-wise and age-wise) is concerned the table no. 6.32 and 6.33 revealed that the intelligence was normally distributed.

Table 6.39: Classification of Age-wise distribution of DIQs, Mean and S.D. of the total Sample (N=800)

DIQ	14	15	16	17	18	Total
55-59	0	0	0	5	0	5
60-64	1	2	3	2	4	12
65-69	1	2	3	4	1	11
70-74	3	4	5	7	4	23
75-79	2	12	9	10	7	40
80-84	3	10	15	9	11	48
85-89	10	15	26	19	11	81
90-94	4	12	29	22	22	89
95-99	4	21	16	25	15	81
100-104	7	17	24	34	17	99
105-109	5	13	26	18	13	75
110-114	12	12	12	27	15	78
115-119	6	13	11	22	13	65
120-124	3	12	14	14	11	54
125-129	1	7	10	4	4	26
130-134	0	1	6	2	3	12
135-139	0	0	1	0	0	1
140-144	0	0	0	0	0	0
Total	62	153	210	224	151	800
Mean	22.94	22.18	21.81	23.28	22.57	23.41
SD	7.46	9.13	8.95	9.02	9.58	8.75

The above table shows that the age-wise distribution of DIQs for the entire sample N=800 was normally distributed. It is observed that the mean and standard deviation of every age-group seems to be very closure to each other. The Mean. and S.D. of the entire sample (N=800) were 23.41 and 8.75 respectively.

Fig. 6.18: Histogram Showing the Gender-Wise Level of Intelligence for the Total Sample (N=800)

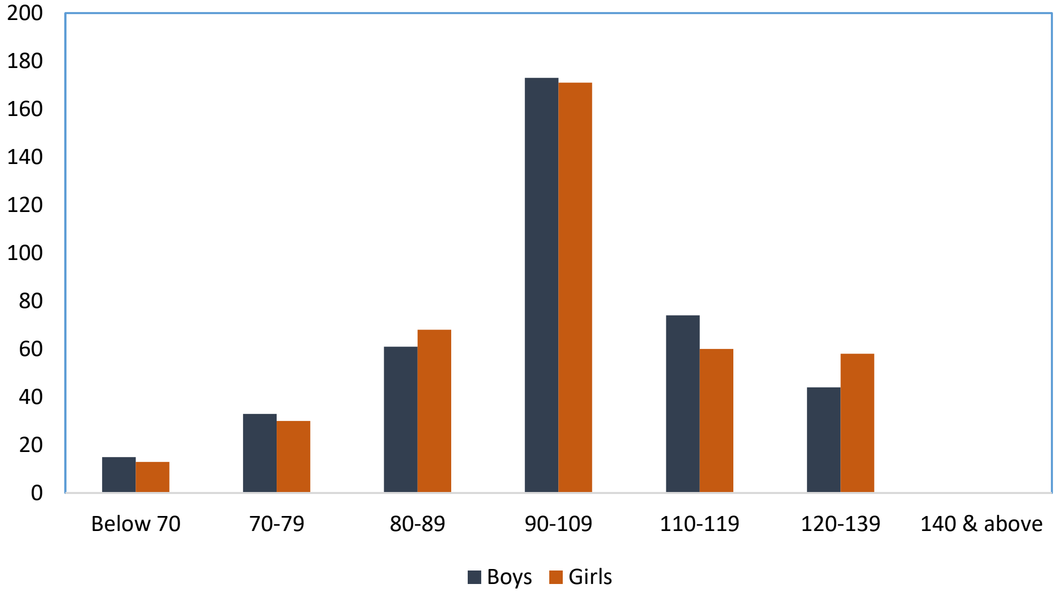


Fig. 6.19: Histogram Showing the Gender-Wise Level of Intelligence for the Age 14 (B=28, G= 34)

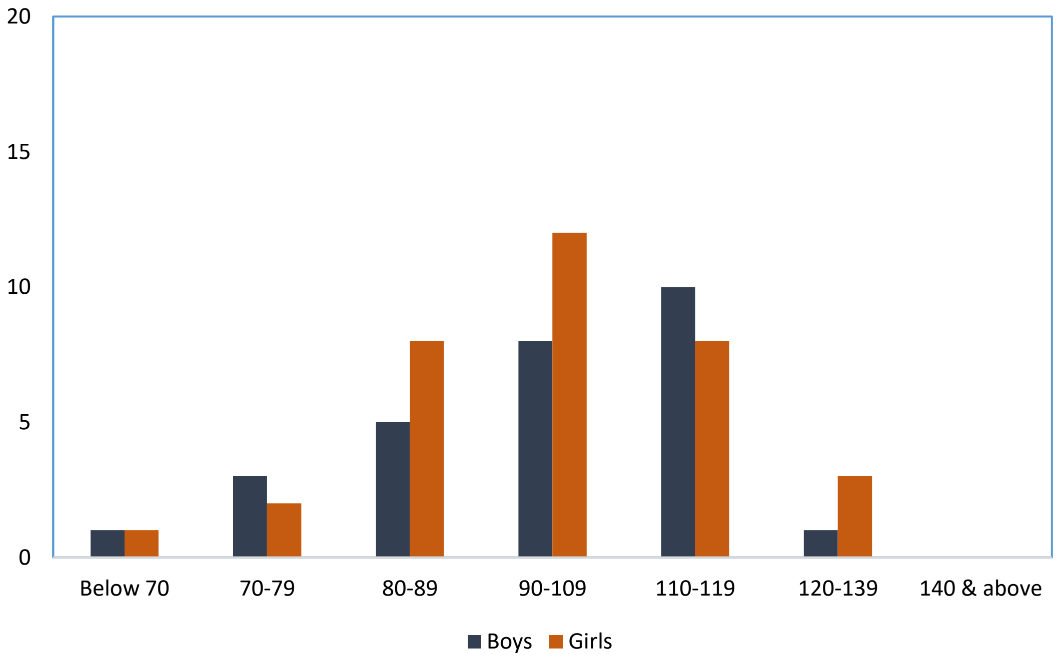


Fig. 6.20: Histogram Showing the Gender-Wise Level of Intelligence for the Age 15 (B=65, G= 88)

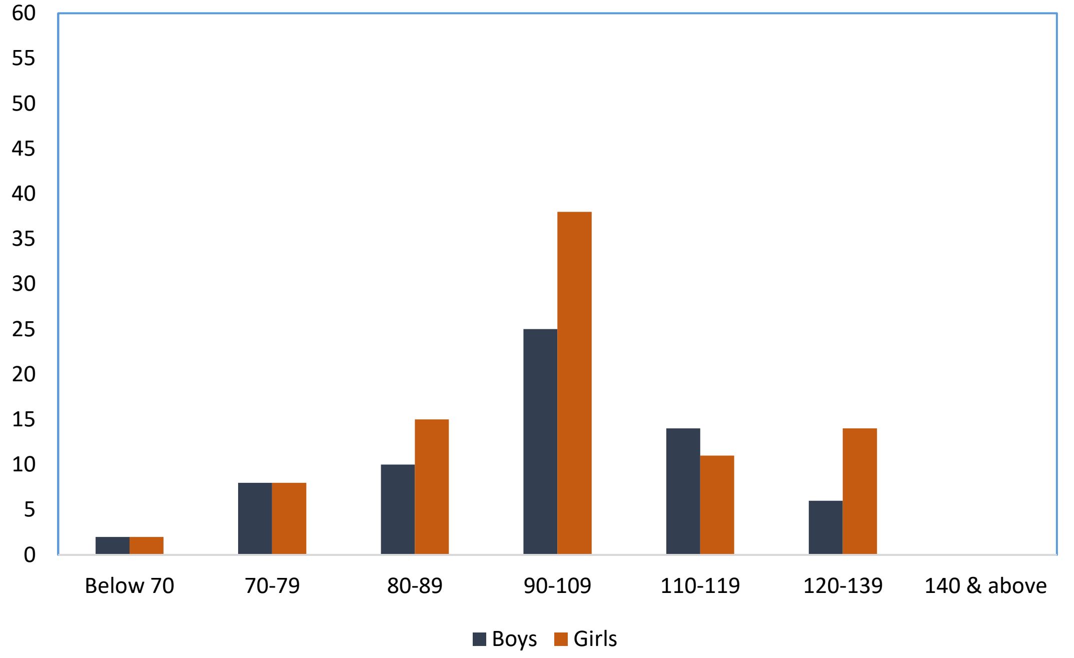


Fig. 6.21: Histogram Showing the Gender-Wise Level of Intelligence for the Age 16 (B=104, G= 106)

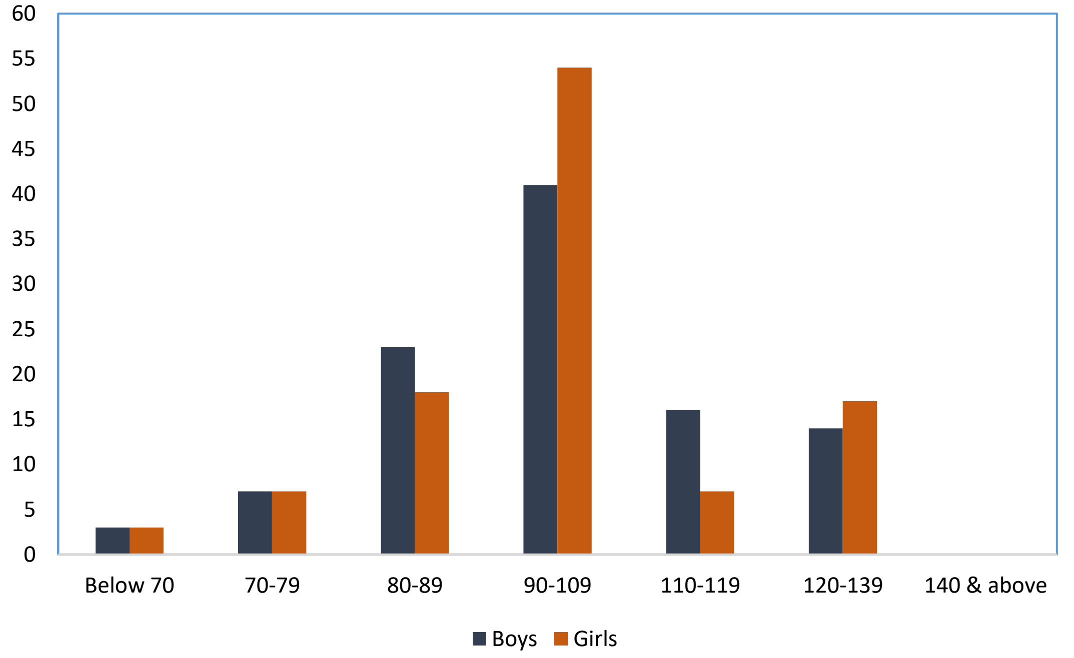


Fig. 6.22: Histogram Showing the Gender-Wise Level of Intelligence for the Age 17 (B=115, G= 109)

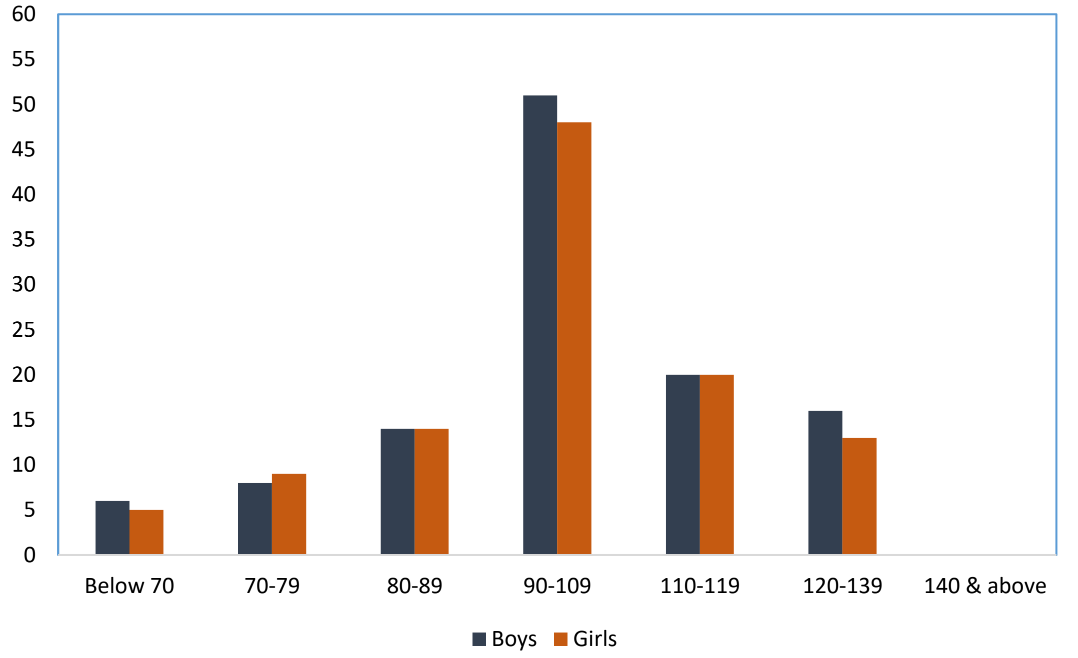
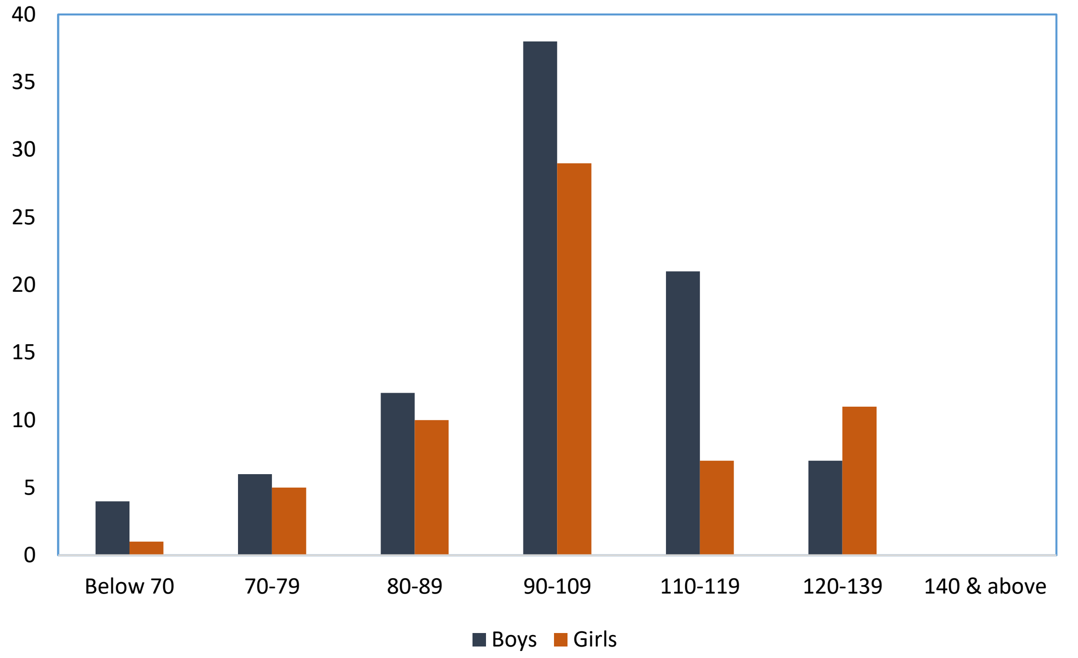


Fig. 6.23: Histogram Showing the Gender-Wise Level of Intelligence for the Age 18 (B=88, G= 63)



CHAPTER – VII

ANALYSIS AND INTERPRETATION OF DATA OF RELATED STUDIES

7-1 Introduction

The present study aimed at studying the differences in the mean scores of the level of intelligence of the students with respect to their gender, age and class. In order to achieve this objective, a sample of 800 (400 boys and 400 girls) students studying in classes IX, X, XI and XII in different schools situated in four districts of Sikkim was drawn. The data available on the selected variable was tabulated, analyzed and interpreted accordingly. The following hypotheses were formulated for testing in the present study:

1. There is no significant difference in the mean scores of the level of intelligence of the students with respect to their gender.
2. 14 and 15 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.
3. 14 and 16 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.
4. 14 and 17 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.
5. 14 and 18 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.
6. 15 and 16 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.
7. 15 and 17 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.
8. 15 and 18 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.

9. 16 and 17 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.
10. 16 and 18 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.
11. 17 and 18 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.
12. Ninth and tenth class secondary school students do not differ significantly with respect to their mean scores on the variable intelligence.
13. Ninth and +1 class secondary/senior secondary school students do not differ significantly with respect to their mean scores on the variable intelligence.
14. Ninth and +2 class secondary/senior secondary school students do not differ significantly with respect to their mean scores on the variable intelligence.
15. Tenth and +1 class secondary/senior secondary school students do not differ significantly with respect to their mean scores on the variable intelligence.
16. Tenth and +2 class secondary/senior secondary school students do not differ significantly with respect to their mean scores on the variable intelligence.
17. +1 and +2 class secondary/senior secondary school students do not differ significantly with respect to their mean scores on the variable intelligence.

7-2 Studying the Gender, Age and Class-wise Differences on the Variable of Intelligence

The differences with respect to gender, age and class on the variable of intelligence of the present test was studied by the same data collected on the sample of 800 secondary/senior secondary school students which have been used for estimating the reliability, validity and establishing the norms. The following tables 7.1 and 7.2 shows the gender-wise, age-wise and class-wise number of students taken as a sample for the present study.

Table 7.1
Gender-Wise and Class-Wise No. of Students

Class	Boys	Girls	Total
9	100	100	**200**
10	100	100	**200**
11	100	100	**200**
12	100	100	**200**
Total	**400**	**400**	**800**

Table 7.2
Age-Wise and Class-Wise No. of Students

Age	Class-IX	Class -X	Class -XI	Class -XII	Total
14	43	9	8	2	**62**
15	65	63	19	6	**153**
16	67	71	59	13	**210**
17	18	43	74	89	**224**
18	7	14	40	90	**151**
Total	**200**	**200**	**200**	**200**	**800**

7-3 Gender and Intelligence

7-3.1 Boys and Girls Secondary/Senior Secondary School Students

Table 7.3 presents the t-value for boys and girls secondary/senior secondary school students in respect of the variable of intelligence along with Ns, Means, SDs and Standard Error of Means for the two groups.

Table 7.3: t-value for boys and girls secondary/senior secondary school students in respect of the variable of intelligence

Group	N	Mean	SD	SE_M	df	t-value
Boys	400	22.24	9.28	0.46	798	0.87 (NS)
Girls	400	22.80	8.75	0.44		

NS- Not Significant

*Table value of ‘t’ at 0.05 level is 1.96

**Table value of ‘t’ at 0.01 level is 2.58

Table 7.3 presents the t-value for boys and girls secondary/senior secondary school students in respect of the variable of intelligence along with Ns, Means, SDs and Standard Error of Means for the two groups.

It is revealed from Table 1 that t-value came out to be 0.87, which is not significant. This indicates that boys and girls Secondary/Senior Secondary School Students do not differ significantly with respect to their mean scores on intelligence. Hence, the hypothesis that *"There is no significant difference in the mean scores of the level of intelligence of the students with respect to their gender"* is accepted.

Since, the mean score on intelligence is lower for boy students (22.24) as compared to girl students (22.80), it may be inferred that girl students exhibit significantly superior intelligence in comparison to boy students.

7-4 Age and Intelligence

7-4.1 Age-wise comparison of Secondary/Senior Secondary School Students on the variable Intelligence

Table 7.4 presents the t-value of intelligence test for different age groups of secondary/senior secondary school students along with Ns, Means, SDs and Standard Error of Means for the two groups.

