Computer Assisted Instruction in Mathematics

Dr. (Smt.) Bharathi Y. Khasnis

The Concept of Computer Assisted Instruction in Schools is gaining more significance all over the world. Particularly in Mathematics Education to make Children understand the concepts, figures, structures, functions, diagrams, complex problems, etc we need to present them in multi dimensional space. CAI has become an inevitable component in mathematics teaching as well as in other subjects. This book has been designed with the intention to the teacher and students. It includes diagnostic Test to identify difficulties in Geometry faced by students while learning .CAI is the best and effective technique to over come the learning difficulties.

CONTENTS

Dr. (Smt) Bharathi. Y. Khasnis, holds B.Ed with first rank from the Karnataka University Dharwad. She received M.Ed with 6th rank from KSOU, Mysore. She also holds M.Sc, (Mathematics), M.Phil (Education) degrees & Ph.D from Karnataka University Dharwad. She has attended number of conferences, Symposia and workshops at National & International level, published articles in the reputed journals. Her area of specialization is Curriculum & Evaluation. Presently she is working as Assistant Professor in BLDEA's JSS College of Education, Vijayapur.

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ABOUT THE BOOK

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Chapter-1

INTRODUCTION

1.1 INTRODUCTION

The world of today, which leans more and more heavily on science and technology, demands more and more mathematical knowledge on the part of more and more people. And the world of tomorrow will make still greater demands on a person to be "well educated" in the technological society of today, and as such he or she should have some degree of mathematical literacy.

Though mathematics has been with us for more that 5000 years, the subject has never been made as lively as it is today. The pace of mathematical discovery and invention has accelerated amazingly during the last few decades. It has been said that mathematics is the only branch of learning in which theories of two thousand years old still valid.

Mathematics plays an important role in accelerating the social, economical and technological growth of a nation. It is more so in India as the nation is rapidly moving towards globalization in all aspects. The world of today which leans more and more heavily on science and technology demands more and more mathematical knowledge on the part of its people. Therefore it is necessary to prepare the child with a strong base of mathematical knowledge to face the challenges of the modern technological society.

Mathematics plays an important role in human life Mathematics of today is the result of the efforts made by a group of men for centuries and its reflects the culture and civilization of human race. It is being said that history of mathematics is the history of human civilization. A perusal of human civilization reveals that mathematics has its influence at every stage

of human progress and development commercial necessity was the force behind all mathematics inventions. Arithmetic development as a result of man's need to assess his wealth and geometry from surveying land. Similarly trigonometry and logarithm grew up to assist astronomy. One cannot ignore the contributions of various civilizations in the development of history of mathematics, especially Greeks in geometry and Indians in arithmetic. Investigations show that many results now accredited to western mathematicians were already known to Indian mathematicians.

In the development of mathematics curriculum at secondary higher secondary school level, very little attention has been given to the history of mathematics due to the constrains of time. It is imperative that our students should know the contributions of great mathematicians and about their real purpose of mathematical inventions.

1.2 HISTORICAL KNOWLEDGE OF MATHEMATICS

1. Knowing the history of mathematics makes the students to appreciate the development and progress of mankind over the years. They will be pleased to know how the earlier mathematicians tried for years with patience and perseverance and discovered mathematical facts.
2. Mathematics is a manmade science by having the historical knowledge; the teacher can teach dynamically and introduce mathematical terms, concepts and conventions effectively.
3. It is a fact that students will better understand and remember subjects which include stories and depiction of events. Hence many mathematical concepts can be introduced in the class by discussing their history.
4. Historical background of mathematics will enable the teacher to present it as a dynamic and progressive subject with full of human interest.
5. A lesson introduced according to the history of mathematics with suitable pictorial and blackboard illustrations will be instructive and interesting.
6. History of mathematics will not only remind us what we have but help us to improve our knowledge and prevents the learner against hasty conclusions.

