CHAPTER-1
INTRODUCTION

1.1 MEANING OF MATHEMATICS

The origin of mathematics is hidden in the evolution of nature. Creation of nature and mathematics is closely related. Mathematics is the Science in which calculations are prime. It is an exact science and involves high cognitive abilities and powers.

According to Chamber’s Twentieth Century Dictionary (1987), “Mathematics is the science of magnitude and number and of all their relations.”

Good’s Dictionary of Education (1973), “Mathematics is the science of measurement, quantity and magnitude.”

According to Webster’s New World Dictionary (1973), “Mathematics is the science dealing with quantities, forms etc. and their relationships by the use of numbers and symbols.”

In the words of Gakhar (1990), “Mathematics is the tool specially suited for dealing with abstract concepts of any kind and there is no limit to its power in this field.” In other words, in mathematics we find results at the abstract level with the help of process of reasoning. Therefore, mathematics may be regarded as a science of abstract form.

From the above opinions, we conclude that mathematics is a science of quantity (amount, size, proportion) and space (time, interval, distance). It deals with the questions and problems involving size, proportion, area, time, interval, distance etc. It is also a science of calculation involving the use of numbers. It deals
with the numerical part of man’s life. In this way, it is a systematic, organized and exact branch of science which deals with abstract concepts.

1.2 NATURE OF MATHEMATICS

Mathematics has its own language and symbols, which cut short the lengthy statements. It helps in the expression of ideas or things by giving them an exact form. In other words, mathematics is the language which was created by the mind of man. Lindsay, a great mathematician remarks “Mathematics is the language of physical sciences and certainly no more marvellous language was ever created by the mind of man”.

Mathematics is the science of logical reasoning where results are developed through a process of reasoning. Thus, mathematics is a way to settle in the mind a habit of reasoning. It is a science of pattern and order. Its domain is not molecules or cells, but numbers, chance, form, algorithms and change. As a science of abstract objects, mathematics relies on logic rather than on observation as its standard of truth. It employs observation, simulation and even experimentation as means of discovering truth. The special role of mathematics in education is a consequence of its universal applicability.

Mathematics is also the science of inductive and deductive reasoning. Inductive reasoning means that when a particular property is true in a sufficient number of cases, then we can conclude that it will prove true in all similar cases. Due to this nature, mathematics in the beginning is inductive. Likewise, mathematics is also deductive science and deductive reasoning is
based on axioms, postulates, self-evident truths, undefined terms and definitions.

Mathematics is an exact science and involves high cognitive abilities and powers. In this connection Courant and Robbins (1941) have expressed their views about the nature of mathematics in beautiful words as, “Mathematics as an expression of the human mind reflects the active will, the contemplative reason and the desire for aesthetic perfection. Its basic elements are logic and intuition, analysis and construction, generality and individuality.”

Mathematics is of two types- pure and applied. Pure mathematics deals with exact statement, concept and theories which are disconnected from perception while applied mathematics is the application of pure mathematics in the real world. Mathematics by nature is both a pure, theoretical adventure of the mind and practically applied science.

1.3 IMPORTANCE OF MATHEMATICS

Mathematics is a subject, which provides basis, directly or indirectly to almost all subjects both of arts and of science streams. A mathematical brain would help the rational and scientific growth of any society. All scientific education is based on mathematics. Its neglect means to remain ignorant about all other sciences.

A central goal for all levels of mathematics education is the development of mathematical power for all students. Students should acquire an effective awareness of both the spirit and the uses of mathematics and a growing understanding of the breadth of the mathematical sciences and their deep interconnecting principles. Modern society is an achieving and progressive society.
Here human being always thinks and works for profitable and better returns. He wants to progress more and more. For this, an efficient planning based on mathematical approach can lead a person to success.

Whatever comforts science has given to us are all due to the knowledge of mathematics. We should not forget that right from morning till evening, all our activities and engagements are controlled and fashioned by mathematics. A common man can pull on sometimes very well, without learning how to read and write, but he can never pull on without learning how to calculate.

Mathematics has its educational, social, emotional and technical importance. It is an indispensable instrument, equipped with signs and symbols, to bring about precision in comprehending the complicated problems. Mathematics has practical and utilitarian value. It disciplines the mind; plays an important role in the advancement of culture and civilization. It develops our intellectual powers; teaches truthfulness, honesty, patience, self-control and self-confidence; develops power of reasoning; gives shape and definiteness to the properties of matter. Such being the power of mathematics, it is strange that not many people are keen on mastering this subject. Apart from this, their performance in this subject is poor.