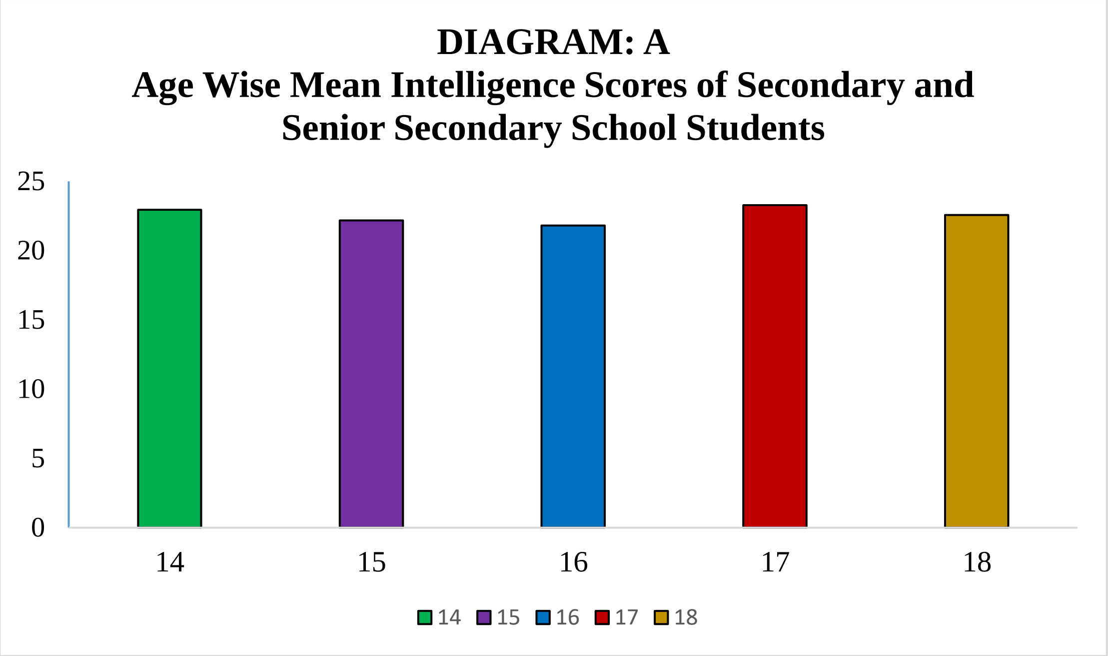
Table 7.4: Age Wise Comparison of Mean Intelligence Scores of Secondary and Senior Secondary School Students

Group	Age	N	Mean	SD	SE_M	t-value	Level of Significance
1	14	62	22.94	7.46	0.95	0.58	Not Significant
	15	153	22.18	9.13	0.74		
2	14	62	22.94	7.46	0.95	0.90	Not Significant
	16	210	21.81	8.95	0.62		
3	14	62	22.94	7.46	0.95	0.27	Not Significant
	17	224	23.28	9.02	0.60		
4	14	62	22.94	7.46	0.95	0.27	Not Significant
	18	151	22.57	9.58	0.78		
5	15	153	22.18	9.13	0.74	0.38	Not Significant
	16	210	21.81	8.95	0.62		
6	15	153	22.18	9.13	0.74	1.16	Not Significant
	17	224	23.28	9.02	0.60		
7	15	153	22.18	9.13	0.74	0.37	Not Significant
	18	151	22.57	9.58	0.78		
8	16	210	21.81	8.95	0.62	1.70	Not Significant
	17	224	23.28	9.02	0.60		
9	16	210	21.81	8.95	0.62	0.77	Not Significant
	18	151	22.57	9.58	0.78		
10	17	224	23.28	9.02	0.60	0.73	Not Significant
	18	151	22.57	9.58	0.78		

*Table value of 't' at 0.05 level is 1.96

**Table value of 't' at 0.01 level is 2.58

The data is graphically represented below:



Age group 14 and 15

It is evident from Table-7.4 and Diagram-A that t-value came out to be 0.58, which is not significant. This indicates that the students of age group 14 and 15 do not differ significantly with respect to their mean scores on intelligence. Hence, the hypothesis that *"14 and 15 age group of students do not differ significantly with respect to their mean scores on the variable intelligence"* is accepted.

Since, the mean score on intelligence is higher for the age group of 14 (22.94) as compared to age group of 15 (22.18), it may be inferred that the students of age group 14 exhibit superior intelligence in comparison to the students of age group 15.

Age group 14 and 16

It is evident from Table-7.4 and Diagram-A that t-value came out to be 0.90, which is not significant. This indicates that the students of age group 14 and 16 do not differ significantly with respect to their mean scores on intelligence. Hence, the hypothesis that *"14 and 16 age group of students do not differ significantly with respect to their mean scores on the variable intelligence"* is accepted.

Since, the mean score on intelligence is higher for the age group of 14 (22.94) as compared to age group of 16 (21.81), it may be inferred that the students of age group 14 exhibit superior intelligence in comparison to the students of age group 16.

Age group 14 and 17

It is evident from Table-7.4 and Diagram-A that t-value came out to be 0.27, which is not significant. This indicates that the students of age group 14 and 17 do not differ significantly with respect to their mean scores on intelligence. Hence, the hypothesis that *"14 and 17 age group of students do not differ significantly with respect to their mean scores on the variable intelligence"* is accepted.

Since, the mean score on intelligence is lower for the age group of 14 (22.94) as compared to age group of 17 (23.28), it may be inferred that the students of age group 17 exhibit superior intelligence in comparison to the students of age group 14.

Age group 14 and 18

It is evident from Table-7.4 and Diagram-A that t-value came out to be 0.27, which is not significant. This indicates that the students of age group 14 and 18 do not differ significantly with respect to their mean scores on intelligence. Hence, the hypothesis that *"14 and 18 age group of students do not differ significantly with respect to their mean scores on the variable intelligence"* is accepted.

Since, the mean score on intelligence is higher for the age group of 14 (22.94) as compared to age group of 18 (22.57), it may be inferred that the students of age group 14 exhibit superior intelligence in comparison to the students of age group 18.

Age group 15 and 16

It is evident from Table-7.4 and Diagram-A that t-value came out to be 0.38, which is not significant. This indicates that the students of age group 15 and 16 do not differ significantly with respect to their mean scores on intelligence. Hence, the hypothesis that *"15 and 16 age group of students do not differ significantly with respect to their mean scores on the variable intelligence"* is accepted.

Since, the mean score on intelligence is higher for the age group of 15 (22.18) as compared to age group of 16 (21.81), it may be inferred that the students of age group 15 exhibit superior intelligence in comparison to the students of age group 16.

Age group 15 and 17

It is evident from Table-7.4 and Diagram-A that t-value came out to be 1.16, which is not significant. This indicates that the students of age group 15 and 17 do not differ significantly with respect to their mean scores on intelligence. Hence, the hypothesis that *"15 and 17 age group of students do not differ significantly with respect to their mean scores on the variable intelligence"* is accepted.

Since, the mean score on intelligence is lower for the age group of 15 (22.18) as compared to age group of 17 (23.28), it may be inferred that the students of age group 17 exhibit superior intelligence in comparison to the students of age group 15.

Age group 15 and 18

It is evident from Table-7.4 and Diagram-A that t-value came out to be 0.37, which is not significant. This indicates that the students of age group 15 and 18 do not differ significantly with respect to their mean scores on intelligence. Hence, the hypothesis that *"15 and 18 age group of students do not differ significantly with respect to their mean scores on the variable intelligence"* is accepted.

Since, the mean score on intelligence is lower for the age group of 15 (22.18) as compared to age group of 18 (22.57), it may be inferred that the students of age group 18 exhibit superior intelligence in comparison to the students of age group 15.

Age group 16 and 17

It is evident from Table-7.4 and Diagram-A that t-value came out to be 1.70, which is not significant. This indicates that the students of age group 16 and 17 do not differ significantly with respect to their mean scores on intelligence. Hence, the hypothesis that *"16 and 17 age group of students do not differ significantly with respect to their mean scores on the variable intelligence"* is accepted.

Since, the mean score on intelligence is lower for the age group of 16 (21.81) as compared to age group of 17 (23.28), it may be inferred that the students of age group 17 exhibit superior intelligence in comparison to the students of age group 16.

Age group 16 and 18

It is evident from Table-7.4 and Diagram-A that t-value came out to be 0.77, which is not significant. This indicates that the students of age group 16 and 18 do not differ significantly with respect to their mean scores on intelligence. Hence, the hypothesis that *"16 and 18 age group of students do not differ significantly with respect to their mean scores on the variable intelligence"* is accepted.

Since, the mean score on intelligence is lower for the age group of 16 (21.81) as compared to age group of 18 (22.57), it may be inferred that the students of age group 18 exhibit superior intelligence in comparison to the students of age group 16.

Age group 17 and 18

It is evident from Table-7.4 and Diagram-A that t-value came out to be 0.73, which is not significant. This indicates that the students of age group 17 and 18 do not differ significantly with respect to their mean scores on intelligence. Hence, the hypothesis that *"17 and 18 age group of students do not differ significantly with respect to their mean scores on the variable intelligence"* is accepted.

Since, the mean score on intelligence is higher for the age group of 17 (23.28) as compared to age group of 18 (22.57), it may be inferred that the students of age group 17 exhibit superior intelligence in comparison to the students of age group 18.

7-5 Class and Intelligence

7-5.1 Class-wise comparison of Secondary/Senior Secondary School Students on the variable Intelligence

Table 7.5 presents the t-value of intelligence test for different classes of secondary/senior secondary school students along with Ns, Means, SDs and Standard Error of Means for the two groups.

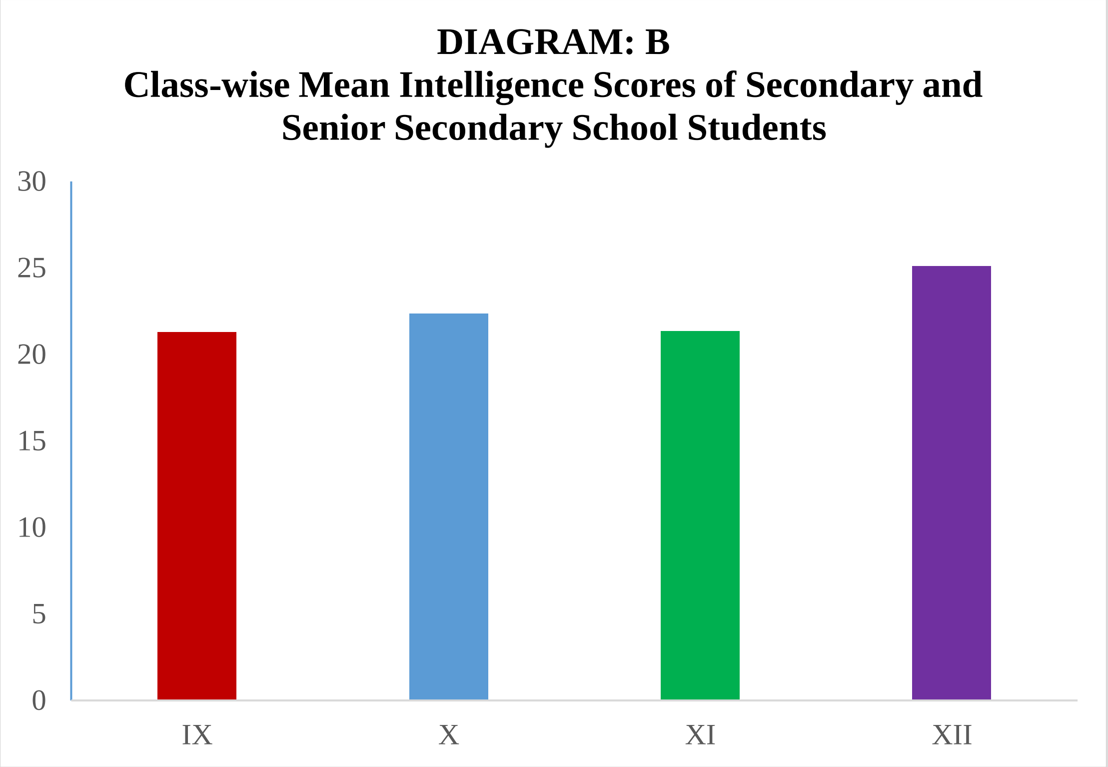
Table 7.5: Class-wise comparison of Mean Intelligence Scores of Secondary and Senior Secondary School Students

Group	Class	N	Mean	SD	SE_M	t-value	Level of Significance
1	Ninth	200	21.29	8.25	0.58	1.29	Not Significant
	Tenth	200	22.36	8.40	0.59		
2	Ninth	200	21.29	8.25	0.58	0.04	Not Significant
	+1	200	21.33	9.44	0.67		
3	Ninth	200	21.29	8.25	0.58	4.31	Significant
	+2	200	25.11	9.43	0.67		
4	Tenth	200	22.36	8.40	0.59	1.16	Not Significant
	+1	200	21.33	9.44	0.67		
5	Tenth	200	22.36	8.40	0.59	3.08	Significant
	+2	200	25.11	9.43	0.67		
6	+1	200	21.33	9.44	0.67	4.01	Significant
	+2	200	25.11	9.43	0.67		

*Table value of ‘t’ at 0.05 level is 1.96

**Table value of ‘t’ at 0.01 level is 2.58

The data is graphically represented below:



a. Ninth and Tenth Secondary School Students

Table 7.5 and Diagram-B presents the t-value for class ninth and tenth secondary school students in respect of the variable of intelligence along with Ns, Means, SDs and Standard Error of Means for the two groups.

It is revealed from Table 1 that t-value came out to be 1.29, which is not significant. This indicates that ninth and tenth secondary school students do not differ significantly with respect to their mean scores on intelligence. Hence, the hypothesis that *"Ninth and tenth class secondary school students do not differ significantly with respect to their mean scores on the variable intelligence"* is accepted.

Since, the mean score on intelligence is lower for ninth class students (21.29) as compared to tenth class students (22.36), it may be inferred that tenth class students exhibit significantly superior intelligence in comparison to ninth class students.

b. Ninth and +1 Secondary/Senior Secondary School Students

Table 7.5 and Diagram-B presents the t-value for class ninth and +1 Secondary/Senior Secondary school students in respect of the variable of intelligence along with Ns, Means, SDs and Standard Error of Means for the two groups.

It is revealed from Table 1 that t-value came out to be 0.04, which is not significant. This indicates that ninth and +1 Secondary/Senior Secondary school students do not differ significantly with respect to their mean scores on intelligence. Hence, the hypothesis that *"*ninth and +1 class Secondary/Senior Secondary *school students do not differ significantly with respect to their mean scores on the variable intelligence"* is accepted.

Since, the mean score on intelligence is lower for ninth class students (21.29) as compared to +1 class students (21.33), it may be inferred that +1 class students exhibit significantly superior intelligence in comparison to ninth class students.

c. Ninth and +2 Secondary/Senior Secondary School Students

Table 7.5 and Diagram-B presents the t-value for class ninth and +2 Secondary/Senior Secondary school students in respect of the variable of intelligence along with Ns, Means, SDs and Standard Error of Means for the two groups.

It is revealed from Table 1 that t-value came out to be 4.31, which is significant at 0.01 level. This indicates that ninth and +2 Secondary/Senior secondary school students differ significantly with respect to their mean scores on intelligence. Hence, the hypothesis that *"Ninth and* +2 class Secondary/Senior *secondary school students do not differ significantly with respect to their mean scores on the variable intelligence"* is rejected.

Since, the mean score on intelligence is lower for ninth class students (21.29) as compared to +2 class students (25.11), it may be inferred that +2 class students exhibit significantly superior intelligence in comparison to ninth class students.

d. Tenth and +1 Secondary/Senior Secondary School Students

Table 7.5 and Diagram-B presents the t-value for class tenth and +1 Secondary/Senior Secondary school students in respect of the variable of intelligence along with Ns, Means, SDs and Standard Error of Means for the two groups.

It is revealed from Table 1 that t-value came out to be 1.16, which is not significant. This indicates that tenth and +1 Secondary/Senior Secondary school students do not differ significantly with respect to their mean scores on intelligence. Hence, the hypothesis that *"Tenth and* +1 class Secondary/Senior Secondary *school students do not differ significantly with respect to their mean scores on the variable intelligence"* is accepted.

Since, the mean score on intelligence is lower for +1 class students (21.33) as compared to tenth class students (22.36), it may be inferred that tenth class students exhibit significantly superior intelligence in comparison to +1 class students.

e. Tenth and +2 Secondary/Senior Secondary School Students

Table 7.5 and Diagram-B presents the t-value for class tenth and +2 Secondary/Senior Secondary school students in respect of the variable of intelligence along with Ns, Means, SDs and Standard Error of Means for the two groups.

It is revealed from Table 1 that t-value came out to be 3.08, which is significant at 0.01 level. This indicates that tenth and +2 Secondary/Senior Secondary school students differ significantly with respect to their mean scores on intelligence. Hence, the hypothesis that *"Tenth and* +2 class Secondary/Senior Secondary *school students* *do not differ significantly with respect to their mean scores on the variable intelligence"* is rejected.

Since, the mean score on intelligence is lower for tenth class students (22.36) as compared to +2 class students (25.11), it may be inferred that +2 class students exhibit significantly superior intelligence in comparison to tenth class students.

f. +1 and +2 Senior Secondary School Students

Table 7.5 and Diagram-B presents the t-value for class +1 and +2 Senior Secondary School Students in respect of the variable of intelligence along with Ns, Means, SDs and Standard Error of Means for the two groups.

It is revealed from Table 1 that t-value came out to be 4.01, which is significant at 0.01 level. This indicates that +1 and +2 Senior Secondary School Students differ significantly with respect to their mean scores on intelligence. Hence, the hypothesis that *"*+1 and +2 class Senior Secondary School Students *do not differ significantly with respect to their mean scores on the variable intelligence"* is rejected.

Since, the mean score on intelligence is lower for +1 class students (21.33) as compared to +2 class students (25.11), it may be inferred that +2 class students exhibit significantly superior intelligence in comparison to +1 class students.

CHAPTER – VIII

SUMMARY, FINDINGS, EDUCATIONAL IMPLICATIONS AND SUGGESTIONS FOR FURTHER RESEARCH

8-1 Introduction

No two individuals are exactly alike. Some are bright, others dull, some are quick, others slow, some solve problems quickly and directly, others fumble over them for a long time, and some adapt themselves to new situations easily while others experience difficulty. In education it was accepted that good educational administration should consider the difference between individuals, because of the fact that each student is different in mental ability or intelligence. In other words, an intelligent person has more chances of success in life or in a given situation than one who is less intelligent. Intelligence plays an important role in one's academic, professional, social and personal life. The teachers and parents are often confused, curious and talk about the differences in the educational performance and academic achievement of the school going children; as most of them believe that intelligence is one of the main determinants in the student's success and failure. So that if the teachers know their students' intelligence, they can understand and manage experiences and accordingly supports them to learn according to their intelligence and abilities.

What does the term intelligence mean to psychologists? There is no agreement as regards the exact definition and nature of intelligence. Some of the experts defined intelligence as the ability to solve problems while few opined that it is the capacity to adapt and learn from experience. On the other hand, few argue that intelligence includes characteristics such as creativity and interpersonal skills (Santrock, 2018, p. 113). Thurstone (1921, p.201) in his paper entitled "Intelligence and Its Measurement" mentioned that Intelligence as judged in every-day life contains at least three psychologically differentiable components which are : a) the capacity to inhibit an instinctive adjustment, b) the capacity to redefine the inhibited instinctive adjustment in the light of imaginal experienced trial and error, c) the volitional capacity to realize the modified instinctive adjustment into overt behaviour to the advantage of the individual as a social animal.

The measurement of intelligence with the help of tests is a concept which is approximately less than a century old. It began when educators in France realized that some students needed more help with learning than others did (Ciccarelli and Meyer, 2008, p. 326). Generally, it is seen that intelligence of a person is different from the others. The intelligence of people are assessed by a number of intelligence scales/tests which have been devised by many psychologists. Intelligence tests are known as psychological tests those are designed to measure a variety of mental functions, such as reasoning, vocabulary, word fluency, perception, comprehension, analogies, classifications and judgement. Intelligence tests assess the characteristics of human intelligence.

Various types of tests have been constructed so far measuring the intelligence but the credit goes to the Binet and Stanford, who have first developed the test measures intelligence. Binet in considered the father of intelligence.

8-2 Need and Significance of the Study

Sikkim is such a state where the tribal population is very high and life is comparatively very hard here due to its geographic and other climatic conditions. Out of the total population of 610,577 (according to 2011 census) in Sikkim the tribal population happens to be 33.8%. The overall development of the state Sikkim depends upon the education of the people of Sikkim and for which the role of the parents is quite crucial. The parents do try always to encourage the youths especially the high school going students who are expected to play a very decisive role in nation building process. This has lead to the increased educational competitions and challenges amongst the students.