7. It gives us an insight into how at every stage of development, minor or major discoveries of mathematics was influenced and conditioned by human needs.
8. It can promote the spirit of research and inspire students towards new inventions.
9. It will help the students to adopt successful methods and avoid unwanted procedures; thereby one can save time and energy.
10. Historical knowledge of mathematics will help the students desist from investigating an unresolved problem by the some method that has led other mathematicians to failure. They can choose an alternate method.
11. Mathematical achievements of the past are a reliable source of intellectual progress and is a peerless contribution to the history of civilization. Understanding of the mathematics history helps to look into the past ages and follow the line of intellectual development as mathematics has been considered as a mirror of civilization.
12. Deep knowledge of history will tell us that all branches of mathematics are inter-related.
13. It helps to avoid compartmentalization in teaching and encourages reading and other desirable habits.
14. The historical approach in teaching is on asset for attainment of objectives of both learning and teaching.
15. Historical knowledge of mathematics helps to imbibe the significance of mathematical ideas and gives a new perspective to research and teaching.
16. Historical knowledge of mathematics can broaden the out look, enrich minds and motivate the learner to contribute something towards the development of mathematics.
17. The study and knowledge of the history of mathematics can promote the right perspective in understanding mathematical concepts and ideas which form the basis for mathematics learning.
18. History of mathematics can play a significant role in the design of curriculum. A survey of events in research could lead to suggestions for new topics to be introduced.

19. It can promote the class work to a greater coherence and produce a more effective course study.

Knowledge of history of mathematics will enable a teacher to introduce a topic effectively. Anecdotes mentioned occasionally bring out healthy changes in the monotony of classroom work.

1.3 MEANING OF MATHEMATICS

The dictionary meaning of mathematics is that it is either the science of number and space or the science of measurement, quantity and magnitude; Mathematics is thus defined as the science of quantity, measurement and spatial relations. It is a systematized, organized and exact branch of science. It deals with quantitative facts, relationship as well as with problems involving space and form. It is a logical study of shape, arrangement, and quantity. Mathematics is defined in different ways by different authors.

Bertrand Russell (1901) defined mathematics as "The subject in which we never know what we are talking about, or whether what we are saying is true", is fundamentally significant. Bell, discussing the merits of this definition in his "Queen of sciences" says that,

(*i*) It emphasizes the entirely abstract character of mathematics.

(*ii*) It reduces all mathematics to postulation forms, and

(*iii*) It apposes the traditional definition of mathematics as the science of number, quantity and measurement".

Comte defined mathematics as "The science of indirect measurement".

According to Kant "Mathematics is the indispensable instrument of all physical researches".

Gauss Stated "Mathematics is the queen of sciences and arithmetic is the queen of all mathematics".

Bacon said "Mathematics is the gateway and key to all sciences".

All the above definitions emphasize mathematics as a tool especially suited for dealing with scientific concepts. According to Lindsay, "Mathematics is the language of physical sciences and certainly no more marvelous language was created by the mind of man". This definition reveals the unique nature of the mathematics language with its signs, symbols, terms and operations, which can handle ideas with a precision and conciseness that is unknown to any other languages.

Locke stated, "Mathematics is a way to settle in the mind a habit of reasoning" A more comprehensive definition of mathematics was given by courant and Robin when they defined mathematics in the following was "Mathematics is an expression of the human mind which reflects the active will the contemplative reason and the desire for aesthetic perfection. Its basis elements are logic and intuition, analysis and construction, generality and individuality".

J.B. Shaw stated, "Mathematics is engaged, in fact, in the profound study of art and the expression of beauty". According to Shaw there are four significant methods of mathematics which give more insight into the nature of mathematics.

- Scientific, leading to generalizations of widenining scope.
- Deductive, leading to a permanent.
- Inventive, leading to the ideal element, and creation of new realms.

Mathematics, therefore, is not only 'number work' or 'computation', but is more about forming generalizations, seeing relationships, and developing logical thinking and reasoning. The national policy on Education (NPE) (1986) stated "Mathematics should be visualized as the vehicle to train a child to think, reason, analyse and to articulate logically". Mathematics should be shown as a way of thinking, an art or form of beauty, and as human achievement.