Broadly speaking, the term mathematics covers two areas of activities - Theoretical and Applied. Theoretical mathematicians are concerned with the logical development of mathematical system. They deal with pure and abstract mathematical concepts without feeling any concern for the practical application of their work to everyday problems. Applied mathematicians use mathematical theories and principles as tools to solve problems in any field such
as physics, chemistry, biology, business, industry and so on. They analyse various aspects of the problem and describe the existing relationship in mathematical terms.

The knowledge of mathematics is indispensable for a wide variety of professions. Any person planning to study physical sciences i.e. physics, astronomy or engineering subjects should have studied mathematics for one or two years in a college and 4 to 5 years in high or higher secondary school. One who wants to be a mathematician, needs 5 to 6 years of graduate and post-graduate work in a college or in a university. The post-graduate degree in mathematics is also a desirable qualification for persons choosing teaching or research as a career in mathematics.

Large varieties of occupations are available these days to persons having a degree or post-graduate qualification in mathematics. The services of mathematicians are generally needed in four broad areas. These are:

(a) Teaching in Schools, Colleges and Universities;
(b) Application of Mathematics in Statistics and Operational Research;
(c) Computer Programming;
(d) Actuaty Mathematics.

(a) Teaching in Schools, Colleges and Universities

Teaching offers largest number of job opportunities for persons with mathematical qualification. They can work in schools, colleges and universities.

Persons having mathematical qualifications have many opportunities for self-employment also. These are available
particularly in the field of education, both at school and college level.

For coaching the school students in the subject of mathematics, there is a demand for part-time tuitions. There is some scope to engage oneself in the teaching at college level. Some students find mathematics a difficult subject; therefore, they need individual coaching. This offers part-time work for some mathematics teachers. Since mathematics is also prescribed as a subject in the various competitive examinations, so there is a good demand for coaching.

(b) Application of Mathematics in Statistics and Operational Research

Mathematicians engaged in applied work are being increasingly called upon to handle statistical work. Mathematical statisticians, through their expert knowledge, help in finding a solution to the problems of trade, industry, business, etc.

In the recent years, government departments have come to greatly rely on statistical data especially for economic planning. Mathematicians handling statistical work in government offices are engaged in varied phases of socio-economic activities. Without mathematics statistical records cannot be kept accurately and there will be no economic development without mathematics. It helps to forecast population growth, estimate the country’s national production and analyse trends in the growth of national economy. They may estimate crop yields, predict and evaluate the results of new techniques introduced. They may be engaged in constructing indices of cost of living, prices or other economic indicators. Persons engaged in the private sector are called upon to
conduct public opinion poll or judge the popularity of particular brand of commodity.

In recent years, the trend has been developed to conduct sample surveys on current topics of socio-economic subject. Mathematicians working on such projects have to collect, analyse and interpret statistical data. For that, they have to chalk out a survey through a questionnaire or by interviewing. They determine the type of data to be gathered and size of the sample to be drawn. They prepare instructions for those who will collect information or for those who will codify and tabulate returns. The data thus collected is analysed and given a summarized shape. Tables, charts and graphs are also got prepared to facilitate interpretation of mass of information. Mathematicians have to draft reports and highlight the conclusions drawn. Earlier, the task of mathematicians was that of summarizing a mass of data to yield a few key figures that measured the economic and social phenomena of the country. But recent advances in the quantitative analysis, including simulation and model building, have made the task of applied mathematicians, particularly at a higher level, all the more important and significant.

(c) Computer Programming

This is an age of machines, which have also found their way into the offices. There are machines to relieve work of drudgery, which was perhaps inevitable when everything had to be done by hand. The latest offering of technology is the electronic computer.

A computer is an advance type of calculating machine, which speeds up many operations associated with modern network. We,
in India, are rather a late starter in this field, but now the number of computer machines is rapidly increasing.

Mathematicians are also required in the field of electronic computer. Statistical data is processed in various types of computers. This facilitates accuracy, speed and convenience in analysis of mass of data. “Mechanical Brains” as these machines may be called, need competent persons with mathematical background to handle them.