As the world is also becoming more and more advanced and complex; educational performance and achievement amongst students have also become more and more difficult. The teachers and parents are often confused, curious and talk about the differences in the educational performance and academic achievement of the school going children; as most of them believe that intelligence is one of the main determinants in the student's success and failure. It is this phenomenon which has encouraged the investigator to study the intelligence of the secondary/senior secondary school students of the state. Seeing the importance of intelligence of students and the necessity of intelligence tests as a measuring tool, the investigator feels that it is important to have a separate intelligence test to measure the general mental ability of the students of Sikkim state. As of now the state does not have a single psychological tool of its own to assess the general mental abilities of the children. Even though there are many intelligence tests that have been constructed and standardized by researchers of our country from time to time in many languages, they do not seem suitable for the students of Sikkim due to local norms. The investigator therefore, decided to construct and standardize a verbal group test of intelligence in the English language for the students of Sikkim. The present test is suitable as per, culture, tradition and environment of Sikkim state.

8-3 Statement of the Problem:

The following problem may be stated for the present study:

"Construction and Standardization of a Verbal Group Test of Intelligence for the Students of Sikkim”

8-4 Objectives of the Study

The objectives of the present study are as follows:

1. To construct a verbal group test of intelligence for the students of IX, X, XI and XII (age 14 to 18).
2. To standardize the test by establishing its reliability and validity.
3. To set up norms for the test.
4. To develop a test manual.
5. To study the differences in the level of intelligence of the students with respect to their gender-wise, age-wise and class-wise.

8-5 Hypotheses of the Study

In the present study the following hypotheses are formulated by the investigator for testing:

1. There is no significant difference in the mean scores of the level of intelligence of the students with respect to their gender.
2. 14 and 15 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.
3. 14 and 16 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.
4. 14 and 17 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.
5. 14 and 18 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.
6. 15 and 16 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.
7. 15 and 17 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.

8. 15 and 18 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.
9. 16 and 17 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.
10. 16 and 18 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.
11. 17 and 18 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.
12. Ninth and tenth class secondary school students do not differ significantly with respect to their mean scores on the variable intelligence.
13. Ninth and +1 class secondary/senior secondary school students do not differ significantly with respect to their mean scores on the variable intelligence.
14. Ninth and +2 class secondary/senior secondary school students do not differ significantly with respect to their mean scores on the variable intelligence.
15. Tenth and +1 class secondary/senior secondary school students do not differ significantly with respect to their mean scores on the variable intelligence.
16. Tenth and +2 class secondary/senior secondary school students do not differ significantly with respect to their mean scores on the variable intelligence.
17. +1 and +2 class secondary/senior secondary school students do not differ significantly with respect to their mean scores on the variable intelligence.

8-6 Operational Definition of Key Terms Used

The different key terms used in the title of the study and in the body of study are operationally defined as follows;

1. **Construction:** Construction of a test means to construct the items for the test. In the present study construction means to write the original test items on the basis of

primary mental abilities given by Thurston and selection of items by means of item analysis.

2. Standardization: In the present study standardization means preparing the uniform procedures in administering and scoring the test and establishing its reliability, validity and norms.

3. Verbal Test: Verbal test is a type of test, which include statements and words. It is mostly a paper and pencil test. The students must be literate and they have understanding of the language so that they can read and write. In this type of test, students use words in attaching meaning or responding to test items. Tests involving comprehension; vocabularies and mathematics are of that type.

4. Group Test: Group tests can be administered to more than one individual at a time and usually can be administered simultaneously to any suitable size of group.

5. Intelligence: Intelligence is a general intellectual capacity which consists of the abilities: to reason well with abstract materials, to comprehend well, to have a clear direction of thought, to relate thinking with the attainment of a desirable end. In the present study intelligence means the scores obtained by the students on a test developed and standardised by the investigator on the basis of Thurstone's primary mental abilities i.e. verbal comprehension, word fluency, number, memory and reasoning.

8-7 Delimitations of the Study

The present study was delimited in the following aspects:

1. The language of the test in the present study was delimited to English only.
2. The test was delimited to only five out of seven Thurstone's primary mental abilities.

8-8 Research Method

The aim of present investigation was to construct and standardize a verbal group test of intelligence for the secondary/senior secondary school students of Sikkim. The present study focused on to describe and interpret what conditions or relationships exist at present in case of secondary/senior secondary school students of Sikkim with respect to the variable intelligence.

Hence, it is decided to use descriptive method of research in the present case which is relevant and justified in view of the objectives of the study.

8-9 Sample

In the present study the sample was drawn from the students studying in different classes like 9th, 10th, +1 and +2 of Secondary/Senior Secondary Schools situated in four (East, West, North and South) districts of Sikkim state. From the selected district, 200 (100 boys and 100 girls) students from each class were taken on the basis of stratified random sampling technique. The total sample consists of 800 secondary/senior secondary school students – 400 boys and 400 girls.

8-10 Tools Used

To test the hypotheses or answer the questions the researchers must gather data with the help of relevant tools. Every scientific research is processed through certain well designed tools. Tools are nothing but the instrument that helps the researcher to gather data. To collect the requisite data for present study the investigator used the following tools:

i) Verbal Group Test of Intelligence constructed and standardized by the investigator

ii) Group Test of Intelligence constructed and standardized by Dr. G. C. Ahuja

8-11 Statistical Techniques Used

In view of the objectives of the study, the following statistical techniques were used to analyze the data.

1. The investigator of the present study used the following formula of correcting the difficulty index of an item for chance success as suggested by Garrett (1981, p. 364) for scoring procedure

$$P_c = \frac{R - W/(K-1)}{N - HR}$$

2. In item analysis for the difficulty value and discriminative power of an item the following formulas were used:

$$DV = (P_u + P_l)/2$$

$$DP = P_u - P_l$$

3. For estimating the reliability of the test the (a) Split-half and (b) Kuder-Richardson reliability methods were used. For calculating the Split-half reliability of the present test the following Pearson's Product Moment and Spearman-Brown Prophecy formulae were applied.

$$\boldsymbol{r} = \frac{\boldsymbol{N}\sum \boldsymbol{xy} - \sum \boldsymbol{X}.\sum \boldsymbol{Y}}{\sqrt{\{\boldsymbol{N}\sum \boldsymbol{X}^2 - (\sum \boldsymbol{X})^2\}\{\boldsymbol{N}\sum \boldsymbol{Y}^2 - (\sum \boldsymbol{Y})^2\}}}$$

Spearman- Brown prophecy formula:

$$r_{tt} = \frac{2r11/12}{1+r11/12}$$

K-R 21:

$$r_{11} = \frac{n\boldsymbol{\sigma}^2 t - M(n-M)}{\boldsymbol{\sigma}^2 t(n-1)}$$

4. For estimating the validity of the test the following two methods were adopted:
a) Content Validity of the test was rated by the expert's judgment.
b) Concurrent Validity of the test was studied by correlating the present test scores with one external criterion test i.e. Ahuja Group Test of Intelligence and was calculated by Pearson's Product Moment Method.

5. For Testing the Normality age-wise and class-wise, the normality of the distribution of the scores were calculated by the Mean, Median, Standard Deviation, P_{10}, P_{90}, Skewness and Kurtosis.

6. For establishing the Norms of the test Z-Score and Percentile Ranks were used to derive for the test age-wise and class-wise.

7. To study the differences in the level of intelligence of the students with respect to their age-wise, class-wise and gender-wise the technique of t- test was used.

8-12 Construction of the Test

The following steps are involved in the construction of the present Intelligence Test:

1. Planning

2. Preparation

3. Preliminary Try Out

4. Try Out

5. Item Analysis, and

6. Final form of the Test

1. Planning

Test planning encompasses all of the many and varied operations that go into producing a test. The following steps were undertaken in planning process of the construction of the Intelligences Test:

(a) Nature of the Test
(b) Types of Items
(c) Length of the Test
(d) Scoring Procedure

(a) Nature of the Test

In spite of assembling a wide variety of intelligence tests, many individual abilities remain outside the scope of measurement and many intelligence tests are not based on strong theoretical foundations. Hence, the present test will include items on Five Primary Mental Abilities of Thurstone out of his Seven Primary Mental Abilities which are as follows:

- Verbal comprehension--the ability to define and understand words
- Word fluency--the ability to produce words rapidly

- Number--the ability to solve arithmetic problems.
- Memory--the ability to memorize and recall
- Reasoning--the ability to find rules

(b) Types of Items

For the present study, the investigator decided to make use of two types of test items. The vast majority of the test items are with multiple choice items because they are most common, flexible and effective. The second type of test items, very minimum in number, is to write the correct answers/ words in a given statement.

(c) Length of the Test

The investigator decided that the length of the test should be within a period of school hour i.e. 35 minutes for attempting all the 30 items including reading the instructions for the test before beginning the test.

(d) Scoring Procedure

In the present test, correct answers are scored with a positive value of 1 whereas, incorrect answers and absent or omitted answers with a value of zero. The sum of the scores for correct responses is the test score. This is the same case for the word fluency sub-test. For scoring the right and wrong answers, the investigator has assigned 0.25 marks for the right answer and 0 for the wrong answers. The correct writing of all the four words received 1 mark each. For the present test, scoring was done with the help of a scoring prepared by the investigator. The verbal group test of intelligence in all consists of a total number of 30 items and the total scores for these items may be obtained by the individual is 45 marks. The scores thus obtained were used for estimation of reliability, validity, for the purpose of item analysis and establishing the norms.

2. Preparation

The following steps were considered under preparation in the present study:

(a) Preparation of Test Items

(b) Preparation of Direction to Test Items

(c) Reviewing and editing of the test items

(d) Preparation of scoring key and answer sheets

(a) Preparation of Test Items

Preparation of test items is the most important task in the preparation step. Item writing is essentially a creative art. Therefore, due care was taken in preparing the test items. On the basis of clear understanding of all the five primary mental abilities, the investigator prepared the initial draft of the test with 165 items. On the basis of all the above information collected, the investigator prepared around 165 items. These items were then tried out on 20 students of classes IX, X, XI and XII. After a thorough study of the responses collected from the 20 respondents, the following 108 items were retained for preliminary try-out:

Table: No. of sub-tests and items retained for preliminary try-out

Sr. No.	Name of Sub-tests	No. of Items retained
1	Verbal Comprehension	25
2	Word Fluency	8
3	Number	25
4	Memory	25
5	Reasoning	25
	Total	108

(b) Preparation of Direction to Test Items

For the present test, the investigator had prepared detailed instructions in the front page of the test booklet and in the beginning of all the sub-tests. The following important information contained in the instructions:

-- The time allowed for completing the test.

-- The procedure for recording answers.

-- Doubt clearance, if any, before starting the test.

-- Total number of items in the test.

(c) Reviewing and editing of the test items

The main purpose of this step is to take a final decision concerning several matters like: length of the test or sub-tests, time-limits, sequence of items of the test, or any technical flaws that may have occurred, instructions provided in the test etc. When all these problems were sorted out, reviewed and edited, the test items were prepared in test booklet form and were made ready for a preliminary try-out phase. The test items were also reviewed by seeking the experts' opinion in the specialized field and with the help of language experts in order to remove any sort of linguistic ambiguity contained in the items. Their suggestions and comments were integrated and necessary changes were made accordingly.

(d) Preparation of scoring key and answer sheets

The investigator prepared a separate answer sheet and scoring key to facilitate objective scoring. For scoring the answers, a separate answer sheet was prepared keeping in mind that the test booklets may be reused. The answer sheet was prepared by providing spaces against the number of each item. The students were instructed at the beginning of taking the test to pick up the correct option corresponding to the correct answer. To make the scoring easier, sub-test wise proper space for scoring has been provided on the side of each response in the answer sheet and space for overall total for each of the sub-test on front side of the answer sheet. Hence, the scores of each of the sub-tests can be obtained very easily.

3. Preliminary Try-Out

Since the test is prepared by individual or group of persons and experts, it cannot be entirely error free. For the preliminary try-out, the test was administered on a sample of 80 (40 boys and 40 girls) students selected randomly studying in classes IX, X, XI and XII (age 14 to 18). On the14+ basis of observation, individual's reactions and the feedback received from the students the investigator improved and modifies the items accordingly. A few vague items were deleted, while some items were modified or rearranged. Finally, a total of 67 (Verbal Comprehension-15, Word Fluency-7, Number-15, Memory-15, and Reasoning-15) items were retained for the first try out.

4. First Try-Out

The main objectives of this first try-out in the present study was to find out weak and defective items viz. over-difficult, over-easy, and those whose distracters are non-functioning; to find out the difficulty level of each item so that selection of items can be made to ensure appropriate distribution of difficulty levels throughout the test; to find out the discrimination power of each item so that only valid items can be selected for the final test; to determine the time limits for the test and to judge the adequacy of the instructions to both administrators of the test and pupils taking it and to establish the reliability and validity of the test. For the first try-out of a sample of 400 students comprising of 200 boys and 200 girls representing classes, IX, X, XI and XII (age 14 to 18) was drawn from the secondary/senior secondary schools situated in Sikkim.

5. Item Analysis

The procedure used to judge the quality of an item is called item analysis. There are varieties of procedures to be used for carrying out item analysis. In the construction of present test two main indices viz., item difficulty and item discrimination were calculated.

Items Retained for the Final form of the Test

After item analysis only good items with appropriate difficulty level and with satisfactory discriminating power are retained and these items form the final test. As suggested by Stanley and Hopkins (1978, p.270) the items whose difficulty value found in between 0.30 and 0.70 and discriminative power 0.40 and above were retained in the final form of the test. The items having negative or zero discriminative power were also not included in the test. The items which did not fulfil the criteria as mentioned above were omitted. As a result, a total number of 37 items out of 67 were rejected. Finally, the test contains 30 items. The following table shows the difficulty value and discriminative power of an item in five sub-tests retained for the final form of the test.

Showing the number of items retained in each Sub-tests having DV 0.30-0.70 and DP above 0.40

Sub-Test No.	Abbreviation	Items retained having DV 0.30-0.70 and DP above 0.40	Total No. of Items retained in each sub-tests
I	VC	5, 7, 10, 13, 15	5
II	WF	1, 2, 4, 6, 7	5
III	N	3, 7, 9, 13, 15	5
IV	M	2, 3, 5, 6, 8, 10, 11, 12, 14, 15	10
V	R	2, 4, 6, 9, 12	5
	Total		**30**

Verbal Comprehension (VC), Word Fluency (WF), Number (N), Memory (M), Reasoning (R)

6. Final Form of the Test

The final form of the test after item analysis and time taken in each sub-test was given as follows:

No. of Items retained and Time Taken in each Sub-Test

Sr. No.	Sub-Test	No. of Items retained	Time taken (in Minutes)
1	Verbal Comprehension	5	5
2	Word Fluency	5	5
3	Number	5	5
4	Memory	10	5
5	Reasoning	5	5
Total		30	25 Minutes

8-13 Standardization of the Test

To estimate the reliability, validity and to establish norms, the intelligences test constructed by the investigator had been administered on a sample of 800 secondary/senior secondary students comprising of 400 boys and 400 girls selected randomly from the population of 4 districts of Sikkim state.

1. Estimation of Reliability

In the present study for determining the reliability of the test the investigator used the following two methods:

-- Split-Half Reliability Method

-- Kuder-Richardson Reliability Method

For determining the Split-Half Reliability, the present test was administered on a sample of 800 secondary/senior secondary students. The coefficient of correlation between the two sets of scores obtained from the two halves was computed by

Product Moment Method and was found to be 0.65. From the reliability of the half test, the self-correlation of the whole test was then estimated by Spearman-Brown Prophecy formula. The coefficient of correlation was found to be 0.78. The Kuder-Richardson reliability of the present test was calculated and found to be 0.96.

2. Estimation of Validity

For estimating the validity of the present test, the following three methods were used:

(i) Face Validity

(ii) Content Validity

(iii) Concurrent Validity

(i) Face Validity

In the present test, the face validity was confirmed based on the opinion, suggestions and comments provided by the experts that it does measure the level of intelligence of secondary/senior secondary school students.

(ii) Content Validity

The content-validity of the present test was obtained through the expert's opinion. The investigator constructed a rating scale consisting of six questions to check the content validity of the tool. A rating scale was constructed by the investigator to check the content validity of the present test. The test items constructed by the investigator for the present intelligence test had given to the 18 experts belongs to the field of education and psychology with necessary directions and requested to rate the items critically for their relevance, appropriateness, language and clarity. The investigator received response only from 14 of the 18 experts. The suggestions and corrections of the 14 experts assisted in the selection of the test items and their modifications. As such, the opinions obtained from the experts were analyzed with respect to the different items included in the test.

(iii) Concurrent Validity

For determining the concurrent validity, the scores of the present test were correlated with the external criterion test viz. Ahuja's Group Test of Intelligence and the correlation was calculated by using Pearson's Product Moment method. The value of product moment coefficient of correlation between the scores of present test and Ahuja's Group Test of Intelligence of School Students came out to be 0. 64 which is significant at 0.01 level. This indicates that the scores of the two tests are related significantly with each other.

3. Establishment of Norms

The data collected from the sample of 800 students (400 boys and 400 girls) was used for derivation of norms. Before deriving the norms, the normality of the frequency distribution was tested age-wise and grade-wise. In order to judge the normality of the distribution of the scores, the value of Mean, Median, SD, P_{10}, P_{90}, Skewness and Kurtosis were calculated. The Mean, Median, SD, Percentiles of the scores of each Age-group and Class lie very closely to one another, which is required for normal distribution. The skewness of the curve is found to be -3.61 which shows that the distribution is negatively skewed. Further, the value of kurtosis is found to be -0.154 which shows that the distribution is platykurtic.

For the present test, Sigma score norms, Percentile norms, T-score norms, DIQ and Stanine scores have been derived.

SIGMA SCORE (Z):

Sigma (Z) scores are expressed in terms of standard deviations from their means. In other words, deviations from the mean expressed in SD units are called Sigma Scores. Sigma Scores are also known as 'Z-Score'.

In the present test, the Sigma (Z) Scores were calculated by applying the following formula:

$$Z = \frac{X - M}{\sigma}$$

Z = Standard score in σ units
X = Raw score of an individual
M = Mean of test score
σ = Standard Deviation of the test scores

The sigma score for each raw score of the present test were given in Table 6.14-6.31.

PERCENTILE NORMS:

To calculate the individual's percentile norms on a test, the deviation of scores were first expressed in sigma score as already described above. With the help of these scores percentile norms were then established by seeing area under the standard normal distribution table of Z-Score. The percentile norms for each raw score were given in Table 6.14-6.31.

T -SCORE NORMS:

Normalized standard scores are generally called T scores. According to Bhatnagar and Bhatnagar (2010, p. 63) in order to avoid decimals and minus signs from Z-score these T-score norms are prepared. T-score is an improvement over Z-score. In T-scores mean is 50 and σ is 10. These scores are always positive. If normalized standard score is multiplied by 10 and added to or subtracted from 50, it is converted into T -Score. For this first Z-score is computed and then T-score is obtained by using the following formula:

$$\text{T-Score} = 50 \pm 10 \text{ (Z score)}$$

The values of T -scores for each raw score were calculated for different age groups of students and class group separately and presented in separate Tables 6.14-6.31.

DEVIATION INTELLIGENCE QUOTIENT (DIQ):

Deviation Intelligence Quotient is a normalized standard score which does not involve the mental age of a child. It is not the ratio of mental and chronological ages. The standardized sample mean is 100 and S.D is usually 16. The raw scores of an intelligence test are transformed into the DIQs. The procedure of transformation is based upon the principle of standard scores. The raw scores were transformed into DIQs with the help of the following formula:

$$\text{DIQ} == 100 + 16\,(\boldsymbol{\sigma})$$

For the present test, the deviation IQ is computed with a mean of 100 and SD of 16.

The DIQ scores for each raw score were calculated and presented for different age groups and class group in Table 6.14-6.31. The separate tables for DIQ scores in classified form for all age groups and gender-wise were also worked out and presented in Table 6.32 – 6.38.

STANINE SCORE:

The word stanine is derived from stay Nine. In this method distribution is divided into nine parts where stanine 5 is in the middle of the distribution. In this case the mean is assumed to be 5 and SD = 2 (1.96). Stanine norms for each raw score were calculated and presented in table no. 6.14 to 6.31.