Finally, we can say that Mathematics is the branch of science which deals with the study of numbers, notations, quantities, measurements etc., and how they affect each other more and more definitions can be piled up to know the different ways in which the term 'Mathematics' is interpreted. But when we subject all these definitions to analyses. We find that Mathematics is a very broad learns and it touches the various aspects of human knowledge and learning. Most of the present day mathematics taught at the school level is more than the study of number, quantity, form and relations.

Meaning of Mathematics in General from the Above Definitions

(*a*) Fundamentally, mathematics is a science related to space and numbers, to quantity facts and relationships.

(*b*) It handles abstract forms and concepts to make them simple for our understanding and application.

(*c*) It interprets data to draw concise conclusions for out demands and aspirations.

(*d*) It opens the gates of nature to allow us to derive maximum benefits for mankind.

(*e*) It opens the gates of nature to allow us to derive maximum benefits for mankind.

(*f*) It taps cognitive and cognitive powers of learners to sharpen their learning.

(*g*) Its tools of application are logic reasoning (inductive and deductive), intuition analysis, generalizations etc.

(*h*) Modern mathematics encourages the understanding of various structures in arithmetic, algebra, geometry etc.,

1.4 NATURE OF MATHEMATICS

The nature of mathematics is made explicit by discussing it under the following heads:

Mathematics is a Science of Discovery

Mathematics is the discovery of relationships and the expression of those relationships is symbolic form – in words, in numbers, in letters, by diagrams or by graphs (E. E. Big as, 1963). According to A.N. whitehead (1972) "Every child should experience the joy of discovery". Mathematics gives an easy and early opportunity to make independent discoveries. The children must have opportunity for making their own discoveries of mathematics ideas, but they must also have the practice necessary to achieve accuracy in their calculations. Today it is discovery techniques, which are making spectacular progress. They are being applied in two fields; in pure number relationships and in everyday problems, involving such things as money, weights and measures.

Mathematics is an Intellectual Game

Mathematics can be treated as an intellectual game with its own rules and abstract concepts. From this viewpoint, mathematics is mainly a matter of puzzles, paradoxes, and problem showing a sort of healthy mental exercise.

Mathematics Deals with the Art of Drawing conclusions

One of the important functions of the school is to familiarize children with a mode of thought which helps them in drawing right conclusions and inferences. Benjamin pierce defined mathematics as 'the science which draws necessary conclusions'. In mathematics the conclusions are certain and definite. Therefore, the learner can check whether or not he has drawn the correct conclusions, permit the learner to begin with simple and very easy conclusions, and gradually move over to more difficult and complex ones.

Mathematics is a Tool Subject

It could be more elegantly expressed as "mathematics, handmaiden to the sciences' from the beginning, down to the nineteenth century, mathematics has been assigned the status of a servant. Then in the nineteenth century, mathematics attained independence. It achieved a completeness and internal consistency that it has not known before.

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Mathematics is a Systematic Deductive Science

Mathematics is systems of logical processes where by conclusions are deduced from certain fundamental assumptions and definitions that have been accepted or proved to be true. The student draws the inferences from the premises, provided the premises are true. In Mathematics, granted the premises, conclusion follows inevitably.

For examples

"When two lines intersect, vertically opposite angles are equal". ∟A and ∟D are vertically opposite angles. Hence ∟A and ∟D are equal.

This conclusion is deducted from the premise 'vertically opposite angles are equal'. By deductive reasoning we prove that if something is true then something else must be true. However the validity of the conclusions rests upon the validity and consistency of the assumptions and definitions upon which the conclusions are based. The teacher should make the students realize this point of view.

Mathematics is an Experimental, Inductive Science

In mathematics the generalizations allows as out comes of the observations of mathematical phenomena and relationships.