Computer Programmers of System Analysis, who handle mechanical tabulation of data, have to study the problem carefully from the customer’s as well as from the machine’s point of view, in order to produce desired results. They prepare a flow chart that shows the steps in a sequence that the machine must take. When the program is made, they test its working practically. Facts and figures to be processed are converted into the form of cards or tapes, used by computer machines. Operator runs the machine according to the instruction sheet and procedure to be followed. For this he needs the knowledge of mathematics.

Persons with lower mathematical qualifications are also needed for the computer machines. They perform some routine jobs that are necessary before the machine is activated. Some of the junior machine room operators are: Key Punch Operator, Verifier, Sorter and Tabulator. However, the type of junior staff deployed depends on the type of machine installed.

(d) Actuary Mathematics

Actuaries are primarily concerned with designing of insurance and pension plans and keeping these programmes on a sound financial footing and for this, they apply their mathematical,
statistical and financial knowledge. Actuaries determine the insurance premium rates and contract provisions for such type of policy offered etc.

Actuaries have to compile data relating to rates of morality, sickness, injury, retirement and property loss from accident, theft, fire or any other hazard. Based on information available to them, they analyses insurers’ claims against their corporation or company. By their understanding of theory of probability and calculus, they evolve new types of policies attractive to the customers, which also bring business to their companies.

In order to be successful in the job, actuaries have to keep themselves well informed of general economic as well as social trends; legislative health and other developments that may affect insurance practices. By virtue of their vast knowledge in the field of insurance, they also work on problems arising in investment, and may frame general policy of the company.

1.4 PLACE OF MATHEMATICS IN SCHOOL CURRICULUM

Mathematics holds an important place in schools. Infact, it starts right from kindergarten and holds a key position among other subjects even at primary and high school level. Today, children are sent to schools for achieving different goals and it is assumed that the child will be able to achieve the following objectives:

1. Acquisition of knowledge and skills
2. Acquisition of various values as discipline, tolerance etc.
3. Acquisition of desired attitudes and ideals.
In post independence India, great emphasis has been placed on mathematics teaching and learning. The Indian Education Commission (1964-1966) has recommended “Mathematics and science should be taught on compulsory basis to all pupils as a part of general education during the first ten years of schooling. The advent of automation and cybernetics in this century make the beginning of the new scientific, industrial revolution and makes it all the more imperative to devote special attention to the study of mathematics”.

The scientific method is the greatest gift of mathematics. As such, mathematics is the mother of sciences. The educationists believe that study of mathematics in itself helps in mental and intellectual development and disciplines human behaviour directly and probably unconsciously by providing training for simplicity, originality, reasoning, accuracy, certainty and verification of results. The commission also pointed out that, “In teaching of mathematics, emphasis should be more on the understanding of basic principles rather than on mechanical teaching of mathematical computation”.

National Policy on Education (1986) has considered the importance of mathematics in general education and suggested that, “Mathematics should be visualised as the vehicle to train a child to think, reason, analyse and to articulate logically. Apart from being a specific subject, it should be treated as concomitant to any subject involving analysis and reasoning”. Mathematics helps in training and disciplining the mind. It also develops the power of thinking and reasoning. Any student of average intelligence can learn mathematics. Study of mathematics is helpful in learning most of the school subjects, as it is believed to
be the art of all arts and science of all sciences. Directly or indirectly, mathematics does not only help everybody in earning but also helps in wise spending. It is mathematics that makes use of physical properties of matter for the benefit of man. Mathematics not only tests result, but very often directs researches.

1.5 THE CURRENT STATUS OF MATHEMATICS

National Advisory Committee on Mathematical Education (NACOME, 1975) commissioned a study of elementary school mathematics instruction. The picture drawn from this survey is as follows:

The ordinary classroom is self-contained. The mathematics period is about 40 minutes long and about half of this time is spent in written work. A single text is followed fairly closely for the problems to be solved by the students, but the students like to read at the most, one or two pages out of five pages of textual material and try to solve a few problems. Besides this, teachers teach in the same way as they were taught in their schools. Almost none of the concepts, methods or big ideas of modern mathematics programs are made clear in this ordinary classroom.