Classification of Intelligence

The level of intelligence of the present test was studied by the same data collected from the sample of 800 that have been used for estimating the reliability, validity and establishing the norms. The levels of intelligence of the entire sample N= 800 in terms of the classification DIQs were described in Table 6.32 to 6.39 gender-wise and age-wise. It is evident from calculations that the level of intelligence was normally distributed at all age levels. With regards to the distribution of intelligence for the entire sample (gender-wise and age-wise) is concerned, the table no. 6.32 and 6.33 revealed that the intelligence was normally distributed. It is observed that the mean and standard deviation of every age-group seems to be very close to each other. The Mean and S.D. of the entire sample (N=800) were 23.41 and 8.75 respectively.

8-14 Findings of the Study

The Test:

The objective of the present investigation was to construct and standardized a verbal group test of intelligence for the secondary/senior secondary school students of Sikkim. To serve this purpose, it was required to construct a suitable tool for measuring the characteristics under study; and to collect the relevant data with the help of this tool. The present intelligence test has been designed in such a way that it covered the different aspects of intelligence of the students and can be administered easily within 35 minutes. Along with the Test Booklet, a separate Answer-Sheet is provided to the students so that the Test Booklets may be re-used. Clear and detailed instructions are given in the front page of the test booklet and in the beginning of all the sub-tests.

The Sub-Tests:

In spite of assembling a wide variety of intelligence tests, many individual abilities remain outside the scope of measurement and many intelligence tests are not based on strong theoretical foundations. Hence, the present test will include items on Five Primary Mental Abilities of Thurstone out of his Seven Primary Mental Abilities which are as follows:

- Verbal comprehension--the ability to define and understand words
- Word fluency--the ability to produce words rapidly
- Number--the ability to solve arithmetic problems.
- Memory--the ability to memorize and recall
- Reasoning--the ability to find rules

Number of Items:

The final form of the test contained 30 items in five sub-tests. The items retained for the final test after item analysis and time taken in each sub-test are given as follows:

No. of Items retained and Time Taken in each Sub-Test

Sr. No.	Sub-Test	No. of Items retained	Time taken (in Minutes)
1	Verbal Comprehension	5	5
2	Word Fluency	5	5
3	Number	5	5
4	Memory	10	5
5	Reasoning	5	5
Total		30	25 Minutes

Reliability of the Test

Split-Half Reliability and Kuder-Richardson Reliability of the test were found as follows:

Reliability of the Test

Types of Reliability	r	P
Split-Half Reliability	0.78	.01*
Kuder-Richardson Reliability	0.96	.01*

*Significant at .01 level

Validity of the Test

(i) Face Validity

In the present test, the face validity was confirmed based on the opinion, suggestions and comments provided by the experts that it does measure the level of intelligence of secondary/senior secondary school students.

(ii) Content Validity

The content-validity of the present test was obtained through the expert's opinion through a rating scale. As such, the opinions obtained from the experts were analyzed with respect to the different items included in the test.

(iii) Concurrent Validity

The concurrent validity of the present test was determined by correlating the scores of the present test with the external criterion test viz. Ahuja's Group Test of Intelligence and the correlation was calculated by using Pearson's Product Moment method which is given below:

Product Moment Coefficient of Correlation between the scores of present test and Ahuja's Group Test of Intelligence of School Students

Group	r	P
Scores of the Present Test	0.64	.01*
Scores of Ahuja's Group Test of Intelligence		

*Significant at .01 level

Norms

The data collected from the sample of 800 students (400 boys and 400 girls) was used for derivation of norms. Before deriving the norms, the normality of the frequency distribution was tested age-wise and grade-wise. In order to judge the normality of the distribution of the scores, the value of Mean, Median, S D, P_{10}, P_{90}, Skewness and Kurtosis were calculated. The Mean, Median, SD, Percentiles of the scores of each Age-group and Class lie very closely to one another, which is required for normal distribution. The skewness of the curve is found to be -3.61 which shows that the distribution is negatively skewed. Further, the value of kurtosis is found to be -.154 which shows that the distribution is platykurtic. Further, before establishing the norms for the present test the Kolmogorov Smirnov test was applied on the data is normally distributed or not and the p value was found to be 1.348 which is greater than 0.05 ($1.348>0.05$). Hence, the sample data are not significantly different than a normal distribution. Therefore, the scores distribution is normal.

For the present test, Sigma score norms, Percentile norms, T-score norms, DIQ and Stanine scores have been derived and given in Tables 6.14-6.31 in the main body of the report.

Interpretation Table for Deviation Intelligence Quotient (DIQ):

The DIQs for the entire sample was classified in the following 7 groups as suggested classification of revised Stanford Binet test for interpreting the DIQ of the children.

Classification for interpreting DIQs of the entire sample (N= 800)

DIQ Scores	Total	%	Classification
Below 70	28	3.50	Mentally Defective
70-79	63	7.88	Borderline Defective
80-89	129	16.13	Low Average
90-109	344	43.00	Normal/Average
110-119	134	16.75	High Average
120-139	102	12.75	Superior
140 & above	0	0.00	Very Superior
Total	800	100.00	

Distribution of Level of Intelligence among the total Sample:

The level of intelligence of the present test was studied by the sample of 800 which have been used for estimating the reliability, validity and establishing the norms. The same data was used to study the levels of intelligence of the entire sample N= 800 in terms of the classification DIQs which is given below:

Table 6.32: Classification of Gender-wise DIQs of the entire Sample No. =800 (Age group 14-18)

DIQ Scores	Boys	%	Girls	%	Total	%	Classification
Below 70	15	3.75	13	3.25	28	3.50	Mentally Defective
70-79	33	8.25	30	7.50	63	7.88	Borderline Defective
80-89	61	15.25	68	17.00	129	16.13	Low Average
90-109	173	43.25	171	42.75	344	43.00	Normal/Average
110-119	74	18.50	60	15.00	134	16.75	High Average
120-139	44	11.00	58	14.50	102	12.75	Superior
140 & above	0	0.00	0	0.00	0	0.00	Very Superior
Total	400	100.00	400	100.00	800	100.00	

It is evident from the above table that the level of intelligence was normally distributed for both boys and girls for the entire sample.

Table: Classification of Age-wise distribution of DIQs, Mean and S.D. of the total Sample (N=800)

DIQ	14	15	16	17	18	Total
55-59	0	0	0	5	0	5
60-64	1	2	3	2	4	12
65-69	1	2	3	4	1	11
70-74	3	4	5	7	4	23
75-79	2	12	9	10	7	40
80-84	3	10	15	9	11	48
85-89	10	15	26	19	11	81
90-94	4	12	29	22	22	89
95-99	4	21	16	25	15	81
100-104	7	17	24	34	17	99
105-109	5	13	26	18	13	75
110-114	12	12	12	27	15	78
115-119	6	13	11	22	13	65
120-124	3	12	14	14	11	54
125-129	1	7	10	4	4	26
130-134	0	1	6	2	3	12
135-139	0	0	1	0	0	1
140-144	0	0	0	0	0	0
Total	62	153	210	224	151	800
Mean	22.94	22.18	21.81	23.28	22.57	23.41
SD	7.46	9.13	8.95	9.02	9.58	8.75

The above table shows that the age-wise distribution of DIQs for the entire sample N=800 was normally distributed. It is observed that the mean and standard deviation of every age-group seems to be very close to each other. The Mean. and S.D. of the entire sample (N=800) were 23.41 and 8.75 respectively.

Studying the Gender, Age and Class-wise Differences on the Variable of Intelligence

After careful analysis of the obtained data and interpretation of the results with regard to the objectives of the study, the investigator reached at the following findings.

1. There is no significant difference in the mean scores of the level of intelligence of the students with respect to their gender.
2. 14 and 15 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.
3. 14 and 16 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.
4. 14 and 17 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.
5. 14 and 18 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.
6. 15 and 16 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.
7. 15 and 17 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.
8. 15 and 18 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.
9. 16 and 17 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.

10. 16 and 18 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.
11. 17 and 18 age group of students do not differ significantly with respect to their mean scores on the variable intelligence.
12. Ninth and tenth class secondary school students do not differ significantly with respect to their mean scores on the variable intelligence.
13. Ninth and +1 class secondary/senior secondary school students do not differ significantly with respect to their mean scores on the variable intelligence.
14. Ninth and +2 class secondary/senior secondary school students differ significantly with respect to their mean scores on the variable intelligence.
15. Tenth and +1 class secondary/senior secondary school students do not differ significantly with respect to their mean scores on the variable intelligence.
16. Tenth and +2 class secondary/senior secondary school students differ significantly with respect to their mean scores on the variable intelligence.
17. +1 and +2 class secondary/senior secondary school students differ significantly with respect to their mean scores on the variable intelligence.

8-15 Discussion of Results and Recommendations

The present test is a verbal group test of intelligence in the English language constructed for the students of Sikkim is the first of its kind. The present test is suitable as per, culture, tradition and environment of Sikkim state. On the basis of the findings of the study the following recommendations can be given:

1. There is no significant difference in the mean scores of the level of intelligence of the students with respect to their gender. Since, the mean score on intelligence is lower for boy students (22.24) as compared to girl students (22.80), it may be inferred that girl students exhibit significantly superior

intelligence in comparison to boy students. As students are in adolescence, time period of remarkable physical, cognitive, emotional, hormonal changes etc. that leads to tremendous stress and strain. Hence, teachers need to focus on engaging learners in multisensory activities, that promote physical exercise i.e., activities, experiments and hands-on work. Keeping them curious and inquisitive about scientific phenomena at school and home in the form of projects, assignments, problem- solving activities, etc. It may be done by actively involving them in the study of natural physical, biological, chemical, geological phenomena around us.

2. 14 and 15 age group of students do not differ significantly with respect to their mean scores on the variable intelligence. Since, the mean score on intelligence is higher for the age group of 14 (22.94) as compared to age group of 15 (22.18), it may be inferred that the students of age group 14 exhibit superior intelligence in comparison to the students of age group 15. The lack of interest, easy going attitude, bad habits, delinquency or truant behaviour could be the *possible reasons for this kind of lag in intelligence. Hence as a teacher, parent, guardian, psychologist we need to ensure* a stimulating, healthy and distraction free environment so that learners can ask questions without hesitation. By increasing learners' attention span by engaging them in reading books, playing constructive games, doing interesting activities, experimenting, minimizing distractions etc.

3. 14 and 16 age group of students do not differ significantly with respect to their mean scores on the variable intelligence. Since, the mean score on intelligence is higher for the age group of 14 (22.94) as compared to age group of 16 (21.81), it may be inferred that the students of age group 14 exhibit superior

intelligence in comparison to the students of age group 16. Increasing learners' attention span by actively engaging them in exploratory activities, reading books, playing constructive games, doing interesting scientific activities, minimizing distractions etc.

4. 14 and 17 age group of students do not differ significantly with respect to their mean scores on the variable intelligence. Since, the mean score on intelligence is lower for the age group of 14 (22.94) as compared to age group of 17(23.28), it may be inferred here that the students of age group 17 exhibit superior intelligence in comparison to the students of age group 14. Hence, it's proved here that with advancing age the physical strength and cognitive abilities do increase among students. However, we can motivate students to engage in problem solving proactively as it is one of the highest mental processes. It involves discovering, analysing, and solving problems constructively.

5. 14 and 18 age group of students do not differ significantly with respect to their mean scores on the variable intelligence. Since, the mean score on intelligence is higher for the age group of 14 (22.94) as compared to age group of 18 (22.57), it may be inferred that the students of age group 14 exhibit superior intelligence in comparison to the students of age group 18. As students are in late adolescence time period of physical, cognitive, emotional, hormonal changes etc. that leads to tremendous stress and strain. Adjustment problems, changing interests, attention deficits, transforming attitude, psycho- social behaviour, responsibilities, etc. could play a changing role here. Hence, learners must be provided with divergent choices in the fields of their studies and they must be stimulated for decision- making, problem solving, and other

higher cognitive abilities. Inculcation of health benefits of artificial intelligence, Vedic maths, robotics, transformational brains games, scientific experiments, environmental conservation activities, puzzles, crosswords, sex education, health and hygiene studies etc. must be included practically in curricular as well as co- curricular activities respectively.

6. 15 and 16 age group of students do not differ significantly with respect to their mean scores on the variable intelligence. Since, the mean score on intelligence is higher for the age group of 15 (22.18) as compared to age group of 16 (21.81), it may be inferred that the students of age group 15 exhibit superior intelligence in comparison to the students of age group 16. The trivial age of adolescence puts tremendous pressure on an individual due to surging hormonal imbalance. Defective study habits, reducing concentration power, faulty home environment, traditional school system, group dynamics, adjustment problems, changing interests, attention deficits, transforming attitude, psycho- social behaviour, peer pressure etc. might play a confounding role here. Hence, we need to focus on engaging learners in multisensory activities, that promote physical exercise i.e., activities, experiments and hands-on work. It is very important to keep students updated as per new skills, competencies and experiences in respective as well as related fields of study. e.g., ICT technologies, online platforms, robotics, coding, foreign language acquisition, 3-D model making, experimental models etc.

7. 15 and 17 age group of students do not differ significantly with respect to their mean scores on the variable intelligence. Since, the mean score on intelligence is lower for the age group of 15 (22.18) as compared to age group of 17 (23.28), it may be inferred that the students of age group 17 exhibit superior

intelligence in comparison to the students of age group 15. Hence, it's proved here that with increasing age the cognitive abilities, physical endurance, social skills, emotional wellbeing, attention span, better adjustment etc. vary positively among students. Teachers, parents, trainers etc. can however modify behaviour by motivating students to engage in problem solving activities proactively as it is one of the highest mental processes. It involves discovering, analysing, and solving problems constructively. Active involvement of students in art, drama, literature, music, dance, painting and other creative fields can do wonders for their overall grooming and personality development.

8. 15 and 18 age group of students do not differ significantly with respect to their mean scores on the variable intelligence. Since, the mean score on intelligence is lower for the age group of 15 (22.18) as compared to age group of 18 (22.57), it may be inferred that the students of age group 18 exhibit superior intelligence in comparison to the students of age group 15. Hence, it proves that with increasing age the intellectual abilities, emotional wellbeing, attention span physical endurance, social skills, better adjustment etc. vary positively among students. Providing equal opportunities to all learners in the educational arena around them can lead to development of integrated knowledge, multiple skills, hands on activities, meaningful experiences etc. Role of parents, teachers, Government policies and schemes to ensure quality education may prove to be viable input for the betterment of an individual and society at large.

9. 16 and 17 age group of students do not differ significantly with respect to their mean scores on the variable intelligence. Since, the mean score on intelligence

is lower for the age group of 16 (21.81) as compared to age group of 17 (23.28), it may be inferred that the students of age group 17 exhibit superior intelligence in comparison to the students of age group 16. Hence, it’s proved here that with advancing age the cognitive abilities, academic achievement do vary among students. Healthy educational environment augments students to engage in problem solving proactively as it is one of the highest mental processes. intellectual abilities, emotional wellbeing, attention span physical endurance, social skills, better adjustment etc. vary positively among students.

10. 16 and 18 age group of students do not differ significantly with respect to their mean scores on the variable intelligence. Since, the mean score on intelligence is lower for the age group of 16 (21.81) as compared to age group of 18 (22.57), it may be inferred that the students of age group 18 exhibit superior intelligence in comparison to the students of age group 16. Hence, it’s proved here that with age the physical, cognitive, social, aesthetic, psychological abilities etc. do vary among students. We can always motivate students to engage in decision- making, problem solving learning/ activities, constructivist learning process etc. by ensuring healthy and stimulating learning environment.

11. 17 and 18 age group of students do not differ significantly with respect to their mean scores on the variable intelligence. Since, the mean score on intelligence is higher for the age group of 17 (23.28) as compared to age group of 18 (22.57), it may be inferred that the students of age group 17 exhibit superior intelligence in comparison to the students of age group 18. The adolescence period puts tremendous pressure on an individual due to heightened emotions hormonal imbalance, physical growth, cognitive development etc. non-

functional stimulation improper study habits, lack of concentration power, peer pressure, adjustment problems, changing interests, attention deficits, transforming attitude, psycho- social behaviour, etc. may be responsible here for the variations. Hence, we need to focus on engaging learners in multisensory activities, that promote physical exercise i.e., activities, experiments and hands-on work. It is very important to keep students updated as per new skills, competencies and experiences in respective as well as related fields of study. e.g., artificial intelligence, experimental models, robotics, coding, 3-D model making, etc.

12. Ninth and tenth class secondary school students do not differ significantly with respect to their mean scores on the variable intelligence. Since, the mean score on intelligence is lower for ninth class students (21.29) as compared to tenth class students (22.36), it may be inferred that tenth-class students exhibit significantly superior intelligence in comparison to ninth class students. Hence, it proves that with increasing chronological age the intellectual abilities, emotional wellbeing, attention span physical endurance, social skills, better adjustment etc. vary positively among students. Teachers, parents, overall educational set-up, scholarships provided by local, state and central Government levels can modify overall performance and personality of the students. Constructivist teaching- learning process, problem- based learning, collaborative learning ensures active involvement of students in intellectual as well as creative fields can do wonders for their overall grooming and personality development.

13. Ninth and +1 class secondary/senior secondary school students do not differ significantly with respect to their mean scores on the variable intelligence.

Since, the mean score on intelligence is lower for ninth class students (21.29) as compared to +1 class students (21.33), it may be inferred that +1 class students exhibit significantly superior intelligence in comparison to ninth class students. Hence, it's proved here that with age the physical, cognitive, social, aesthetic, psychological abilities etc. do vary among students. We can always provide enriching experiences to students to engage in higher cognitive capabilities i.e., decision- making, problem solving learning/ activities, constructivist learning process etc. by ensuring healthy and stimulating learning environment.

14. Ninth and +2 class secondary/senior secondary school students differ significantly with respect to their mean scores on the variable intelligence. Since, the mean score on intelligence is lower for ninth class students (21.29) as compared to +2 class students (25.11), it may be inferred that +2 class students exhibit significantly superior intelligence in comparison to ninth class students. Hence, it's proved here that with advancing age the physical, emotional, social and cognitive abilities do vary among different students. Healthy home environment, congenial educational opportunity, safe socio-political system augments students to engage in problem solving proactively as it is one of the highest mental processes. intellectual abilities, emotional wellbeing, attention span physical endurance, social skills, better adjustment etc. vary positively among students.

15. Tenth and +1 class secondary/senior secondary school students do not differ significantly with respect to their mean scores on the variable intelligence. Since, the mean score on intelligence is lower for +1 class students (21.33) as compared to tenth class students (22.36), it may be inferred that tenth-class

students exhibit significantly superior intelligence in comparison to +1 class students. It highlights that study habits, home environment, educational stimulus, balanced activities etc. It is very important to keep students updated as per new skills, competencies and experiences in respective as well as related fields of study. e.g., artificial intelligence, STEM (science, technology, engineering, mathematics) technologies, experimental models, robotics, coding, 3-D model making, hands on activities, creative fields etc.

16. Tenth and +2 class secondary/senior secondary school students differ significantly with respect to their mean scores on the variable intelligence. Since, the mean score on intelligence is lower for tenth class students (22.36) as compared to +2 class students (25.11), it may be inferred that +2 class students exhibit significantly superior intelligence in comparison to tenth class students. Hence, it's proved here that with advancing age the physical, emotional, social and cognitive abilities do vary among students. Healthy home environment, congenial educational opportunity, safe socio- political system stimulates students to engage in logical thinking, rational decision-making problem solving as it is one of the highest mental processes. intellectual abilities, emotional wellbeing, attention span physical endurance, social skills, better adjustment etc. vary positively among students. skill- based teaching/ learning, reflective- level thinking, problem- based learning, project method, constructivist teaching strategies must be utilised.

17. +1 and +2 class secondary/senior secondary school students differ significantly with respect to their mean scores on the variable intelligence. Since, the mean score on intelligence is lower for +1 class students (21.33) as compared to +2 class students (25.11), it may be inferred that +2 class students

exhibit significantly superior intelligence in comparison to +1 class students. Hence, it's proved here that with advancing age the cognitive abilities and academic achievement do vary among students. Hence, learners must be provided with divergent choices in the fields of their studies and they must be stimulated for decision- making in their respective fields of studies. Inculcation of STEM (science, technology, engineering, mathematics) technologies, artificial intelligence, robotics, transformational brains games, health and hygiene studies, environment education etc. must be included practically and objectively in school curriculum.

8-16 Suggestions for Further Research

The present test is a verbal group test of intelligence in the English language constructed for the students of Sikkim studying in classes 9^{th} to 12^{th} (age 14 to 18). The present study may have its own limitations as it may not cover all aspects of intelligence testing which needs to be investigated. The investigator, therefore, would like to suggest the future investigators to conduct studies on the following aspects:

-- Construction and standardization of verbal group test of intelligence in Nepali language for students of Sikkim.