It is based on the principle that if a relationship holds good for some particular cases, it holds good for any similar case and hence the relationship can be generalized. Such a process is called inductive reasoning. For example the student generalizes that the sum of the angles in a triangle is 180^0 after having observed this properly in a number of triangles. Thus a generalization, a rule or a formula is arrived at through the careful observation of particular facts, instances and examples. Many of the mathematical definitions and rules can be generalized through induction. The teacher of mathematics has to provide adequate number of examples requiring the students to observe so that the relationships are explicit leading to the generalization.

Mathematics Involves as Intuitive Method

The first step in the learning of any mathematical subject is the development of intuition this must come before rules are stated or formal operations are introduced. The teacher has to faster intuition in our young children, by following the right strategies of teaching.

Intuition when applied to mathematics involves the concretization of an idea not yet stated in the form of some sort of operations or examples. Intuition is to anticipate what will happen next and what to do about it. It implies the act of grasping the meaning or significance or structure of a problem without explicit reliance on the analytic mode of thought. It is a form of mathematical activity which depends on the confidence in the applicability of the process rather than upon the importance of right answers all the time. It is up to the teacher to allow the child to use his natural and intuitive ways of thinking by encouraging him to do so and honoring him when he does.

Mathematics is Science of precision and Accuracy

Mathematics is known as an 'exact' science because of its precision. It is perhaps the only subject which ca claims certainty of results. In mathematics the results are either right or wrong, accepted or rejected. There is no midway possible between rights or wrong. Mathematics can decide whether or not its conclusions are right. Even when there is a new emphasis on approximation, mathematical results can have any degree of accuracy required. It is the teacher's job to help the students in taking decisions regarding the degree of accuracy, which are most appropriate for a measurement or calculation.

Mathematics is a Subject of Logical Sequence

The study of mathematics begins with few well known uncomplicated definitions and postulates and proceeds step by step, to quite elaborate steps. Mathematics learning always proceeds from simple to complex and from concrete to abstract. It is a subject in which the dependence on earlier knowledge is particularly great Algebra depends on arithmetic, the calculus depends on algebra, dynamics depends on the calculus, and analytical geometry depends on algebra and elementary geometry and so on. Thus gradation and sequence can be observed among topics in any selected branch of mathematics.

Mathematics Requires the Application of Rules and Concepts to new Situations

The study of mathematics requires the learners to apply the skill acquired to new situations. The students can always verify the validity of the mathematical rules and relationships by applying them to novel situations concepts and principles become more functional and meaningful only when they are related to actual practical applications. Such a practice will make the learning of mathematics more meaningful and significant.

Mathematics has its own Language and Symbols

The language for communication of mathematical ideas is largely in terms of symbols and words which every body cannot understand. There is no popular terminology for talking about mathematics. Mathematical talk consists of making use of mathematics symbolism understanding mathematics is realizing what symbolism corresponds to structure that has been obstructed.

In arithmetic and algebra student's deal not with facts, but with symbols. The child who is poor in mathematics is unable to see what concepts the symbols stand for, what the concepts themselves are abstracted from, and hence what the symbols communicate.

The symbols of mathematics constitute a language, which is gradually developed by and for the pupil. This language must be acquired just like any other language and there is need for translating this language in to one's own mother tongue. Long period of training with patience and endurance is needed to make the students feel at home with this language. The training that mathematics provides in the use of symbols is an excellent preparation for other sciences.

The use of symbols makes the mathematical language more elegant and precise than any other language. For example the commutative law of addition and multiplication in real number system can be stated in the verbal form as; the addition and multiplication of two real numbers is indecent of the order in which they are combined; This can be stated in a concise form as; a + b = b + a, and a X b = b X a, a,b,E,R Almost all mathematical statements, relations and operations are expressed using mathematical symbols. Such as +, -, X, %, <, >, ≡, ≤, $\sqrt{\ }$, ∑, ^, E and so on. It is highly impossible to prepare a comprehensive list of all the mathematical symbols. Any one, who wants to read and communicate effectively in the mathematical symbols and their definite use.