At present, due to scientific and technological advancements in the world, there is a lot of change in the content of school mathematics. There is a change in the trend from traditional to modern mathematics; there is a change in the language of mathematics and change in the system of examination. Teachers are teaching with new and child centered methods; principle of individual difference is also taken care of. There are numerous child centered curriculum plans of instruction.
Thus, setting goals at higher level of complexity as well as higher teacher expectations for pupils in mathematics guide the pupils to achieve at a more optimal level. Thus a highly structured mathematics curriculum needs to be emphasized. Pupils need a more structured environment in mathematics. The pupil is the focal point of instructions in mathematics. Mathematics is a basic need and it is vital for pupils to learn as much as possible. So, teachers and administrators need to stay abreast of current trends in the teaching of mathematics and implement what is relevant and assist pupils to learn as optimally as possible (Ediger, 2003).

1.6 ACADEMIC ACHIEVEMENT

Academic Achievement has always been a crucial area and the main topic of educational research. Academic Achievement, in general, referred to the degree or level of success or proficiency attained in some specific area concerning scholastic or academic work. Good (1973), in the Dictionary of Education defined academic achievement as “knowledge attained or skills developed in the school subjects, usually designated by test scores or marks assigned by the teacher.”

As soon as a child steps into the school, the process of his behaviour modification begins. He acquires new attitudes, capabilities and skills, which are judged by his achievement. Achievement need is a learned motive to compete and strive for success. In the school, it may be taken to mean the attainment of any level of excellence in a desirable activity by the student. Since the word ‘desirable’ implies a value judgement, it is obvious that a particular attainment may be referred to as achievement or otherwise depending on whether it is considered desirable or not. Achievement is used in broad sense; it is customarily concerned
with academic context with the development of knowledge, understanding and acquisition of skills.

According to Hawes and Hawes (1982), “Academic achievement means successful accomplishment of performance in particular subject, areas or courses, usually by reasons of skill, hard work and interest, typically summarized in various types of grades, marks, scores or descriptive commentary.” Therefore, achievement would not only include acquisition of knowledge and skills but also attitudes and values. Achievement, as manifested by the application of acquired skills and knowledge is a product of learning attitudes and interests. Traw (1960) defined academic achievement as the attained ability or degree of competence in school tasks usually as measured by standardized tests and expressed in age or grade units based on norms derived from a wide sampling of pupils’ performance. In other words, academic achievement may be defined as the competence children actually show in the school subjects in which they receive instructions.

The need for measuring academic achievement is based on two fundamental assumptions of psychology. Firstly, there are differences within the individual from time to time known as behaviour oscillation i.e. academic achievement of the same individual differ from time to time, from one class to another and from one educational level to another. Secondly, there are individual differences. Individuals of the same age group, of the same grade, usually differ in their potential abilities and academic proficiency whether these are measured by standardized measure of achievement or by the teacher grading or by marks obtained in tests and examination.
In the present study, academic achievement of pupils in the subject of mathematics has been taken as a dependent variable and emotional intelligence, creativity, learning styles and mathematical aptitude have been taken as independent variables.

1.7 ACADEMIC ACHIEVEMENT IN MATHEMATICS

Mathematics is regarded as the father of all sciences. Mathematics is a sort of mental jogging to build up the mind and keep it fit. It sharpens the mind. There is a disciplinary value in the study of mathematics, in the development of sound work habits, capacity to do work independently and acquire problem solving skills and strategies. It is self-discipline, which helps in the analysis of a problem, the identification of what is given and what is to be solved, the selection of strategy to solve the problem and interpretation of the obtained results. Achievement in mathematics is the competency shown by the student in the subject. It is the knowledge attained or skill developed in the field of mathematics. Its measure is the score on achievement test in mathematics. Mathematics is one of the three R’s (reading, writing and arithmetic). Pupils individually are different from one another and possess diverse learning styles. They also possess different intelligence, such as, being able to work better individually or with in a group. The mathematics teacher has a major responsibility in assisting pupils to learn in ongoing lessons and units in mathematics. ‘High expectations’ has become a key word. It has been seen that if teacher has high expectations from pupils in mathematics, the latter will achieve higher grades.

Mathematics achievement is an essential part of the academic achievement in present time. It is the key to success in many professions. It is the power of solving with speed and
accuracy difficult and complex problems. There are numerous good sources from which objectives are to be achieved by the pupils in mathematics. National Council of Teachers of Mathematics (NCTM, 1989) recommended a comprehensive statement of objectives for teachers to read and voluntarily apply valuable ideas in classroom teaching and for pupils to achieve higher grades in mathematics.