-- Construction and standardization of verbal group test of intelligence in English language for the school students of age group of 6 to 13+ years of Sikkim.

-- Construction and standardization of verbal group test of intelligence in Nepali language for the school students of age group of 6 to 13+ years of Sikkim.

-- Construction and standardization of verbal group test of intelligence in Nepali language for the adults of Sikkim.

-- Construction and standardization of verbal group test of intelligence in English language for the adults of Sikkim.

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MANUAL

FOR

VERBAL GROUP TEST OF INTELLIGENCE FOR THE STUDENTS OF 14 TO 18 YEARS

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1-1: CONSTRUCTION OF THE TEST

1-1.1 Introduction

No two individuals are exactly alike. Some are bright, others dull, some are quick, others slow, some solve problems quickly and directly, others fumble over them for a long time, and some adapt themselves to new situations easily while others experience difficulty. In education it was accepted that good educational administration should consider the difference between individuals, because of the fact that each student is different in mental ability or intelligence. Intelligence plays an important role in one's academic, professional, social and personal life. The teachers and parents are often confused, curious and talk about the differences in the educational performance and academic achievement of the school going children; as most of them believe that intelligence is one of the main determinants in the student's success and failure.
As the world is also becoming more and more advanced and complex; educational performance and achievement amongst students have also become more and more difficult. The teachers and parents are often confused, curious and talk about the differences in the educational performance and academic achievement of the school going children; as most of them believe that intelligence is one of the main determinants in the student's success and failure. It is this phenomenon which has encouraged the investigator to study the intelligence of the secondary/senior secondary school students of the state. Seeing the importance of intelligence of students and the necessity of intelligence tests as a measuring tool, the investigator feels that it is important to have a separate intelligence test to measure the general mental ability of the students of Sikkim state. The investigator therefore, decided to construct and standardize a verbal group test of intelligence in the English language for the students of Sikkim for the age group of 14 to 18 years.

1-1.2 Construction

In spite of assembling a wide variety of intelligence tests, many individual abilities remain outside the scope of measurement and many intelligence tests are not based on strong theoretical foundations. Hence, the present test includes items on Five Primary Mental Abilities of Thurstone out of his Seven Primary Mental Abilities which are as follows:

- Verbal comprehension--the ability to define and understand words
- Word fluency--the ability to produce words rapidly
- Number--the ability to solve arithmetic problems.
- Memory--the ability to memorize and recall
- Reasoning--the ability to find rules

Two types of test items are constructed in the present test. The vast majority of the test items are with multiple choice items because they are most common, flexible and effective. The second type of test items, very minimum in number, is to write the correct answers/ words in a given statement.

On the basis of all the five primary mental abilities, the investigator prepared the initial draft of the test with 165 items. These items were then tried out on 20 students of classes IX, X, XI and XII. After a thorough study of the responses collected from the 20 respondents, the following 108 items were retained for preliminary try-out.

The main purpose of this step is to take a final decision concerning several matters like: length of the test or sub-tests, time-limits, sequence of items of the test, or any technical flaws that may have occurred, instructions provided in the test etc. When all these problems were sorted out, reviewed and edited, the test items were prepared in test booklet form and were made ready for a preliminary try-out phase. The test items were also reviewed by seeking the experts' opinion in the specialized field and with the help of language experts in order to remove any sort of linguistic ambiguity contained in the items. For the preliminary try-out, the test was administered on a sample of 80 (40 boys and 40 girls) students selected randomly studying in classes IX, X, XI and XII (age 14 to 18). On the basis of observation, individual's reactions and the feedback received from the students the investigator improved and modifies the items accordingly. A few vague items were deleted, while some items were modified or rearranged. Finally, a total of 67 (Verbal Comprehension-15, Word Fluency-7, Number-15, Memory-15, and Reasoning-15) items were retained for the first try out.

For the first try-out of a sample of 400 students comprising of 200 boys and 200 girls representing classes, IX, X, XI and XII (age 14 to 18) was drawn from the secondary/senior secondary schools situated in Sikkim. To calculate the item difficulty and item discrimination power of the items in present test Kelley's method of item analysis was employed. Kelley demonstrated that when extreme groups, each consisting of 27% of the total group were used, the ratio of the difference in abilities of the group to the standard error of their difference i.e. the degree of uncertainty about the size of real difference was found to be maximum. Thus, by accepting the two tails and rejecting the middle 46% we can minimize our labour without scarifying the precision of our result. To compute the difficulty value and discrimination power of an item of the intelligences test the following procedure was followed:

The answer sheets of 400 students were arranged in a descending order, (i.e. from the highest to the lowest score). Thereafter, three groups were formed as follows:

- (i) Upper 27% of total sheets (i.e. 108 sheets)
- (ii) Middle 46% of total sheets (i.e.184 sheets)
- (iii) Lower 27% of total sheets (i.e. 108 sheets)

As per Kelley's method, the middle group of 46% was rejected and only the two extreme groups (i.e. upper 27% and lower 27%) was taken into consideration for calculating the difficulty value and discriminative power of an item.

The investigator applied the following formula of correcting the difficulty index of an item for chance success as has been suggested by Garrett (1981, pp.364-365):

$$P_c = \frac{R - W/(K-1)}{N - HR}$$

(to correct a difficulty index for chance success)

in which

Pc = the percent who actually know the right answer
R = the number who get the right answer
W = the number who get the wrong answer
N = the number of examinees in the sample
HR = the number of examinees who do not reach the item (and hence do not try it)
k = the number of options or choices

Now, for each item the proportion of the students who passed an item in the upper and the lower groups was determined. The difficulty value and discrimination power of an item was then calculated by using the following formula as suggested by Davis.

$$DV = (P_u + P_l)/2$$

$$DP = P_u - P_l$$

Where,

P_u = Proportion of correct answers on the item of upper group examinees
P_l = Proportion of correct answers on the item of lower group examinees

Items Retained for the Final form of the Test

After item analysis only good items with appropriate difficulty level and with satisfactory discriminating power are retained and these items form the final test. The items which did not fulfil the criteria as mentioned above were omitted. As a result, a total number of 37 items out of 67 were rejected. Finally, the test contains 30 items. The final form of the test after item analysis and time taken in each sub-test was given as follows:

Table-1: No. of Items retained and Time Taken in each Sub-Test

Sr. No.	Sub-Test	No. of Items retained	Time taken (in Minutes)
1	Verbal Comprehension	5	5
2	Word Fluency	5	5
3	Number	5	5
4	Memory	10	5
5	Reasoning	5	5
Total		30	25 Minutes

1-1.3 Administering the Test

The present test can be easily administered within a period of school hour i.e. 35 minutes for attempting all the 30 items including reading the instructions for the test before beginning the test. The detailed instructions in the front page of the test booklet and in the beginning of all the sub-tests are given. The following important information contained in the instructions:

-- The total time allowed for completing the test.
-- The procedure for recording answers.
-- Doubt clearance, if any, before starting the test.
-- Total number of items in the test.

1-1.4 Test Booklet, Answer Sheets and Scoring Key

A separate answer sheet and test booklet was prepared keeping in mind that the test booklets may be reused. To make the scoring easier, sub-test wise proper space for scoring has been provided on the side of each response in the answer sheet and space for overall total for each of the sub-test on front side of the answer sheet. Important instructions are given in the front side of the test booklet before attempting the test.

1-1.5 Scoring Procedure

In the present test, correct answers are scored with a positive value of 1 whereas, incorrect answers and absent or omitted answers with a value of zero. The sum of the scores for correct responses is the test score. This is the same case for the word fluency sub-test. For scoring the right and wrong answers, the investigator has assigned 0.25 marks for the right answer and 0 for the wrong answers. The correct writing of all the four words received 1 mark each. For the present test, scoring was done with the help of a scoring prepared by the investigator. The verbal group test of intelligence in all consists of a total number of 30 items and the total scores for these items may be obtained by the individual is 45 marks.

1-2 STANDARDIZATION OF THE TEST

1-2.1 Sample

For construction, standardization and establishing the norm for the present test the sample was drawn from the students studying in different classes like 9th, 10th, +1 and +2 of Secondary/Senior Secondary Schools situated in four (East, West, North and South) districts of Sikkim state. From the selected district, 200 (100 boys and 100 girls) students from each class were taken on the basis of stratified random sampling technique. The total sample consists of 800 secondary/senior secondary school students – 400 boys and 400 girls. The district, class and age wise distribution of the sample is given below:

Table-2: District and Class-wise Distribution of the Sample

District	East			West			North			South			Grand Total
Class	**B**	**G**	**T**	**B**	**G**	**T**	**B**	**G**	**T**	**B**	**G**	**T**	
9	25	25	50	25	25	50	25	25	50	25	25	50	**200**
10	25	25	50	25	25	50	25	25	50	25	25	50	**200**
11	25	25	50	25	25	50	25	25	50	25	25	50	**200**
12	25	25	50	25	25	50	25	25	50	25	25	50	**200**
Total	**100**	**100**	**200**	**100**	**100**	**200**	**100**	**100**	**200**	**100**	**100**	**200**	**800**

Table-3: Age-wise Distribution of the Sample

Age	East	West	North	South	Total
14	11	10	22	19	**62**
15	52	38	39	24	**153**
16	48	59	63	40	**210**
17	55	54	49	66	**224**
18	34	39	27	51	**151**
Total	**200**	**200**	**200**	**200**	**800**

1-2.2 Distribution of Test Scores:

Age wise and Class wise distribution of scores for boys, girls and total sample are presented in table no. 4 to 9.

Table-4: Age-Wise distribution of scores: Total sample (N= 800)

Age/Class Interval	14	15	16	17	18	Total
0-4	0	4	5	7	5	21
5-9	3	8	13	11	8	43
10-14	4	20	25	19	18	86
15-19	15	25	47	36	29	152
20-24	9	33	40	43	28	153
25-29	21	25	37	47	21	151
30-34	9	23	23	41	24	120
35-39	1	14	16	16	14	61
40-44	0	1	4	4	4	13
45-49	0	0	0	0	0	0
Total	62	153	210	224	151	800
Mean	22.94	22.18	21.81	23.28	22.57	23.41
Median	24.50	22.00	21.00	24.00	23.00	24.00
SD	7.46	9.13	8.95	9.02	9.58	8.75
Skewness	-.390	-.135	.044	-.477	-.148	-.361
Kurtosis	-.687	-.633	-.440	-.111	-.495	-.154

Table-5: Age-Wise Distribution of Test Scores for Boys (N= 400)

Age/Class Interval	14	15	16	17	18	Total
0-4	0	3	3	5	4	15
5-9	3	5	6	5	3	22
10-14	2	9	14	13	10	48
15-19	4	9	24	19	13	69
20-24	3	13	17	18	21	72
25-29	10	9	16	25	13	73
30-34	6	11	14	19	17	67
35-39	0	6	8	10	5	29
40-44	0	0	2	1	2	5
45-49	0	0	0	0	0	0
Total	28	65	104	115	88	400
Mean	22.79	21.28	21.78	22.64	22.81	22.24
Median	25.00	22.00	21.00	24.00	23.00	23.00
SD	8.55	9.69	9.14	9.41	9.33	9.28

Table-6: Age-Wise Distribution of Test Score for Girls (N= 400)

Age/Class Interval	14	15	16	17	18	Total
0-4	0	1	2	2	1	6
5-9	0	3	7	6	5	21
10-14	2	11	11	6	8	38
15-19	11	16	23	17	16	83
20-24	6	20	23	25	7	81
25-29	11	16	21	22	8	78
30-34	3	12	9	22	7	53
35-39	1	8	8	6	9	32
40-44	0	1	2	3	2	8
45-49	0	0	0	0	0	0
Total	34	88	106	109	63	400
Mean	23.06	22.84	21.84	23.95	22.24	22.80
Median	23.00	22.50	21.50	24.00	20.00	23.00
SD	6.56	8.68	8.82	8.58	9.99	8.75

Table-7: Class-Wise Distribution of Test Score for Total Sample (N= 800)

Class/Class Interval	IX	X	XI	XII	Total
0-4	3	2	10	6	21
5-9	13	9	15	6	43
10-14	22	27	19	18	86
15-19	50	39	41	22	152
20-24	40	35	45	33	153
25-29	38	44	25	44	151
30-34	24	27	27	42	120
35-39	10	16	16	19	61
40-44	0	1	2	10	13
45-49	0	0	0	0	0
Total	200	200	200	200	800
Mean	21.29	22.36	21.33	25.11	23.41
Median	21.00	22.00	21.50	26.00	24.00
SD	8.25	8.40	9.44	9.43	8.75
Skewness	-.043	-.052	-.236	-.522	-.361
Kurtosis	-.415	-.636	-.454	-.097	-.154

Table-8: Class-Wise Distribution of Test Scores for Boys (N= 400)

Class/Class Interval	IX	X	XI	XII	Total
0-4	3	1	5	6	15
5-9	5	8	6	3	22
10-14	8	20	13	7	48
15-19	24	16	17	12	69
20-24	18	15	23	16	72
25-29	23	17	11	22	73
30-34	17	12	15	23	67
35-39	2	10	9	8	29
40-44	0	1	1	3	5
45-49	0	0	0	0	0
Total	100	100	100	100	400
Mean	21.75	21.32	21.63	24.27	22.24
Median	22.50	20.50	22.00	26.00	23.00
SD	8.12	9.36	9.46	9.93	9.28

Table-9: Class-Wise Distribution of Test Scores for Girls (N= 400)

Class/Class Interval	IX	X	XI	XII	Total
0-4	0	1	5	0	6
5-9	8	1	9	3	21
10-14	14	7	6	11	38
15-19	26	23	24	10	83
20-24	22	20	22	17	81
25-29	15	27	14	22	78
30-34	7	15	12	19	53
35-39	8	6	7	11	32
40-44	0	0	1	7	8
45-49	0	0	0	0	0
Total	100	100	100	100	400
Mean	20.83	23.40	21.02	25.95	22.80
Median	20.00	24.00	21.00	26.00	23.00
SD	8.40	7.22	9.47	8.87	8.75

1-2.3 Reliability of the Test

Split-Half Reliability and Kuder-Richardson Reliability of the test were found as follows:

Table-10: Reliability of the Test

Types of Reliability	r	P
Split-Half Reliability	0.78	.01*
Kuder-Richardson Reliability	0.96	.01*

*Significant at .01 level

1-2.4 Validity of the Test

(i) Face Validity
In the present test, the face validity was confirmed based on the opinion, suggestions and comments provided by the experts that it does measure the level of intelligence of secondary/senior secondary school students.

(ii) Content Validity
The content-validity of the present test was obtained through the expert's opinion through a rating scale. As such, the opinions obtained from the experts were analyzed with respect to the different items included in the test.

(iii) Concurrent Validity
The concurrent validity of the present test was determined by correlating the scores of the present test with the external criterion test viz. Ahuja's Group Test of Intelligence and the correlation was calculated by using Pearson's Product Moment method which is given below:

Table-11: Product Moment Coefficient of Correlation between the scores of present test and Ahuja's Group Test of Intelligence of School Students

Group	r	P
Scores of the Present Test	0.64	.01*
Scores of Ahuja's Group Test of Intelligence		

*Significant at .01 level

1-2.5 Norms

The data collected from the sample of 800 students (400 boys and 400 girls) was used for derivation of norms. Before deriving the norms, the normality of the frequency distribution was tested age-wise and grade-wise. In order to judge the normality of the distribution of the scores, the value of Mean, Median, S D, P_{10}, P_{90}, Skewness and Kurtosis were calculated. Further, before establishing the norms for the present test the Kolmogorov Smirnov test was also applied on the data to check whether it is normally distributed or not.
For the present test, Sigma score norms, Percentile norms, T-score norms, DIQ and Stanine scores have been derived and given in Tables 6.14-6.31 in the main body of the report.

Sigma Score (Z):
Sigma (Z) scores are expressed in terms of standard deviations from their means. In other words, deviations from the mean expressed in SD units are called Sigma Scores. Sigma Scores are also known as 'Z-Score'.
In the present test, the Sigma (Z) Scores were calculated by applying the following formula:

$$Z = \frac{X - M}{\sigma}$$

Z = Standard score in σ unıts
X = Raw score of an individual
M = Mean of test score
σ = Standard Deviation of the test scores

The sigma score for each raw score of the present test were given in Table 6.14-6.31.

Percentile Norms:
To calculate the individual's percentile norms on a test, the deviation of scores were first expressed in sigma score as already described above. With the help of these scores percentile norms were then established by seeing area under the standard normal distribution table of Z-Score. The percentile norms for each raw score were given in Table 6.14-6.31.

T -Score Norms:
Normalized standard scores are generally called T scores. According to Bhatnagar and Bhatnagar (2010, p. 63) in order to avoid decimals and minus signs from Z-score these T-score norms are prepared. T-score is an improvement over Z-score. In T-scores mean is 50 and σ is 10. These scores are always positive. If normalized standard score is multiplied by 10 and added to or subtracted from 50, it is converted into T -Score. For this first Z-score is computed and then T-score is obtained by using the following formula:

$$\text{T-Score} = 50 \pm 10 \text{ (Z score)}$$

The values of T -scores for each raw score were calculated for different age groups of students and class group separately and presented in separate Tables 6.14-6.31.

Deviation Intelligence Quotient (DIQ):
Deviation Intelligence Quotient is a normalized standard score which does not involve the mental age of a child. It is not the ratio of mental and chronological ages. The standardized sample mean is 100 and S.D is usually 16. The raw scores of an intelligence test are transformed into the DIQs. The procedure of transformation is based upon the principle of standard scores. The raw scores were transformed into DIQs with the help of the following formula:

$$\text{DIQ} == 100 + 16\,(\sigma)$$

For the present test, the deviation IQ is computed with a mean of 100 and SD of 16.
The DIQ scores for each raw score were calculated and presented for different age groups and class group in Table 6.14-6.31. The separate tables for DIQ scores in classified form for all age groups and gender-wise were also worked out and presented in Table 6.32 – 6.38.

Stanine Score:
The word stanine is derived from stay Nine. In this method distribution is divided into nine parts where stanine 5 is in the middle of the distribution. In this case the mean is assumed to be 5 and SD = 2 (1.96). Stanine norms for each raw score were calculated and presented in table no. 6.14 to 6.31.

Classification of Intelligence
The level of intelligence of the present test was studied by the same data collected from the sample of 800 that have been used for estimating the reliability, validity and establishing the norms. The levels of intelligence of the entire sample N= 800 in terms of the classification DIQs were described in Table 6.32 to 6.39 gender-wise and age-wise. It is evident from calculations that the level of intelligence was normally distributed at all age levels. With regards to the distribution of intelligence for the entire sample (gender-wise and age-wise) is concerned, the table no. 6.32 and 6.33 revealed that the intelligence was normally distributed. It is observed that the mean and standard deviation of every age-group seems to be very close to each other. The Mean and S.D. of the entire sample (N=800) were 23.41 and 8.75 respectively.

Interpretation Table for Deviation Intelligence Quotient (DIQ):

The DIQs for the entire sample was classified in the following 7 groups as suggested classification of revised Stanford Binet test for interpreting the DIQ of the children.

Table-12: Classification for interpreting DIQs of the entire sample (N= 800)

DIQ Scores	Total	%	Classification
Below 70	28	3.50	Mentally Defective
70-79	63	7.88	Borderline Defective
80-89	129	16.13	Low Average
90-109	344	43.00	Normal/Average
110-119	134	16.75	High Average
120-139	102	12.75	Superior
140 & above	0	0.00	Very Superior
Total	800	100.00	

Distribution of Level of Intelligence among the total Sample:

The level of intelligence of the present test was studied by the sample of 800 which have been used for estimating the reliability, validity and establishing the norms. The same data was used to study the levels of intelligence of the entire sample N= 800 in terms of the classification DIQs which is given below:

Table-13: Classification of Gender-wise DIQs of the entire Sample No. =800 (Age group 14-18)

DIQ Scores	Boys	%	Girls	%	Total	%	Classification
Below 70	15	3.75	13	3.25	28	3.50	Mentally Defective
70-79	33	8.25	30	7.50	63	7.88	Borderline Defective
80-89	61	15.25	68	17.00	129	16.13	Low Average
90-109	173	43.25	171	42.75	344	43.00	Normal/Average
110-119	74	18.50	60	15.00	134	16.75	High Average
120-139	44	11.00	58	14.50	102	12.75	Superior
140 & above	0	0.00	0	0.00	0	0.00	Very Superior
Total	400	100.00	400	100.00	800	100.00	

It is evident from the above table that the level of intelligence was normally distributed for both boys and girls for the entire sample.