Mathematics is Logic

It goes without saying that logic is an important factor in mathematics; it governs the pattern of deductive proof through which mathematics is developed, of course, logic was used in mathematics centuries ago. According to Russel and white head mathematics is logic during the last few decades there has been great emphasis on the analysis of the logical structure of mathematics as a whole. Mathematics may be sought of as a highly disciplined mode of thinking. The teachers should help students to appreciate the structure and pattern which underlie mechanical and computational skills. Wherever there is structure, relationship, regularity, systematic variation, there is mathematics.

Mathematics is on Abstract Science

Mathematical concepts are abstract in the sense that they cannot be seen or felt in the physical world for example, Euclid's lines are supposed to have no width, and his points no size. No such objects can be found in the physical world. Infinity is some thing that we can never experience and yet it is a central concept of mathematics. Similarly negative numbers do not correspond to any physical objects because we cannot have quantities less than nothing.

Therefore, all mathematical concepts cannot be learned through experiences with concrete objects. Some concepts can be learned only through their definitions and they may not have concrete counter parts to be abstracted from most of the mathematical concepts are such concept of a prime number, concept of probability, the concept of a function, the concept of a limit, the concept of a continuous function, to list a few are all abstract in the sense that they can be learned only through their definitions and it is not possible to provide concrete objects to correspond to such concepts. Even when concretization is possible they are only representation of the concepts and not physical objects themselves.

Mathematics is a Study of Structures

The dictionary meaning of structure is 'the formation, arrangement, and articulation of parts in anything built up by nature or art'. Therefore, a mathematical structure should be some sort of arrangement, formation, or result of putting together of parts. For example, we take as the fundamental building units of a structure the members a, b, c……

of a non-empty set S. We hold together these building units by using one or more operations, namely addition or multiplication.

A mathematical structure is a mathematical system with one or more explicitly recognized properties. We may create a structure from a mathematical system by making specific recognition of one or more of the commutative, associative or distribution properties that the system may have with one or more basic structures at hand. One may construct other structures. Since plane analytic geometry is the study of subset of the Cartesian set Re X Re where Re is the set of real numbers, plane analytic geometry may be considered as a superstructure based upon the structure known as real number system. Thus mathematics has got definite logical structures. These structures ensure the beauty and order of mathematics. Number system, group, field, ring, vector, space, etc are all examples of mathematical structures.

1.5 NEED AND SIGNIFICANCE OF LEARNING MATHEMATICS

Mathematics is regarded as the mother of all science. If our students are to function effectively in this era of rapid technological advancement and globalization, they must be mathematically literate. Those who understand and can do mathematics have significantly enhanced opportunities and options that will open doors to productivity.

The Kothari commission (1964-66) emphasizes the significance of mathematics in the school curriculum by stating "One of the out standing characteristics of scientific culture is quantification. The advent of automation and cybernetics, in this century, marks the beginning of the scientific industrial revolution and makes it all the more imperative to devote special attention to the study of mathematics. Proper foundation to the knowledge of the subject should be laid in the school".

It is Necessary that every child Should Learn Mathematics Because

1. A good mathematical background with the knowledge of concepts and theories is essential for meeting the challenges of the modern technological society.
2. Mathematics learning helps to apply mathematical concepts and theorems to new situations.
3. The study of mathematics develops the ability to transfer the mathematical type of thinking and reasoning to daily life situations.

4. Mathematics provides a clear understanding of laws of nature.
5. Mathematics helps in clear understanding of the culture and development of our civilization.
6. Mathematics helps to appreciate the applications of mathematics for the scientific and technological advancement.
7. The study of mathematics provides sufficient mathematical skills to meet the demands of daily life.
8. Mathematics learning helps in a better understanding of the world around us.
9. The study of mathematics develops ability to make independent decisions in societal issues.
10. Mathematics learning inculcates a good deal of self-reliance, self-confidence, tolerance and open-mindedness.
11. Mathematics provides a frame work for solving problems.
12. Learning of mathematics develops ability to transfer the knowledge and skills learned through mathematics lessons to other context in the workplace and in everyday life.
13. The study of mathematics develops logical thinking and reasoning, critical mind and creative imagination.
14. Mathematics learning develops ability to apply mathematics and make meaningful connections to life's experiences.
15. The study of mathematics enhances the ability to communicate mathematical ideas coherently and clearly to peers, teachers and others.
16. Mathematics learning helps to think alternative methods of solving problems.