Pupils need to: (i) Learn to value mathematics, (ii) Become confident in their ability to do mathematics, (iii) Become mathematical problem solvers, (iv) Learn to communicate mathematically, (v) Learn to reason mathematically.

These educational objectives for students reflect the importance of mathematical literacy. Each of these objectives is relevant for pupils in kindergarten, grade twelve and beyond throughout one's life. Mathematics is not just for the gifted and talented, but each pupil needs to develop proficiency in mathematics.

1.8 RATIONALE OF THE STUDY

In the era of advancement of science and technology, individual are bombared with the information in all the fields irrespective of its relevance, applicability and adoptability to them. It is very difficult to access the right learning path for students and to cater to individual differences. Hence it becomes increasingly important that right education is imparted to the students so that teaching and learning may be made more meaningful and adaptive for all students. Every man's life is filled with discontent, with restlessness and with conflict. These factors cloud our days and keep us awake at night because we don't understand our own selves, our dreams, our wishes, ambitions and our limitations.
Emotional pressure is increasing day by day at adolescent age, which has led to unbalanced and maladjusted personalities in the society. Our education aims at the all round development of the personality of the child. Education is meant for developing three domains i.e. cognitive, conative and affective. Our education mainly stresses on the development of the cognitive aspect and to some extent develops the conative aspect. The cognitive aspect deals with knowledge and conative aspect deals with motor skills. The affective aspect, which deals with emotions, feelings and sentiments of the child, is totally neglected in our education system. Therefore, there is a great need to study emotional intelligence of the children. It is also essential to develop creativity in students.

According to Torrance (1969), “Everybody possesses to some extent the ability involved in being creative. These abilities involved can be increased or decreased in the way children are treated.” Also there is a need of studying the problem subject wise, because each subject is unique in itself and it is a common experience to find a student’s achievement high in one subject and low in some other. The analysis shown earlier indicate that bulk of studies deals with achievement in general, though some stray attempts have been made with reference to a particular subject of study; Such researches will be of great help to teachers, school administrators and to guidance and counselling workers. In view of this, in the present study only achievement in mathematics was taken. The choice of the subject of mathematics was because Mathematics achievement of the students at each developmental stage is likely to be influenced by multiplicity of factors e.g. aptitude, attitude, creativity, intelligence, learning styles, problem
solving ability, personality traits of the students and some other educational environmental factors. In the present study investigator has chosen four factors emotional intelligence, creativity, learning styles and mathematical aptitude and has tried to find out to what extent the emotional intelligence, creativity, learning styles and mathematical aptitude affect the academic achievements of the students in mathematics.

The number of students opting mathematics at higher stage is very low, because majority of the students are victim of the false notion that mathematics is a dull, dry, uninteresting and tough subject. They feel that if they opt for this subject, it will negatively affect their academic achievement. To score good marks in a particular subject, aptitude towards that subject is mandatory. Mathematical aptitude signifies some aspects of the present ability of the individual that predicts some future performance in mathematics. Education can be seen as a long-term aptitude development effort, as it prepares the human being for later stages of life. To achieve more in the subject of mathematics, the students should have higher mathematical aptitude.

In the past several years, there has been extensive research on various approaches of teaching in higher education. But no one method or approach has been found consistently superior to all. It reveals the fact that no one approach can be best suited to all students. The most important question is to determine which students learn best and under what conditions. An emerging important area of research that holds promise in helping us answer this question is student’s learning styles. It is very important for teachers to know what the learning styles of students are. Do they vary significantly? What type of learning procedures
and activities promote the most rapid and successful learning by students who have deeply different patterns for their own learning? Emphasizing the need to diagnose the learning styles of students Dunn and Dunn (1975) says, “To bring the learners of varied differences into confining environment and to group them in a way that makes educational sense is virtually impossible unless we examine each of these complex individuals to identify exactly, how he or she is likely to learn more effectively”. Proper learning styles established during the academic years have a lasting value in the subjects like mathematics. Lack of good learning styles especially in mathematics may lead to under achievement.