Table-14: Classification of Age-wise distribution of DIQs, Mean and S.D. of the total Sample (N=800)

DIQ	14	15	16	17	18	Total
55-59	0	0	0	5	0	5
60-64	1	2	3	2	4	12
65-69	1	2	3	4	1	11
70-74	3	4	5	7	4	23
75-79	2	12	9	10	7	40
80-84	3	10	15	9	11	48
85-89	10	15	26	19	11	81
90-94	4	12	29	22	22	89
95-99	4	21	16	25	15	81
100-104	7	17	24	34	17	99
105-109	5	13	26	18	13	75
110-114	12	12	12	27	15	78
115-119	6	13	11	22	13	65
120-124	3	12	14	14	11	54
125-129	1	7	10	4	4	26
130-134	0	1	6	2	3	12
135-139	0	0	1	0	0	1
140-144	0	0	0	0	0	0
Total	62	153	210	224	151	800
Mean	22.94	22.18	21.81	23.28	22.57	23.41
SD	7.46	9.13	8.95	9.02	9.58	8.75

Verbal Group Test of Intelligence
(14 to 17 Years +)

INSTRUCTIONS

1. Do not open this booklet until you are asked to do so.
2. Answers are to be written on the separate answer-sheet provided.
3. Please fill all the information like your name, school name, class, age etc. in the answer sheet.
4. Do not make any mark on this booklet.
5. In this Test Booklet there are five sub-tests. Each sub-test is to be done one by one. The present test contains all together 30 items. Important instructions and explanations are given with the help of *Examples*. Be sure that you understand how to answer the questions.
6. **Select the correct answer from A, B, C, D, by putting the right sign (√) in the answer box provided in the answer-sheet.**
7. You will be given **10 minutes** for understanding these instructions. After that you will be given **25 minutes** to solve the test items.
8. If you commit a mistake, put a round (0) circle over your wrongly marked response and mark the correct response again. Do not waste time in using rubber.
9. When you are instructed to stop at the expiry of the time limit, you have to stop writing immediately.
10. Try to attempt all the items. If you find a difficult item leave it and proceed further.
11. Do not spend too much time on one test-problem.
12. If you have any doubt get them clear before you start the test.

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DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

TEST-I

EXAMPLES FOR PRACTICE

In this test, items related to verbal comprehension are given. You have to find out the best answer out of the four alternatives as given below in the examples:

I. Find the Synonym of: *SECURE*

A. Comfortable *B. Independent* *C. Secret* ***D. Safe***

II. Find the Antonym of**:** *LEADER*

A. Goodwill *B. Disloyal* ***C. Follower*** *D. Common*

III. Arrange the letters correctly and get the name of: *"RSEHO"*

A. Animal *B. City* *C. Country* *D. Ocean*

IV. Find the Correct Spelling:

A. Skelaton *B. Skelton* *C. Skleton* ***D. Skeleton***

V. Find the Correct meaning of: *Unable to read*
A. Educated *B. Illegible* *C.* ***Illiterate*** *D. Literate*

TEST-I

TEST PROBLEMS

1. Find the Synonym of: ZENITH

A.	Rich	**B.**	Triumph	**C.**	Top	**D.**	Risk

2. Find the Antonym of: HEARTFELT

A.	Loving	**B.**	Insincere	**C.**	Unhealthy	**D.**	Humorous

3. Arrange the letters correctly and get the name of: "LEPAN"

A.	Animal	**B.**	Ocean	**C.**	City	**D.**	Country

4. Find the Correct Spelling:

A.	Apprantaly	**B.**	Apparently	**C.**	Apparantly	**D.**	Aparantely

5. Find the Correct meaning of: "All knowing"

A.	Omniscient	**B.**	Omnipotent	**C.**	Omnipresent	**D.**	Obsolete

TEST-II

EXAMPLES FOR PRACTICE

In this test, items related to word fluency are given. You have to write the words as per the directions given in the test items and example as given below:

I. Write four words starting with “Z”.

Zoo, Zinc, Zoology, Zebra

TEST-II

TEST PROBLEMS

Note: Time is very less. Don’t stop any one question. After giving the answer of one question try to solve next question immediately.

1. Write four words starting with “K”.

2. Write four words ending with “L”.

3. Write four words starting and ending with “R”.

4. Write four words in which “Q” letter is used.

5. Write four words starting with “W”.

TEST-III

EXAMPLES FOR PRACTICE

In this test, items related to number are given. You have to find out the best answer out of the four alternatives as given below in the examples:

Select the correct one:

I. Choose appropriate number for blank: $-7-(\_\_) = 2$

A.	5	**B.**	−5	**C.**	9	**D.**	**−9**

II. Find the value of $5^0 \times 7^0 \times 3^0$

A.	**1**	**B.**	1/15	**C.**	105	**D.**	0

TEST-III

TEST PROBLEMS

<u>From Item No.1 to 5.</u> Select the correct one:

1. Which of the following statement is false?

A.	−5+(−5)= −10	**B.**	−8+1=7	**C.**	−3+(−1)= 2	**D.**	11+(−12)= −1

2. 0 ÷ 10 gives

A.	0	**B.**	10	**C.**	1	**D.**	−10

3. 125 ÷ (−25) is equal to

A.	1	**B.**	5	**C.**	−5	**D.**	100

4. The product of 153.7 and 10 is

A.	1.537	**B.**	15.37	**C.**	153.7	**D.**	1537

5. The place value of 2 in 21.38 is

A.	Ones	**B.**	Tens	**C.**	Tenth	**D.**	Hundredth

TEST-IV

EXAMPLES FOR PRACTICE

In this test, items related to memory are given. You have to find out the best answer out of the four alternatives as given below in the examples:

Select the correct one:

I. Who invented the telephone?

A.	Thomas Edison	**B.**	Sir Issac Newton
C.	Archimedes	**D.**	**Alexander Graham Bell**

II. Who introduced the term 'mole' in chemistry?

A.	John Dalton	**B.**	Avogadro
C.	Lavoisier	**D.**	**Ostwald**

TEST-IV

TEST PROBLEMS

From Item No.1 to 10. **Select the correct one:**

1. Who was the first Vice President of India?

A.	Zakir Husain	**B.**	Shankar Dayal Sharma
C.	Sarvepalli Radhakrishnan	**D.**	Gopal Swarup Pathak

2. The famous children's book – "Jungle Book" was written by

A.	Rudyard Kipling	**B.**	Charles Dickens
C.	A. A. Milne	**D.**	Roald Dahl

3. Who is the founder of Yoga?

A.	Baba Ramdev	**B.**	Maharshi Patanjali
C.	Kapila	**D.**	Adishankaracharya

4. First Indian Satellite launched in space was called

A.	Ramanujam	**B.**	Aryabhatta
C.	Agni	**D.**	Apollo

5. The art of telling untrue stories in literature is called

A.	Prose	**B.**	Fiction
C.	Poetry	**D.**	Songs

6. What comes after a billion and a trillion?

A.	Million	**B.**	Quintillion
C.	Quadrillion	**D.**	Decillion

7. In which of the following, the speed of the sound is maximum:

A.	Air	**B.**	Water
C.	Steel	**D.**	Kerosene

8. In which sphere of the environment Ozone layer is located

A.	Troposphere	**B.**	Stratosphere
C.	Mesosphere	**D.**	Thermosphere

9. Which Indian emperor built Sanchi Stupa?

A.	Ashoka	**B.**	Prithviraj Chauhan
C.	Tipu Sultan	**D.**	Sansar Chand

10. When did World War II started and when it ended?

A.	1912-1920	**B.**	1940-1942
C.	1905-1915	**D.**	1937-1945

TEST-V

EXAMPLES FOR PRACTICE

In this test, items related to reasoning are given. You have to find out the best answer out of the four alternatives as per the directions given in the test items and example as given below:

I. Find the one that makes the best comparison:

Bird : Sky :: Man : ?
A. *Fire* *B.* *Air* ***C.*** ***Land*** *D.* *Water*

II. Find the odd one out:

A. *Touch* *B.* *See* *C.* *Hear* ***D.*** ***Smile***

TEST-V

TEST PROBLEMS

Find the one that makes the best comparison:

1. Boxing: Gloves :: Rowing : ?

A.	Rope	**B.**	Balls	**C.**	Sticks	**D.**	Boats

2. Alphabets : Words :: Cells : ?

A.	Antibiotics	**B.**	Virus	**C.**	Organs	**D.**	Tissues

3. Find the odd one out:

A.	Potato	**B.**	Guava	**C.**	Tomato	**D.**	Mango

Find the correct answer:

4. A and B are brothers and C and D are sisters. A's son is D's brother. How is B related to C?

A.	Uncle	**B.**	Aunt	**C.**	Nephew	**D.**	Father

Find the correct answer:

5. ACE, GIK, ? , SUW

A.	MOQ	**B.**	LNP	**C.**	BDE	**D.**	ZVX

<u>Answer Sheet</u>

Verbal Group Test of Intelligence
(14 to 17 Years +)

Please fill in the following information:

Your Name……………………………………………………………………………

School Name……………………………………………………………….………..

Age…………….Gender: Male/Female………………… Class…………..……

Locality: Rural/Urban……………………….…………

Category: SC/ST/OBC/General/EWS……..………………………………….

SCORING TABLE

Test No.	I	II	III	IV	V	Total
Score Obtained						

Note: Select the correct answer from A, B, C, D, by putting the **right sign (√)** in the answer box provided in the answer-sheet.

TEST-I

1	**A**		**B**		**C**		**D**		**Score Obtained**
2	**A**		**B**		**C**		**D**		
3	**A**		**B**		**C**		**D**		
4	**A**		**B**		**C**		**D**		
5	**A**		**B**		**C**		**D**		

TEST-II

Item No.	**Answer**	**Score Obtained**
1		
2		
3		
4		
5		

TEST-III

1	A		B		C		D		Score Obtained
2	A		B		C		D		
3	A		B		C		D		
4	A		B		C		D		
5	A		B		C		D		

TEST-IV

1	A		B		C		D		Score Obtained
2	A		B		C		D		
3	A		B		C		D		
4	A		B		C		D		
5	A		B		C		D		
6	A		B		C		D		
7	A		B		C		D		
8	A		B		C		D		
9	A		B		C		D		
10	A		B		C		D		

TEST-V

1	A		B		C		D		Score Obtained
2	A		B		C		D		
3	A		B		C		D		
4	A		B		C		D		
5	A		B		C		D		

SCORING KEY

Verbal Group Test of Intelligence
(14 to 17 Years +)

TEST-I

Q. No.	Answer	Marks
1	**C**	**1**
2	**B**	**1**
3	**D**	**1**
4	**B**	**1**
5	**A**	**1**

TEST-II

Item No.	Answer	Marks	Final Score
1	0.25 marks for each correct word to be awarded	0.25x4=1	Marks obtained in Item no. 1 should be multiply by 4 i.e. 1x4= 4
2	0.25 marks for each correct word to be awarded	0.25x4=1	Marks obtained in Item no. 1 should be multiply by 4 i.e. 1x4= 4
3	0.25 marks for each correct word to be awarded	0.25x4=1	Marks obtained in Item no. 1 should be multiply by 4 i.e. 1x4= 4
4	0.25 marks for each correct word to be awarded	0.25x4=1	Marks obtained in Item no. 1 should be multiply by 4 i.e. 1x4= 4
5	0.25 marks for each correct word to be awarded	0.25x4=1	Marks obtained in Item no. 1 should be multiply by 4 i.e. 1x4= 4

N.B. If a student obtained altogether 3.75 marks for the above Test II then his/her score will be 3.75x4= 15

TEST-III

Q. No.	Answer	Marks
1	B	1
2	A	1
3	C	1
4	D	1
5	B	1

TEST-IV

Q. No.	Answer	Marks
1	C	1
2	A	1
3	B	1
4	B	1
5	B	1
6	C	1
7	C	1
8	B	1
9	A	1
10	D	1

TEST-V

Q. No.	Answer	Marks
1	D	1
2	D	1
3	A	1
4	A	1
5	A	1

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INTELLIGENCE LEVEL AMONG SCHOOL STUDENTS IN RELATION TO THEIR GENDER AND GRADE

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ABSTRACT

The main objective of the present research was to study the level of intelligence of secondary/senior secondary school students. The sample comprised of 800 secondary/senior secondary school students out of which 400 boys and 400 were girl students. For the present study the verbal group of intelligence test developed and standardized by the investigator was used to meet the objectives. To test the hypotheses technique of t-test has been used. The results revealed that ninth and tenth, ninth and +1, tenth and +1 class students and boys and girls secondary/senior secondary school students do not differ significantly with respect to their mean scores on the variable intelligence. On the other hand Ninth and +2, Tenth and +2 and +1 and +2 class secondary/senior secondary school students differ significantly with respect to their mean scores on the variable intelligence.

Keywords: *Intelligence, Secondary/Senior Secondary School Students*

Introduction:

In education it was accepted that good educational administration should consider the difference between individuals, because of the fact that each student is different in mental ability or intelligence. Intelligence is a very important factor in education. So that if the teachers know their students' intelligence, they can understand and manage experiences and accordingly supports them to learn according to their intelligence and abilities. Intelligence is a very important factor that is responsible for the success of an individual in life, though it cannot be said that every intelligent person is successful in life. In other words an intelligent person has more chances of success in life or in a given situation than one who is less intelligent. Intelligence plays an important role in one's academic, professional, social and personal life. As the world is also becoming more and more advanced and complex; educational performance and achievement amongst students have also become more and more difficult. The teachers and parents are often confused, curious and talk about the differences in the educational performance and academic achievement of the school going children; as most of them believe that intelligence is one of the main determinants in the student's success and failure. From infancy through the preschool years, most studies find few differences between boys and girls in overall mental and motor development or in specific abilities. It is this phenomenon which has encouraged the investigator to study the intelligence of the secondary/senior secondary school students of the Sikkim state.

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Objectives of the Study:

The study conducted by the investigator was based on the following objectives:

1. To compare the mean scores on the variable intelligence for the following students:

a. ninth and tenth class secondary school students

b. ninth and +1 class secondary/senior secondary school students

c. ninth and +2 class secondary/senior secondary school students

d. tenth and +1 class secondary/senior secondary school students

e. tenth and +2 class secondary/senior secondary school students

f. +1 and +2 class senior secondary school students

g. boys and girls secondary/senior secondary school students

Hypotheses of the Study:

The study tends to test the following null hypotheses:

1. Ninth and tenth class secondary school students do not differ significantly with respect to their mean scores on the variable intelligence.
2. Ninth and +1 class secondary/senior secondary school students do not differ significantly with respect to their mean scores on the variable intelligence.
3. Ninth and +2 class secondary/senior secondary school students do not differ significantly with respect to their mean scores on the variable intelligence.
4. Tenth and +1 class secondary/senior secondary school students do not differ significantly with respect to their mean scores on the variable intelligence.
5. Tenth and +2 class secondary/senior secondary school students do not differ significantly with respect to their mean scores on the variable intelligence.
6. +1 and +2 class secondary/senior secondary school students do not differ significantly with respect to their mean scores on the variable intelligence.
7. Boys and Girls secondary/senior secondary school students do not differ significantly with respect to their mean scores on the variable intelligence.

Research Method:

In the present study, descriptive survey method was used.

Sample:

In the present study the sample was drawn from the students studying in 9^{th}, $10^{th,}$ 11^{th} and 12^{th} classes of Secondary/Senior Secondary Schools situated in four (East, West, North and South) districts of Sikkim. From the selected district 200 (100 boys and 100 girls) students from each class were selected randomly. Finally, the total sample consisted of 800 (400 boys and 400 girls) students.

Tool Used:

To collect the requisite data for present study verbal group test of intelligence developed and standardized by the investigator was used. This test consists of 30 items pertaining to the different mental abilities. These different mental abilities are Verbal comprehension, Word fluency, Number, Memory and Reasoning.

Statistical Techniques Used:

In order to test the hypotheses of the present study, the investigator used the technique of t-test.

Analysis and Interpretation of Data:

A. Studying Differences on the Variable of Intelligence

TABLE 1: Class Wise and Gender Wise Comparison of Mean Intelligence Scores of Secondary and Senior Secondary School Students

Objective	Group	N	Mean	SD	SE_M	t-value	Level of Significance
1	Ninth Class	200	11.81	4.85	0.34	1.31	Not Significant
	Tenth Class	200	12.46	4.94	0.35		
2	Ninth Class	200	11.81	4.85	0.34	0.62	Not Significant
	+1 Class	200	12.13	5.53	0.39		
3	Ninth Class	200	11.81	4.85	0.34	4.54	Significant
	+2 Class	200	14.21	5.70	0.40		
4	Tenth Class	200	12.46	4.94	0.35	0.61	Not Significant
	+1 Class	200	12.13	5.53	0.39		
5	Tenth Class	200	12.46	4.94	0.35	3.28	Significant
	+2 Class	200	14.21	5.70	0.40		
6	+1 Class	200	12.13	5.53	0.39	3.70	Significant
	+2 Class	200	14.21	5.70	0.40		
7	Boys	400	12.36	5.54	0.28	1.58	Not Significant
	Girls	400	12.95	5.14	0.26		

a. Ninth and Tenth Secondary School Students

Table 1 presents the t-value for class ninth and tenth secondary school students in respect of the variable of intelligence along with Ns, Means, SDs and Standard Error of Means for the two groups.

It is revealed from Table 1 that t-value came out to be 1.31, which is not significant. This indicates that ninth and tenth secondary school students do not differ significantly with respect to their mean scores on intelligence. Hence, the hypothesis that *"Ninth and tenth class secondary school students do not differ significantly with respect to their mean scores on the variable intelligence"* is accepted.

Since, the mean score on intelligence is lower for ninth class students (11.81) as compared to tenth class students (12.46), it may be inferred that tenth class students exhibit significantly superior intelligence in comparison to ninth class students.

b. Ninth and +1 Secondary/Senior Secondary School Students

Table 1 presents the t-value for class ninth and +1 Secondary/Senior Secondary school students in respect of the variable of intelligence along with Ns, Means, SDs and Standard Error of Means for the two groups.

It is revealed from Table 1 that t-value came out to be 0.62, which is not significant. This indicates that ninth and +1 Secondary/Senior Secondary school students do not differ significantly with respect to their mean scores on intelligence. Hence, the hypothesis that "ninth and +1 class Secondary/Senior Secondary *school students do not differ significantly with respect to their mean scores on the variable intelligence"* is accepted.

Since, the mean score on intelligence is lower for ninth class students (11.81) as compared to +1 class students (12.13), it may be inferred that +1 class students exhibit significantly superior intelligence in comparison to ninth class students.

c. Ninth and +2 Secondary/Senior Secondary School Students

Table 1 presents the t-value for class ninth and +2 Secondary/Senior Secondary school students in respect of the variable of intelligence along with Ns, Means, SDs and Standard Error of Means for the two groups.

It is revealed from Table 1 that t-value came out to be 4.54, which is significant at 0.01 level. This indicates that ninth and +2 Secondary/Senior secondary school students differ significantly with respect to their mean scores on intelligence. Hence, the hypothesis that *"Ninth and* +2 class Secondary/Senior *secondary school students do not differ significantly with respect to their mean scores on the variable intelligence"* is rejected.

Since, the mean score on intelligence is lower for ninth class students (11.81) as compared to +2 class students (14.21), it may be inferred that +2 class students exhibit significantly superior intelligence in comparison to ninth class students.

d. Tenth and +1 Secondary/Senior Secondary School Students

Table 1 presents the t-value for class tenth and +1 Secondary/Senior Secondary school students in respect of the variable of intelligence along with Ns, Means, SDs and Standard Error of Means for the two groups.

It is revealed from Table 1 that t-value came out to be 0.61, which is not significant. This indicates that tenth and +1 Secondary/Senior Secondary school students do not differ significantly with respect to their mean scores on intelligence. Hence, the hypothesis that *"Tenth and* +1 class Secondary/Senior Secondary *school students do not differ significantly with respect to their mean scores on the variable intelligence"* is accepted.