The study of mathematics enhances the ability to apply mathematical ideas and relationships to areas out side classroom such as art. Science and other curricular areas and in everyday life especially physical phenomena.

1.6 SCOPE OF MATHEMATICS

In our every-day life, which is invaded by new scientific and technological discoveries, the scope of mathematics has widened. Acquiring few arithmetical skills is not enough, as we need more

and more people with a sound knowledge of all-round mathematical skills. "Whether the programme of modern mathematics is successful or not, is not relevant. But qualitatively better mathematics education is undoubtedly the need of the day". We know the mathematics provides enough scope for both, inductive and deductive knowledge to enrich our imagination and modes of thinking and even behavior to excel in life.

Modern civilization is the gift of mathematics. For scientists, technologists, engineers, doctors, specialists and others. Mathematics is there to have catalytic impact upon there understanding in order to enrich their performance to serve mankind all over the globe, productively and usefully. The material progress of the present day world is perplexing and at times unbelievable, but all this is the work of our mathematicians to improve the quality of human life by reducing time, distance and human efforts. For instance, computer, the new magic of mathematics, has a wonderful contribution towards human growth and development. Weather forecasts, locating diseases, finding hidden wealth under the soil, injecting fool-proof precision in our industrial production, revolutionizing agriculture etc., are modern gifts to people everywhere simplified by the mathematical understanding and application.

Mathematics is undoubtedly a fascinating subject of study. It enthused Brahmagupta, Ramanjuon, and Shakunthala Devi (called the 'super computer' Narlikar. Aryabhata and a host of creative people to touch new heights by applying mathematics to varied fields of human knowledge and interest, and offer bewildering facts about new fields of learning David Hilbert, who trumpeted his observations by saying, "Mathematics is what competent people understand the world to mean".

Almost every subject of study in order to exhibit its scope depends directly or indirectly, on the application of mathematics; In physical science like physics, chemistry, Astronomy, Geology, Engineering (of multiple kinds) etc., Mathematics has vital scope for scientists to design their experiments and analyze the data to it perfection social sciences like Economics, Psychology, Sociology, etc., directly depend on the preparation of various models offering strategies, statistical aids, formula and so on to make sound decisions for predictions, planning and allied things.

Scope of mathematics has rapidly increased all the more because of its study as a compulsory subject by all boys and girls in the 1072 scheme of present day education in India. Previously there used to be a different course of study in mathematics which, by and large, the girl students in schools could easily avoid by taking what was called 'House hold and Domestic Arithmetic'. No geometry, trigonometry and algebra were studied by them. But changed circumstances and the pressure of situations, made the study of modern mathematics compulsory for both boys and girls at the school level. Both sexes have to study the same course to make them selves strong enough to meet the challenges of modernism.

Research and development programmes in various fields of human activity cannot take off unless mathematics opens its huge wings to bless them for opening new avenues of growth and development in a scientific and crystal clear manner.

A logical corollary to all stated facts reveals that the discipline of mathematics, whose frontiers are rapidly widening, has vast scope for each one of us.

In recent years, it has been noted by Joseph W. Dauhen, "Nearly every part of our lives involves mathematics. It has played an essential role in the development of modern technology – the tools, materials, techniques and sources of power that make our lives and work easier. In recent year's plant biology, medical diagnosis, microbiology, nuclear medicine, medical pathology, etc., have greatly revolutionized our life and this has been facilitated by the application of modern mathematical techniques of an advanced kind Lastly, Goud S.H. (American Mathematical society, providence, Rhodelsland. USA) emphasizes the need for mathematical instruction and says that 20^{th} century is undisputed "golden age" of mathematics. Thus the scope of the subject is rightly realized and established.