Modern age is called the age of competition. All parents are worried about the future of their adolescents. It is therefore, important for the parents and teachers to know and understand the nature of the adolescent. It is also very essential to know about their emotional intelligence, creativity, learning styles and aptitude. All these are important factors for the study of academic achievement in a particular subject. Therefore, parents, teachers and counsellors cannot afford to ignore to identify and develop students’ emotional intelligence, creativity, learning styles and aptitude in right way. It is very much appropriate and necessary to conduct a research study in this area so that parents and teachers must know what level of emotional intelligence, creativity, learning styles and aptitude are helpful in enhancing student’s achievement. Thus, the present study will prove to be a humble effort in studying and determining the relationship of these variables. The systematic and empirical studies on relationship of academic achievement with these important variables are still
lacking. Also the inference drawn on the basis of the studies so far reported cannot be regarded as general and final.

Motivated by the above consideration and by the important place of emotional intelligence, creativity, learning styles and mathematical aptitude of students and their affect on their academic achievement especially in the field of mathematics, the investigator has undertaken the present study.

1.9 STATEMENT OF THE PROBLEM

“A Study of Academic Achievement in Mathematics in relation to Emotional Intelligence, Creativity, Learning Styles and Mathematical Aptitude at High School Stage.”

1.10 OBJECTIVES OF THE STUDY

Present study was conducted with the following objectives:

1. To know the relationship between emotional intelligence and achievement in mathematics.

2. To know the relationship between creativity and achievement in mathematics.

3. To know the relationship between learning styles of students and their achievement in mathematics.

4. To know the relationship between mathematical aptitude and achievement in mathematics.

5(a) To know difference in the achievement in mathematics due to high and low levels of emotional intelligence.

(b) To know difference in the achievement in mathematics due to high and low levels of creativity.
To know difference in the achievement in mathematics due to high and low levels of mathematical aptitude.

6(a) To know the difference in emotional intelligence of male and female students.

(b) To know the difference in emotional intelligence of government and private school students.

7(a) To know the difference in creativity of male and female students.

(b) To know the difference in creativity of government and private school students.

8(a) To know the difference in mathematical aptitude of male and female students.

(b) To know the difference in mathematical aptitude of government and private school students.

1.11 DELIMITATIONS OF THE STUDY

Study was delimited with respect of following:

1. The study was delimited to government and private high school students, studying in IXth class.

2. The study was conducted on a sample of 700 students comprising male and female students.

1.12 DEFINITIONS OF THE KEY TERMS

1. Academic Achievement

Good (1973) defined, “Academic achievement is one part of wider term i.e. educational growth, which includes knowledge
attained or skills developed in the school subjects which is usually evaluated by test scores or marks assigned by teachers or both.”

2. Emotional Intelligence

In the present study Emotional Intelligence has been operationally defined in terms of self awareness, empathy, self motivation, emotional stability, managing relations, integrity, self development, value orientation and social skills.

According to Salovey and Mayer (1990), “Emotional intelligence is in terms of being able to monitor and regulate one’s own and other’s feelings and to use feelings to guide thought and action.”

Goleman (1995) has given five aspects of emotional intelligence: (a) Self – awareness (b) Self – regulation (c) Motivation (d) Empathy and (e) Social skills.

3. Creativity

In the present study creativity has been operationally defined as “The process of sensing gaps or disturbing, missing elements; forming ideas or hypotheses concerning theory, testing these hypotheses and communicating the results, possibly modifying and retesting the hypotheses”. Its measure is the total score on fluency, flexibility and originality as measured by Verbal Test of Creative Thinking (by Baquer Mehdi, 1985).

4. Learning Styles

Agarwal and Pandey (1977) define learning styles as, “Sum total of individual’s preferences for physical, social, emotional and environmental elements in the course of learning.”
5. **Aptitude**

As per Bingham (1937), “Aptitude refers to those qualities characterizing person’s ways of behaviour which serve to indicate how well he can learn to meet and solve certain specific kinds of problems.” Based on the above definition **mathematical aptitude** may be defined as person’s ways of behaviour which serve to indicate how well he can learn to meet and solve mathematical problems.