Since, the mean score on intelligence is lower for +1 class students (12.13) as compared to tenth class students (12.46), it may be inferred that tenth class students exhibit significantly superior intelligence in comparison to +1 class students.

e. Tenth and +2 Secondary/Senior Secondary School Students

Table 1 presents the t-value for class tenth and +2 Secondary/Senior Secondary school students in respect of the variable of intelligence along with Ns, Means, SDs and Standard Error of Means for the two groups.

It is revealed from Table 1 that t-value came out to be 3.28, which is significant at 0.01 level. This indicates that tenth and +2 Secondary/Senior Secondary school students differ significantly with respect to their mean scores on intelligence. Hence, the hypothesis that *"Tenth and* +2 class Secondary/Senior Secondary *school students do not differ significantly with respect to their mean scores on the variable intelligence"* is rejected.

Since, the mean score on intelligence is lower for tenth class students (12.46) as compared to +2 class students (14.21), it may be inferred that +2 class students exhibit significantly superior intelligence in comparison to tenth class students.

f. +1 and +2 Senior Secondary School Students

Table 1 presents the t-value for class +1 and +2 Senior Secondary School Students in respect of the variable of intelligence along with Ns, Means, SDs and Standard Error of Means for the two groups.

It is revealed from Table 1 that t-value came out to be 3.70, which is significant at 0.01 level. This indicates that +1 and +2 Senior Secondary School Students differ significantly with respect to their mean scores on intelligence. Hence, the hypothesis that *"*+1 and +2 class Senior Secondary School Students *do not differ* *significantly with respect to their mean scores on the variable intelligence"* is rejected.

Since, the mean score on intelligence is lower for +1 class students (12.13) as compared to +2 class students (14.21), it may be inferred that +2 class students exhibit significantly superior intelligence in comparison to +1 class students.

g. Boys and Girls Secondary/Senior Secondary School Students

Table 1 presents the t-value for boys and girls secondary/senior secondary school students in respect of the variable of intelligence along with Ns, Means, SDs and Standard Error of Means for the two groups.

It is revealed from Table 1 that t-value came out to be 1.58, which is not significant. This indicates that boys and girls Secondary/Senior Secondary School Students do not differ significantly with respect to their mean scores on intelligence. Hence, the hypothesis that *"boys and girls secondary/senior secondary school students do not differ significantly with respect to their mean scores on the variable intelligence"* is accepted.

Since, the mean score on intelligence is lower for boy students (12.36) as compared to girl students (12.95), it may be inferred that girl students exhibit significantly superior intelligence in comparison to boy students.

Findings of the Study:

After careful analysis of the obtained data and interpretation of the results with regard to the objectives and hypotheses of the study, the investigator reached at the following findings:

1. Ninth and tenth class secondary school students do not differ significantly with respect to their mean scores on the variable intelligence.
2. Ninth and +1 class secondary/senior secondary school students do not differ significantly with respect to their mean scores on the variable intelligence.
3. Ninth and +2 class secondary/senior secondary school students differ significantly with respect to their mean scores on the variable intelligence.
4. Tenth and +1 class secondary/senior secondary school students do not differ significantly with respect to their mean scores on the variable intelligence.
5. Tenth and +2 class secondary/senior secondary school students differ significantly with respect to their mean scores on the variable intelligence.
6. +1 and +2 class secondary/senior secondary school students differ significantly with respect to their mean scores on the variable intelligence.
7. Boys and girls secondary/senior secondary school students do not differ significantly with respect to their mean scores on the variable intelligence.

Educational Implications:

On the basis of the above findings, the investigator is inclined to have the following educational implications for both the parents and teachers:

-- Home, school and society members should make their contributions equally in the development of intelligence among secondary/senior secondary school students.

-- Different type of competitive exams, Olympiads, quiz etc. may be helpful to enhance the level of intelligence among secondary/senior secondary school students.

-- There should be separate grade wise facility of guidance and counseling services for the secondary/senior secondary school students.

-- The teachers should be very much vigilant and careful regarding the development of level of intelligence among secondary/senior secondary school students.

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INTELLIGENCE LEVEL AMONG SCHOOL STUDENTS IN RELATION TO THEIR AGE

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ABSTRACT

The major purpose of this research was to investigate the age wise level of intelligence among secondary/senior school students. The data were collected on the 800 secondary/senior secondary school students – 400 boys and 400 girls through random method of sampling by employing Intelligence Test developed and standardized by the investigator. The technique of t-test was used to verify the hypotheses. The outcome of the research investigation was shows that the age group 14 and 15, 14 and 16, 14 and 17, 14 and 18, 15 and 16, 15 and 17, 15 and 18, 16 and 17, 16 and 18, and 17 and 18 of secondary/senior secondary school students do not differ significantly with respect to their mean scores on the variable intelligence.

Keywords: *Intelligence, Secondary/Senior Secondary School Students, Age*

Introduction:

No two individuals are exactly alike. Some are bright, others dull, some are quick, others slow, some solve problems quickly and directly, others fumble over them for a long time, and some adapt themselves to new situations easily while others experience difficulty. The teacher is conscious that there are individual differences in intelligence. The idea that people vary what we call intelligence has been with us for a long time. Plato discussed similar variations more than 2000 years ago (Woolfolk, 2016, p. 148). Gardner believes that intelligence has a biological base. An intelligence is a “biopsychological potential to process information in certain ways in order to solve problems or create products that are valued in at least one culture or community” (Gardner, 2009, p.5). It is generally agreed upon by almost all psychologists that intelligence increases up to adolescence and declines in old age. These are general trends, but little is known with sufficient certainty to be widely accepted (Chauhan, 2007, p. 290). It should be noted that the rate of growth of intelligence is not the same in the case of superior, average and inferior children. Children of superior intelligence start at a higher level and continue to be higher throughout the entire period of growth. Children of inferior intelligence start lower and stay lower upto maturity. Children of average intelligence lie in between. Some of the psychologists believe that the development of intelligence reaches its maximum by the 16th year, though some psychologist believe that intelligence goes on growing into early twenties. Thus, in order to reach at decisive conclusion in this respect, the present study is designed to investigate.

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Objectives of the Study:

The study conducted by the investigator was based on the following objectives:

1. To compare the students with respect to their mean scores on the variable intelligence for the following age groups:

(a.) age group 14 and 15 (b). age group 14 and 16 (c). age group 14 and 17 (d.) age group 14 and 18 (e.) age group 15 and 16 (f.) age group 15 and 17 (g). age group 15 and 18 (h.) age group 16 and 17 (i.) age group 16 and 18 and (j.) age group 17 and 18.

Hypotheses of the Study:

The study tends to test the following null hypotheses:

1. Students do not differ significantly with respect to their mean scores on the variable intelligence for the following age groups:

(a.) age group 14 and 15 (b). age group 14 and 16 (c). age group 14 and 17 (d.) age group 14 and 18 (e.) age group 15 and 16 (f.) age group 15 and 17 (g). age group 15 and 18 (h.) age group 16 and 17 (i.) age group 16 and 18 and (j.) age group 17 and 18.

Method:

In order to accomplish the objectives of the present investigation the researcher has used the survey method of descriptive research.

Sample:

In the present study the sample was drawn from the students studying in different classes like 9th, 10th, +1 and +2 of Secondary/Senior Secondary Schools situated in four (East, West, North and South) district of Sikkim. From the selected district, 200 (100 boys and 100 girls) students from each class were taken on the basis of random sampling technique. The total sample consists of 800 secondary/senior secondary school students – 400 boys and 400 girls.

Tool Used:

To collect the requisite data for present study verbal group test of intelligence developed and standardized by the investigator was used. This test consists of 30 items pertaining to the different mental abilities. These different mental abilities are Verbal comprehension, Word fluency, Number, Memory and Reasoning.

Statistical Techniques Used:

Objective numbers 1 to 10 sought to compare secondary/senior secondary school boys and girls of different age groups with respect to their mean scores on the variable of intelligence. In view of this, the technique of t-test was used in all these cases.

Analysis and Interpretation of Data:

The present study aimed at studying the difference among secondary/senior secondary school students with respect to their age. In order to achieve this objective, a sample of 800 (400 boys and 400 girls) secondary/senior secondary school students studying in classes 9th, 10th, +1, and +2 was drawn from Secondary and Senior Secondary Schools situated in four (East, West, North and West) district of Sikkim. The data available on the selected variable was tabulated, analyzed and interpreted in the following manner.

t-value for objective number 1(a.) came out to be 0.27, which is not significant. This indicates that the students of age group 14 and 15 do not differ significantly with respect to their mean scores on intelligence. Hence, the hypothesis that *"14 and 15 age group of students do not differ significantly with respect to their mean scores on the variable intelligence"* is accepted.

Since, the mean score on intelligence is higher for the age group of 14 (12.74) as compared to age group of 15 (12.54), it may be inferred that the students of age group 14 exhibit superior intelligence in comparison to the students of age group 15.

t-value for objective number 1(b.) came out to be 0.67, which is not significant. This indicates that the students of age group 14 and 16 do not differ significantly with respect to their mean scores on intelligence. Hence, the hypothesis that *"14 and 16 age group of students do not differ significantly with respect* *to their mean scores on the variable intelligence"* is accepted.

Since, the mean score on intelligence is higher for the age group of 14 (12.74) as compared to age group of 16 (12.24), it may be inferred that the students of age group 14 exhibit superior intelligence in comparison to the students of age group 16.

t-value for objective number 1(c.) came out to be 0.35, which is not significant. This indicates that the students of age group 14 and 17 do not differ significantly with respect to their mean scores on intelligence. Hence, the hypothesis that *"14 and 17 age group of students do not differ significantly with respect to their mean scores on the variable intelligence"* is accepted.

Since, the mean score on intelligence is lower for the age group of 14 (12.74) as compared to age group of 17 (12.99), it may be inferred that the students of age group 17 exhibit superior intelligence in comparison to the students of age group 14.

t-value for objective number 1(d.) came out to be 0.08, which is not significant. This indicates that the students of age group 14 and 18 do not differ significantly with respect to their mean scores on intelligence. Hence, the hypothesis that *"14 and 18 age group of students do not differ significantly with respect to their mean scores on the variable intelligence"* is accepted.

Since, the mean score on intelligence is lower for the age group of 14 (12.74) as compared to age group of 18 (12.80), it may be inferred that the students of age group 18 exhibit superior intelligence in comparison to the students of age group 14.

t-value for objective number 1(e.) came out to be 0.53, which is not significant. This indicates that the students of age group 15 and 16 do not differ significantly with respect to their mean scores on intelligence. Hence, the hypothesis that *"15 and 16 age group of students do not differ significantly with respect to their mean scores on the variable intelligence"* is accepted.

Since, the mean score on intelligence is higher for the age group of 15 (12.54) as compared to age group of 16 (12.24), it may be inferred that the students of age group 15 exhibit superior intelligence in comparison to the students of age group 16.

t-value for objective number 1(f.) came out to be 0.82, which is not significant. This indicates that the students of age group 15 and 17 do not differ significantly with respect to their mean scores on intelligence. Hence, the hypothesis that *"15 and 17 age group of students do not differ significantly with respect to their mean scores on the variable intelligence"* is accepted.

Since, the mean score on intelligence is lower for the age group of 15 (12.54) as compared to age group of 17 (12.99), it may be inferred that the students of age group 17 exhibit superior intelligence in comparison to the students of age group 15.

t-value for objective number 1(g.) came out to be 0.42, which is not significant. This indicates that the students of age group 15 and 18 do not differ significantly with respect to their mean scores on intelligence. Hence, the hypothesis that *"15 and 18 age group of students do not differ significantly with respect to their mean scores on the variable intelligence"* is accepted.

Since, the mean score on intelligence is lower for the age group of 15 (12.54) as compared to age group of 18 (12.80), it may be inferred that the students of age group 18 exhibit superior intelligence in comparison to the students of age group 15.

t-value for objective number 1(h.) came out to be 1.45, which is not significant. This indicates that the students of age group 16 and 17 do not differ significantly with respect to their mean scores on intelligence. Hence, the hypothesis that *"16 and 17 age group of students do not differ significantly with respect to their mean scores on the variable intelligence"* is accepted.

Since, the mean score on intelligence is lower for the age group of 16 (12.24) as compared to age group of 17 (12.99), it may be inferred that the students of age group 17 exhibit superior intelligence in comparison to the students of age group 16.

t-value for objective number 1(i.) came out to be 0.95, which is not significant. This indicates that the students of age group 16 and 18 do not differ significantly with respect to their mean scores on intelligence. Hence, the hypothesis that *"16 and 18 age group of students do not differ significantly with respect to their mean scores on the variable intelligence"* is accepted.

Since, the mean score on intelligence is lower for the age group of 16 (12.24) as compared to age group of 18 (12.80), it may be inferred that the students of age group 18 exhibit superior intelligence in comparison to the students of age group 16.

t-value for objective number 1(j.) came out to be 0.33, which is not significant. This indicates that the students of age group 17 and 18 do not differ significantly with respect to their mean scores on intelligence. Hence, the hypothesis that *"17 and 18 age group of students do not differ significantly with respect to their mean scores on the variable intelligence"* is accepted.

Since, the mean score on intelligence is higher for the age group of 17 (12.99) as compared to age group of 18 (12.80), it may be inferred that the students of age group 17 exhibit superior intelligence in comparison to the students of age group 18.

Educational Implications:

The findings of the present study have the important implications for educational practice. In the present study, the investigator found that intelligence of the students is increasing day by day. This has the implication for teachers to use appropriate intervention strategies for enhancing the intelligence level among the students. Teachers can improve the intelligence level of students by providing systematic feedback on different type of learning performance. Different guidance and counseling programmes should be organized to solve the respective problems of students. Both the boys and girls students need to be given maximum opportunity for self expression and original thinking. Parents and teachers should take of care the factors that affect the level of intelligence among the students. They should keep a continuous check on this, and try to enhance their intelligence level by proper guidance and creative techniques.

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REUSABLE BOOKLET
OF
GGTI
(13 TO 17 YEARS+)

G. C. Ahuja (Mysore)

MAIN DIRECTIONS

A. Do not open or turn any page of this booklet until you are told to do so.

B. Do not make any mark in this booklet and handle it with care.

C. Answers are to be written on the separate answer-sheet provided.

D. Place this booklet to your left and the answer-sheet to your right.

E. On your separate answer-sheet, write your name and other required information~~s~~ in the proper spaces.

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APPENDIX - II

Group Test of Intelligence for 13 to 17 years +

(G.C. Ahuja)

Name :		Standard	:
School :		Age	:
		Sex	: Male / Female

General Instructions

1. There are eight tests in this booklet. Each test will be taken one by one. Necessary instructions for making the answers are given and explained with the aid of practice examples. Be sure that you understand how to workout the problem.

2. Mark all your answers on the Answer sheet only, and at the appropriate space meant for each test against the same serial number of each test – problem.

3. Work quickly, but try not to make mistakes. Each test is to be finished with in the prescribed time. Do not waste time on any one problem, if it is difficult for you; leave it and proceed further. If you finish a test before time, revise your answers but do not turn the page till you are instructed to do so.

4. If you have at any time marked a wrong answer, encircle it and make the other answer. Do not waste time in using rubber.

5. For each test you will be instructed to begin and when to stop. At the expiry of the time limit, when you are instructed to shop, put down your pencil or pen immediately and turn over the page.

6. Get your doubts cleared before the start of each test, but once the test starts, you are not allowed to ask anything.

7. Do not make any marks in the Test Booklet.

8. All these instructions are to be very strictly observed.

TEST I

PRACTICE EXAMPLES :

1. I-F-E-V

   A. Wife B. Few C. If we D. Five E. Fine

2. I.G.T.H.-L

   A. Sight B. Night C. Light D. Tight E. Right

EXPLANATION:

1.*Here four letters are given, which are to be arranged-in such a way that letter should* be used. The letters are : I-F-E-V. Now observe the given answers which are marked A, B, C, D and E. The correct answer is 'Five'. From the letters I-F-E-V, only 'Five can be formed, which is at 'D'. Look at the ANSWER SHEET for TEST I Serial Number I, a cross mark (Like the Multiplication Sign X) is, made on D.

2. The Correct answer is at 'C'. Mark it yourself. In the ANSWER SHEET against Serial Number 2, make a cross (X) on C.

HOW TO MARK THE TEST PROBLEMS:

You have to make a cross (X) on any of the five answers which are: A,B,C,D, and E, where you make a cross that would be considered your answer. Put one cross mark only, otherwise, You would not be given any credit. Make a cross against the same Serial Number of the Test Problem on the ANSWER SHEET only.

NUMBER OF PROBLEMS AND TIME – LIMIT

You are to answer 9 Test Problems in FOUR Minutes.

TEST PROBLEMS

1. H-I-E-S-M-I-F-C

   A. Semicircle B. Mischief C. Knife D. Scientific
   E. Handkerchief

2. A-T-L-E-C-B-S-O-N

   A. Stable B. Table C. Subtraction D. Capable E. Constable

3. T-U-A-C-P-U-N-T-I-O-N

   A. Station B. Recapitulation C. Punctuation
   D. Repetition E. Television

4. H-G-T-I-H-E

   A. Eight B. Highest C. Tiger D. Height E. Tight

5. G-E-N-A-L-A-G-U

   A. Gauge B. Luggage C. Old Age D. Language E. Longitude

6. C-T-A-D-I-N-O-O-M-M-O-A-C

   A. Commodity B. Recommendation C. Accommodation
   D. Declaration E. communication

7. N-O-P-I-S-R

   A. Piston B. Prime C. Prisoner D. Pioneer E. Communication

8. R-E-N-A-T-S-I-G-U

   A. Singer B. Signature C. Singular D.Restaurant E. Resignation

9. E-D-E-I-N-D-E-N-P-T-N

   A. Dependent B. Development C. Independent
   D. Implement E. Introduction

TEST II

PRACTICE EXAMPLES:

1. A. Blade	B. Razor.	C. Axe	D. Knife	E. Crow
2. A. Iron	B. Silver	C. Vegetable	D. Gold	E. Copper
3. A. Monday	B. July	C. Tuesday	D. Friday	E. Sunday

EXPLANATION:

1. In the first example, look at all the five words. Out of these five, four words are related to each other in some way, but there is one such word which is absurd and has nothing to do with the other four words. As you know that: Blade, Razor, Axe, and Knife are instruments, but the word Crow which is at 'E' has nothing to do with these. Now look at the ANSWER SHEET for TEST II against Serial Number 1, a cross mark (X) is made on E.

2. Similarly, the word Vegetable at 'C' is not related to the remaining four words. Mark it yourself. Against Serial Number 2, make a cross on C.

3. Mark it yourself. Against Serial Number 3, make a cross on B.

NUMBER OF PROBLEMS AND TIME – LIMIT:-

You are to answer 20 Test Problems in FOUR Minutes.

TEST PROBLEMS

S. No.					
1	A.Cow	B. Horse	C. Donkey	D. Pigeon	E. Buffialo
2	A. Delhi	B Bombay	C. Calcutta	D. New York	E. Madras
3	A. Brother	B. Uncle	C. Grand Mother	D. Nice	E. Servant
4	A. Labourer	B. Lawyer	C. Doctor	D. Professor	E. Engineer
5	A. Scholarship	B. Prize	C. Freeship	D. Needy	E. Award
6	A. Discussion	B. Lecture	C. Debate	D. Speech	E. Soliloquy
7	A. Indian	B. Japanese	C. Russian	D. American	E. Bengali
8	A. Century	B. Gross	C. Enough	D. Score	E. Dozen
9	A. Building	B. Mansion	C. Residence	D. Bungalow	E. Den
10	A. India	B. Pakistan	C. England	D. Goa	E. China
11	A. English	B.Mathematic	C. Hindi	D. French	E. Latin
12	A. Photo	B. Snap	C. Reflection	D. Portrait	E. Picture
13	A. Explain	B. Relate	C. Speak	D. Sing	E. Reveal
14	A. Leg	B. Knee	C. Toe	D. Ankle	E. Palm
15	A. Classfellow	B. Colleague	C. Companion	D. Co-worker	E. Neighbour
16	A. Article	B. Kind	C. Category	D. Grade	E. Class
17	A. Knife	B. Sword	C. Dagger	D. Gun	E. Razor
18	A. Godown	B. Stable	C. Meadow	D. Garage	E. Store
19	A. Sailor	B. Passenger	C. Mahout	D. Driver	E. Pilot
20	A. Favour	B. Affection	C. Love	D. Liking	E. Regards

TEST III

PRACTICE EXAMPLES:

1. Shoe is to Foot, as Cap is to:

   A. Hand B. Head C. Hat D. Cloth E. Uniform

2. To be Rich one must have:

   A. Wealth B. Goodluck C. Friends D. Business E. Locker

3. Train is to Passengers as School is to :

   A. Teachers B. Parents C. Students D. Players E. Naughly

EXPLANATION:

1. As Shoe is meant for the Foot, Similarly, Cap is for the Head. The word Head is at 'B' Now look at the Answer Sheet for Test III against Serial Number 1, a cross mark (X) is made on B.
2. To be Rich, one must have 'Wealth', because, without it no one can be said to be Rich. Mark it yourself. Against Serial Number 2, make a cross on A.
3. The correct answer is at 'C' Mark it yourself. Against Serial Number 3, make a cross on C.