The scope of mathematics is to be consolidated in the following way with the views given above,

1. Mathematics is a subject for all calculations measurements for quantative identifications.
2. It helps in daily life because of its utility characteristics.
3. It helps in future learning.
4. It helps in securing jobs (as surveyor, building contractor, cashier, Statistician, teacher, architect, business men etc.,)

1.7 VALUES OF TEACHING MATHEMATICS

The following values or advantages can be derived through the teaching of Mathematics.

Utilitarian value
Social value
Moral value
Aesthetic value
Disciplinary value
Intellectual value
Cultural value
International value

Utilitarian Value

As far as the practical or utilitarian value of the subject Mathematics is concerned no other subject of the School curriculum can surpass it. Not a single aspect of our life is free from its use. Its importance is next to that of mother tongue. People can go along without their mother tongue but not without calculations. Every one of us uses some Mathematics directly or indirectly in every form of our life.

Mathematics, is one sense, has bread and butter value. The vocations now cease to be empirical, banded down from one generation to another. One has to choose and train oneself in one or other vocation. With the advent of modern technology, Mathematics has been a living wire for one's contract to an occupation. The base of any vocation, however small or big it may be, is essentially economic and mathematical and therefore the knowledge of Mathematics is capable of opening gates to so many vocations.

Social Value

Mathematics is a subject of great social importance. It helps in the proper organisation and maintenance of our social structure. Society is the result of the union of individual. It needs various laws, mores and traditions for its perpetuation. Mathematics helps not only in the formation of laws but also their compliance. In fact the harmony, law and order and dynamicity prevailed in our society are all because of Mathematics. The world transaction, exchange, commercial trade and business depend on Mathematics. The means of transport, communication and so many scientific inventions and discoveries that have knitted the world into a family owe their existence to Mathematics.

Moreover, one can lead a normal social life only when he is able to adjust himself in the existing social set-up. Today our social setup or social existence is totally governed by the scientific and technological knowledge which can only be attained by the study of Mathematics. In fact the ignorance about Mathematics is the stumbling block in the progress of a nation or society. History of Mathematics openly reveals that whenever a country has given due weightage to the teaching of Mathematics it has made a tremendous progress. It is in this connection that great Napoleon once said, "The progress and the improvement of Mathematics are linked to the prosperity of the State."

Moral Value

Study of Mathematics does also help in character formation and moral development. What is needed in a man of strong character is not only germinated but also gets nourished through the teaching of Mathematics.

The qualities like truthfulness, honesty, purity of thoughts and cleanliness, justice, punctuality, duty boundness, patience, self-control, self-respect, self-confidence, respect for others' opinion, discrimination between good and bad, brevity and simplicity, in the expression of thoughts, observation of rules and belief in the systematic organisation and arrangement etc. which definitely contribute towards a strong character are automatically inculcated through the teaching of Mathematics. It happens because the problems in Mathematics, conform to moral action. In mathematics, right is right and wrong is wrong for ever. The answer always either wrong or right, it cannot be both right and wrong at the same time. As Metzler says, "Work must be either right or wrong and if wrong, the mistaken must be discovered". Mathematics helps in developing proper moral attitude as there is no place of prejudiced feelings, biased attitude, doubts and half-truths in the solution of problems in mathematics. In this way mathematics is the only subject which helps in impersonal analysis, correct reasoning and valid conclusions. One learns to put a reasonable check and control over one's emotions and feelings through its study.

Aesthetic value

Those who did not get proper opportunities to study mathematics have developed a wrong notion in their minds that mathematics is a dry and uninteresting subject. For the lover of mathematics, there is all

beauty, art, music and fineness in this subject. One's find a huge treasure of pleasure after getting success Pythagoras sacrificed hundred oxen to the Goddess for the celebrating his Archimedes had also forgotten his nakedness after discovering his principle. Just imagine the feelings of ownership and self confidence when one gets success after a long struggle in a mathematics problem. Specially when the answer tallies with the answer given in the book every student feels maximum satisfaction and derives the greatest pleasure.