1.13 **SIGNIFICANCE OF THE STUDY**

Mathematics is one of the oldest sciences. In fact, its knowledge is essential for the understanding of various other subjects. Its knowledge is indispensable for a wide variety of professions e.g. school teacher, college teacher, university teacher, computer programming, actuarial mathematics, systematic analysis, operational research, trade, industry, business etc. In the recent years, every government of the world has come to greatly rely on statistical data especially for economic planning and budgeting. Each government relies heavily on the creative and talented mathematicians as many vital decisions are taken on the basis of statistical data. Therefore, seeing the importance of the subject of mathematics and the role of mathematicians in the development of civilization, the investigator has chosen this field for her research study. Its knowledge is very useful in guiding students in their educational and vocational careers and also for providing proper environment at home and school for improving their abilities. It was a great problem for the psychologists to answer the question ‘Why do certain students score less or fail while others score high?’ Researches in this area have revealed that emotional intelligence, creativity, learning styles and
mathematical aptitude are important correlates of academic achievement of the students especially in the field of mathematics at all levels of education.

Education in the contemporary society is not mere acquisition of bookish knowledge, but in fact interaction between the teacher and the pupil; understanding and handling the emotions in the right manner, at the right time, in the right way. The growth of harmonious personality of the individual depends largely on his emotional intelligence. It enables a man to achieve the highest pinnacle in his search for self-fulfillment as well as social fulfillment.

Achievement in mathematics is the competency shown by the student in the subject. No doubt, there are intra and inter differences among the individuals in the achievement of mathematics and these differences may be due to their aptitude in the subject. The incident of large failure in mathematics in secondary school examination and in university examination is of great concern not only to the parents but also to the educators. Sometimes, parents due to their over-enthusiasm and ambition force the child to learn mathematics without knowing the aptitude of the child. The child due to lack of aptitude and due to distaste for mathematics gradually develops hatred for the subject and becomes backward in mathematics.

The present study has significance, relevance, importance and utility for both parents and teachers because this will encourage them to come forward to understand their children's emotional intelligence level, creativity, learning styles and aptitude towards a particular subject. It is more important for the teachers
as they can capitalize the opportunities according to the pupils' interest, taste and aptitude.

Because of new advancements in science and technology, an individual is uncertain about future. With rapid industrialization, urbanization, technical advancement and hard competition in life, an individual's life has become more confused and insecure. He has to compete with manifold influences, which impinge on his personality. The success and achievement of a person is determined by his emotional intelligence, creativity, learning styles and aptitude and many more factors. These factors help an individual in balanced development of his personality. Therefore, this study will help the students to know about themselves. Accordingly, they can opt for mathematics subject at higher stage.

A central goal for all levels of mathematics education is the development of mathematical power for all students. In particular, mathematical power includes the ability to explore, conjecture, and reason logically; to solve non-routine problems; to connect concepts within mathematics and real-world situations; to read, write, listen, and speak mathematically. Acquiring mathematical power also requires the development of self-confidence and a disposition to pursue, use quantitative and spatial information in solving problems and making decisions. Students' flexibility, perseverance, interest, curiosity, and creativity also affect the acquisition of mathematical power. This will help the students in their future life, skills and career.

Findings of the present study may be helpful to parents and school authorities, including teachers and principals; to know and understand the effect of emotional intelligence, creativity, learning styles and mathematical aptitude on the pupils' academic
achievement in mathematics and can take appropriate steps in this direction. Therefore, there is a need to explore this field further and that too scientifically. Moreover, in this field no systematic study of this kind has been conducted so far and therefore, present study is an attempt in this direction.

Present study has employed the statistical techniques of correlation and t-ratio. In this way, present study is helpful in studying the predictive efficiency of independent variables i.e. emotional intelligence, creativity, learning styles and mathematical aptitude in predicting the achievement of students in mathematics.

One of the main strength of the present study is that it has provided standardized tool viz. Achievement Test in Mathematics for the benefit of mathematics teachers for IX class.

1.14 ORGANIZATION OF THE RESEARCH REPORT

Introduction and objectives of the study have been given in chapter I, while chapter II deals with the theoretical viewpoints about independent variables. In chapter III, review of related studies and hypotheses have been presented while fourth chapter deals with construction and standardization of achievement test in mathematics. In chapter V, method and procedure has been given. Chapter VI deals with analysis of data along with interpretation and discussion. Chapter VII deals with summary, conclusions, educational implications and suggestions for further research. Bibliography and Appendices have been given at the end of the research report.