Number of Problems and time – Limit.

Your are to answer 20 Test Problems in FOUR Minutes.

TEST PROBLEMS

1. Train is to Wheels, as Bird is to :

   A. Air B. Wings C. Flesh D. Bones E. Beak

2. Failure is to Sadness, as victory is to:

   A. Work B. Happiness C. Player E. Soldier E. Enemy

3. Coal is to Black, as Grass is to :

   A. Animal B. Green C. Meadow D. Nature E. Graze

4. Dog is to Nose, as Elephant is to :

   A. Trunk B. Circus C. Emperor D. Ears E. Teeth

5. Water is to Sea, as Sand is to:

   A. Camel B. Desert C. Stone D. Building Material E. Heat

6. Iron is to Heavy, as Cotton is to :

   A. Weight B. Cloth C. Light D. Mill E. Farmer

7. Lock is to Key; as Bottle is to

   A. Fill B. Label C. Cork D. Shape E. Screw

8. Foot is to Socks, as Hand is to :

   A. Gloves B. Fingers C. ring D. Arm E. Cripple

9. To be a Scholar, one must have:

   A. Health B. Library C. Money D. Spectacles E. Ability

10. Camera is to photo, as Tap is to :

    A. Pipe B. Metal C. Height D. Water E. Children

11. Alive is to Awake, as Dead is to:

    A. Conscious B. Unconscious C. Brave D. Coward E. Asleep

12. Former is to Later, as Elder is to:

    A. Older B. Aged C. Younger D. Next E. Tailor

13. Taxi is to Hire, is House is to:

    A. Occupant B. House Tax C. Homeless D. Rent E. Owner

14. Principal is to Vice Principal, as Monitor is to:

    A. Teacher B. Head Master C. Second Monitor D. Student E. Class

15. Friendship always involves:

A. Courtesy B. Enthusiasm C. Contention

D. Agreement E. Co-operation

16. Theatre is to Spectators, as Police Station is to:

A. Constable B. Inspector C. Gentleman D. Court E. Accused

17. Blood is to Veins, as Pencil is to:

A. Lead B. Write C. rubber D. Pen E. Eye

18. Copying in the Examination Hall is an act of:

A. Kindness B. Bravery C. Foolishness D. Entertainment

E. Indiscipline

19. Beautiful is to Ugly, as Love is to:

A. Handsome B. Parents C. Enjoy D. Hate E. Soul

20. Hair is to Head, as Finger is to:

A. Hand B. Body C. Palm D. Thumb E. Point

TEST IV

PRACTICE EXAMPLES

1. How many pencils can be bought for Rs.3, if each pencil costs 30 Ps.?

   A. 20 B. 15 C. 1 D. 25 E.10

2. There are three packets of biscuits. Each packet contains one biscuit more than the other in order. In the first packet, there are 22 biscuits. How many biscuits are there in the third packet?

   A.28 B. 24 C. 23 D. 20 E. 21

EXPLANATION:

1. Each pencil costs 30 Ps. and there are three rupees, or we may say 300 Ps. Thus 10 pencils can be bought. The correct answer is at 'E'. Look at the Answer Sheet for Test IV against Serial Number 1, a cross mark (X) is made on E.

2. Each biscuit packet contains one biscuit more than the other, and the first packet contains 22 biscuits. Thus the second packet would contain 23. Similarly, the third packet would contain 24. The correct answer is at 'B'. Mark it yourself. Against Serial Number 2, make a cross on B.

Number of Problems and Time – Limit:

You are to answer 6 Test Problems in FOUR Minutes.

TEST PROBLEMS

1. In an Arithmetic test, a student attempted 6 questions and secured 60 percent marks. How many questions did he miss?

   A.6 B.8 C.4 D.12 E. 2

2. If a piece of cloth 10 meters long will shrink to 7 metres when washed how many metres long will a 40 metres long cloth be after shrinking?

   A. 21 B. 20 C. 24 D. 28 E. 35

3. In which of the following ways could 192 pens be packed?

   A. 17 boxes with 16 pens each B. 14 boxes with 13 pens each

   C. 28 boxes with 19 pens each D. 16 boxes with 12 pens each

   E. 12 boxes with 11 pens each

4. A boy sold his pen with that that amount he purchased 4 pencils for 19 Ps. each. He had a balance of 24 Ps. with him. For how many Rs. & Ps. did he sell his pen?

   A. 1.50 B. 1.00 C. 2.20 D. 200

5. Three students utter a whole number each. Each speaks the square of the other in order, but the number remains the same. What was such number?

   A.3 B.16 C.27 D. 0.1 E. 1

6. How many oranges can be bought for Rs.5 at the rate of 2 for 25 Ps?

   A.20 B. 100 C.40 D. 10 E. 5

TEST V

PRACTICE EXAMPLES:

	S.No.	SAME	OPPOSITE	NEITHER
		S	O	N
1.	Sit ....Stand	?	?	?
2.	Look ....See	?	?	?
3.	Yes .... No	?	?	?
4.	Go ....Sorry	?	?	?
5.	Fast ....Quick	?	?	?

EXPLANATION:

1. Sit means the opposite of Stand. Look at the Answer Sheet for Test V against Serial number 1, a cross is made on O (Meaning Opposite).
2. Look means the same as See. Therefore, against serial Number 2, a cross is made on S (Meaning Same).
3. Yes means the opposite of No. Mark it yourself. Against Serial Number 3, make a cross on O (Meaning Opposite)
4. Go means neither the Same, nor the Opposite of Sorry, Mark it yourself. Make a cross against Serial Number 4, on N (Meaning that the pair of words is neither the Same nor the Opposite, that is, it is Neither).
5. Mark it yourself. You have to make a cross against Serial Number 5 on S (Meaning Same).

Number of Problems and Time Limit:

You are to answer 40 Test Problems in four minutes.

TEST PROBLEMS

1. Broad ....Narrow
2. Victory ....Defeat
3. Net ....Neek
4. Vanish ....Disappear
5. Quality ....Stretch
6. Excellent ....Splendid
7. Ancient ....Modern
8. Recite ....Ring
9. Confused .... Puzzled
10. Declare .... Announce
11. Organ .... Ounce
12. Spy ....Invert
13. Pardon ....Forgive
14. Pyre ....Petrol
15. Clarity ....Military
16. Mingle ....Mix
17. Queer ....Strange
18. Mend ....Repair
19. Danger ....Risk
20. Vanquish ....Root
21. Satisfied ....contended
22. Fresh ......Stale
23. Confess ....Oral
24. Diminish ....Lesson
25. Lend .....Borrow
26. Maximum ....Mature
27. Relate ....Narrate
28. Retain ....keep
29. Frank ....Filthy
30. Permit ......Prohibit
31. Harsh ....Severe
32. Perplex .... Puzzle
33. Dejected ....depressed
34. Generous ....Liberal
35. Exile ....Banish
36. Prestige ....Reputation
37. Breadth ....Width
38. Humble ....Meek
39. Obvious ....Evident
40. Omit ....Exit

TEST VI

TEST PROBLEMS

PASSAGES:

A. The real life of India is not in the cities; it is in the homes of the ordinary people; it is in the villages. The cities present only, one side of the picture, but the majority of the people of India live almost on the border-line of starvation.

B. Once a poor widow who had lost her only son came to Buddha and prayed to him to bring her dead child back to life. The holy man, touched by the great sorrow of the poor woman, said, "There is only one medicine that can restore your son to life. Bring me a handful of rice from a house where death has never taken place".

C. Cheerfulness and health go hand in hand. The healthy are cheerful and those who are cheerful are also found healthy. The singing birds fill us with pleasure. Objects of nature like fountains, lakes and rivers, also produce pleasing ideas in our minds. Therefore, everything in the universe is a source of joy.

D. Our ancestors had great difficulty in obtaining books. Ours is what to select. We must be careful what we read. There are indeed, books and books, and there are books which Lamb said, are not books at all. Bacon remarked to an unfortunate author, "I will lose no time in reading your book". Others are more than useless, and poison the mind with suggestions of evil. Few perhaps realise how much the happiness of life, and the formation of Character depend on a wise selection of books we read.

QUESTIONS BASED ON THE ABOVE PASSAGES

1. What did Buddha ask the woman to bring?

   A. Wood B. Child C. Rice D. Gold E. Death

2. What request did she make to Buddha?

   A. To bless her with a child B. T o kill her also

   C. To give her plenty of wealth D. To make her son alive again

   E. To give life to her husband

3. The statement, "There the books which are not books at all" means:

   A. These are useful books B. The authors of these books are dead

   C. These are not – books D. These are holy books

   E. These books contain filthy matter

4. Where do we find the real picture of the Indian people?

   A. In the films B. In the nature C. In the hospitals

   D. In the villages E. In the cities

5. The word 'Restore' means:

   A. Birth B. Alive C. Store D. Chemist E. Bring back

6. Our fore-fathers faced difficulty in:

   A. Reading books B. Writing books C. Getting books

   D. Selling books E. Selecting books

7. 'The cities represent only an incomplete picture'. Which word or words have been used to express an incomplete picture?

   A. Narrow B. Full C. One side of

   D. Half E. Ordinary people

8. The most suitable title for the fourth passage 'd' is :

   A. Reading of books

   B. Character and books

   C. Selection of books

   D. Abundance of books

   E. An unfortunate author

TEST VII

PRACTICE EXAMPLES:

1.	2	4	(?)	8	10	
2.	P	(?)	R	S	T	
3.	10	11	13	16	(?)	25

EXPLANATION:

1. You have to write in the bracket on the A.NSWER SHEET, the number that has been omitted from the series. Here the number that has been omitted is 6. Look at the ANSWER SHEET for TEST VII against Serial Number 1, 6 is written in the bracket.

2. Mark it youself. Against Serial Number 2, write Q in the bracket "(Q)".

3. You would observe that there is a certain order or arrangement. The increase or decrease that there is a certain order or arrangement. The increase or decrease is in a systematic meaner. Look at the following:-

The first number is	:	10
The second number is	:	10 plus 1 (11)
The third number is	:	11 plus 2 (13)
The fourth number is	:	13 plus 3 (6)
The fifth Number should be	:	16 plus 4 (20)

Mark it yourself. Against Serial Number 3, write 20 in the bracket.

NUMBER OF PROBLEMS AND TIME-LIMIT:

You are to answer 12 Test Problems in four minutes.

TEST PROBLEMS

S.No						
1.	101	(?)	121	131	141	
2.	63	(56)	49	(?)	35	28
3.	1	7	13	19	(?)	
4.	2	9	(?)	23	30	
5.	11.9	10.8	9.7	8.6	(?)	
6.	Z-A	Y-B	X-C	W-D	(?)	
7.	D	H	(?)	P	T	
8.	P	R	T	V	(?)	
9.	119	102	85	68	(?)	
10.	3	4	5	10	11	12 17 18 19 (?)
11.	1	4	2	8	3	(?) 4 16
12.	25	35	44	(?)	59	

TEST VIII

PRACTICE EXAMPLES:

1. He who teaches in a school is called :

   A. Student B. Teacher C. Officer D. Scholar E. Professor

2. The saying 'Think before you speak' means :

   A. Silence is golden. B. Don't speak and be quiet.

   C. Slow and steady wins the race. D. Think over it, after you have spoken

   E. Before starting to speak, think over it.

3. He who steals is called:

   A. Fool B. Poor C. Clever D. Thief E. Beggar

EXPLANATION:

1. Here you have to select the best out of the five given answers. In a School, it is the Teacher who teaches. The correct answer is at 'B'. Look at the ANSWER SHEET for TEST VIII against Serial Number 1, a cross is made on B.

2. The correct answer is at 'E'. Mark it yourself. Against Serial Number 2, make a cross on E.

3. Mark it yourself you have to make a cross on D.

NUMBER OF PROBLEMS AND TIME-LIMIT:

You are to answer 20 Test Problems in four minutes.

TEST PROBLEMS

1. He who tells a lie is called:

   A. Lawyer B. Disobedient C. Honest D. Liar E. Naughty

2. He who writes books is called:

   A. Teacher B. Publisher C. Scholar D. Auther E. Steno

3. He who is always in time is called:

   A. Punctual B. Optimist C. lazy D. Serious E. Good

4. He who is new to a certain place is called:

   A. Stranger B. Hawker C. Minister D. Poet E. Philosopher

5. One who is locked up in jail is called:

   A. Constable B. Thief C. Robber D. Prisoner E. Foreigner

6. That which remains unaffected by water is called.

   A. Water Proof B. Umbrella C. Raincoat D. Plastic E. Leather

7. A Woman whose husband is not alive is called:

   A. Widower B. Unfortunate C. Married D. Widow E. Maiden

8. He who slaughters animals is called:

   A. Cruel B. Animal C. Nonvegetarian D. C Customer E. Butcher

9. The saying, 'A word for the wise and rod for the foolish' means:

   A. All men are wise B. Give desirable treatment to all

   C. For a wise man only a hint would do, but not for the fool who is subject to punishments.

   D. It is no use to cry over spilt milk E. Fools are wiser than the wise

10. He who does not believe in God is called:

    A. Thiest B. Preacher C. Athiest D. Worried E. Propher

11. When we think, we:

    A. Dream B. Sing C. Concentrate D. Sit E. Steep

12. He who serves in a hotel is called:

    A. Cook B. Waiter C. Manager D. Servant E. Tray

13. He who ploughs the land is called:

    A. Worker B. Land lord C. Labourer D. Villager E. Peasant

14. The saying 'Nip the evil in the bud' means:

A. Honesty is the best policy B. We should avoid doing bad acts

C. Evil is in the bud D. Nip the bud in the evil

E. To Stop bad actions at the initial stage

15. A. gentleman is one who does not:

A. go to see pictures B. Like others C. Inflict pain on others

D. Marry E. Steal

16. The saying 'A rolling stone gathers no moss' means:

A. We should not shirk work

B. Moss cannot be collected by the stones

C. We should move from place to place

D. If we keep hafting, we cannot achieve much.

E. Change is the law of nature

17. The voice that can be heard is called:

A. Audible, B. Clear C. Loud D. Visible E. Low

18. A child born after the death of its father is called

A. Innocent B. Clear C. Unfortunate D. Orphan E. Posthumous

19. He who complies words in the printing press is called:

A. Pressman B. compositor C. Manager D. Client E. Builder

20. That which is hated is called

A. Injurious B. Painful C. Disfigured D. Contemptible E. Disastrous

ANSWER SHEET

of

GGTI-A

(13 to 17 Years)

(English Version)

NATIONAL PSYCHOLOGICAL CORPORATION • AGRA •

G. C. Ahuja (Mysore)

Please fill up the following informations : ***Date***

Name

Age **Class** **Sex : Male** **Female**

School ____________________

SCORING TABLE

Test No.	I	II	III	IV	V	VI	VII	VIII	Total	Interpretation
Score										

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• Check

TEST I

Sr.No.	Practice Example					Sr. No.	Test Problems				
	A	B	C	D	E		A	B	C	D	E
						1.					
1.						2.					
2.						3.					
						4.					
						5.					
						6.					
						7.					
						8.					
						9.					

TEST II

Sr.No.	Practice Example					Sr. No.	Test Problems				
	A	B	C	D	E		A	B	C	D	E
						1.					
1.						2.					
2.						3.					
3.						4.					
						5.					
						6.					
						7.					
						8.					
						9.					
						10.					
						11.					
						12.					
						13.					
						14.					
						15.					
						16.					
						17.					
						18.					
						19.					
						20.					

Check •

• Check

TEST III

Sr. No.	Practice Example					Sr. No.	Test Problems				
	A	B	C	D	E		A	B	C	D	E
						1.					
1.						2.					
2.						3.					
3.						4.					
						5.					
						6.					
						7.					
						8.					
						9.					
						10.					
						11.					
						12.					
						13.					
						14.					
						15.					
						16.					
						17.					
						18.					
						19.					
						20.					

TEST IV

Sr.No.	Practice Example					Sr. No.	Test Problems				
	A	B	C	D	E		A	B	C	D	E
1.						1.					
2.						2.					
						3.					
						4.					
						5.					
						6.					

Check •

• Check

TEST V

Sr. No.	Practice Example		
	Same	Opposite	Neither
1.	☐	☐	☐
2.	☐	☐	☐
3.	☐	☐	☐
4.	☐	☐	☐
5.	☐	☐	☐

Sr. No.	Test Problems		
	Same	Opposite	Neither
1.	☐	☐	☐
2.	☐	☐	☐
3.	☐	☐	☐
4.	☐	☐	☐
5.	☐	☐	☐
6.	☐	☐	☐
7.	☐	☐	☐
8.	☐	☐	☐
9.	☐	☐	☐
10.	☐	☐	☐
11.	☐	☐	☐
12.	☐	☐	☐
13.	☐	☐	☐
14.	☐	☐	☐
15.	☐	☐	☐
16.	☐	☐	☐
17.	☐	☐	☐
18.	☐	☐	☐
19.	☐	☐	☐
20.	☐	☐	☐
21.	☐	☐	☐
22.	☐	☐	☐
23.	☐	☐	☐
24.	☐	☐	☐
25.	☐	☐	☐
26.	☐	☐	☐
27.	☐	☐	☐
28.	☐	☐	☐
29.	☐	☐	☐
30.	☐	☐	☐
31.	☐	☐	☐
32.	☐	☐	☐
33.	☐	☐	☐
34.	☐	☐	☐
35.	☐	☐	☐
36.	☐	☐	☐
37.	☐	☐	☐
38.	☐	☐	☐
39.	☐	☐	☐
40.	☐	☐	☐

Check •

• Check

TEST VI

Sr.No.	Practice Example				
	A	B	C	D	E
1.	☐	☐	☐	☐	☐
2.	☐	☐	☐	☐	☐
3.	☐	☐	☐	☐	☐

Sr. No.	Test Problems				
	A	B	C	D	E
1.	☐	☐	☐	☐	☐
2.	☐	☐	☐	☐	☐
3.	☐	☐	☐	☐	☐
4.	☐	☐	☐	☐	☐
5.	☐	☐	☐	☐	☐
6.	☐	☐	☐	☐	☐
7.	☐	☐	☐	☐	☐
8.	☐	☐	☐	☐	☐

TEST VII

Sr. No.	Practice Example
1.	☐
2.	☐
3.	☐

Sr. No.	Test Problems
1.	☐
2.	☐
3.	☐
4.	☐
5.	☐
6.	☐
7.	☐
8.	☐
9.	☐
10.	☐
11.	☐
12.	☐

Check •

• Check

TEST VIII

Sr.No.	Practice Example				
	A	B	C	D	E
1.	☐	☐	☐	☐	☐
2.	☐	☐	☐	☐	☐
3.	☐	☐	☐	☐	☐

Sr.No.	Test Problems				
	A	B	C	D	E
1.	☐	☐	☐	☐	☐
2.	☐	☐	☐	☐	☐
3.	☐	☐	☐	☐	☐
4.	☐	☐	☐	☐	☐
5.	☐	☐	☐	☐	☐
6.	☐	☐	☐	☐	☐
7.	☐	☐	☐	☐	☐
8.	☐	☐	☐	☐	☐
9.	☐	☐	☐	☐	☐
10.	☐	☐	☐	☐	☐
11.	☐	☐	☐	☐	☐
12.	☐	☐	☐	☐	☐
13.	☐	☐	☐	☐	☐
14.	☐	☐	☐	☐	☐
15.	☐	☐	☐	☐	☐
16.	☐	☐	☐	☐	☐
17.	☐	☐	☐	☐	☐
18.	☐	☐	☐	☐	☐
19.	☐	☐	☐	☐	☐
20.	☐	☐	☐	☐	☐

Check •