Disciplinary Value

Mathematics does not only help in developing and controlling the faculties on an individual, it also equips him with proper intellect, reasoning and seriousness needed to lead a responsible life. That is why a mind trained through the study of Mathematics is more capable of leading a well disciplined life. Study of Mathematics is helpful in having constructive discipline. Every student of Mathematics is habitual to think properly without any unnecessary biases and prejudices.

Cultural Value

By culture of a nation or society we mean the mode of living of its inhabitants. The culture is reflected through how they live, behave, eat, drink and maintain their social relationship. The scientific discoveries, which owe their roots in Mathematics, are to a great extent, responsible for bringing changes in the mode of living and thereby the culture has been continuously influenced by the progress and improvement of Mathematics. Hogbent says "Mathematics is the mirror of civilizations." The history of Mathematics portrays civilization and culture of different countries at different periods.

1.8 THE PLACE OF MATHEMATICS IN EVERY DAY LIFE

Remove mathematics from daily life and all civilization will crumble down without this pillar. We have created such a mathematical system around ourselves that it is neither possible nor desirable to try to live without it Mathematics is the mainstay in our present day systematic life. Without numerical and mathematical evidence we cannot decide many issues in our day to day life. There are specified timings, measures, rates wages, tenders, discounts, demands, supplies, rations, quotas, contracts, marks, taxes, exchanges, capabilities, consumptions, targets, etc., which

impart a universal system to our daily life. In the absence of there mathematical specifications. We shall face chaos confusion and anarchy.

Mathematics is indispensable in any body's life long planning and day-to-day planning. A human being is always after gainful and increasing returns. A mathematical approach is essential for any progress. If any body wants to attain heights in his life, he must not fail to accept the role of mathematics in it.

Day to day evaluation in life or daily self-evaluation and over all life evaluation provide to us assessment, judgment, guidance and direction for the future.

1.9 THE PLACE OF MATHEMATICS IN THE SCHOOL CURRICULUM

Every body stands in need of some knowledge of mathematics. But in the case of an ordinary citizen, it is felt that the knowledge acquired during the primary and middle stage will suffice consequently there is some controversy over the place of mathematics in the school curriculum.

Some peoples are also of the view that mathematics is an exceptionally difficult subject i.e., its study demands special ability and intelligence. It is felt that every body is not capable enough to learn it successfully. Therefore, everybody should not be burdened with the study of this tough subject. References are also made to low pass percentage and heavy failures in this subject in examinations. These poor results also support the view that mathematics should be made an optional subject.

There appears some justification the view that mathematics should be made an optional subject at the high school stage. Since mathematics is primarily taught for its disciplinary values and mental discipline being a myth, no mathematics needs to be taught beyond the middle school stage.

It is also true that mathematics is indispensable in various sciences and professions. But everybody is not going to become an engineer or a statistician. "Only those who have to go to such vocations may continue to study it.

If we take a broader view of the situation, we can infer that the belief of the critics is erroneous.

Mathematics is a useful subject for most of the vocations and specialized courses. Although every body studying in the school is not going to become on engineer or a scientist but at a very early stage, it

may not be possible to determine finally as to who is not going to join a profession like that, therefore the duty, of the school is to give to the high school student a broad view of who he is capable of achieving in future. To deprive the student of the knowledge of the subject at the high school stage means narrowing the choice of semi vocational courses, preparatory courses, vocational courses and vocations for him. Ignorance of mathematics will be a great handicap in the way of his future studies and occupations.

When foreigners talk of making this subject optional they do so on a different footing. Their pupils are two years older at the high school stage. In India, the pupils at high school stage are too young and immature to choose subjects and vocations for them selves.

The parents being mostly illiterate are also not in a position to make any final choice at this stage regarding the future education and vocation of their children. Therefore, our business is to give to the high school student a broad of what may lie in future and to give him a course hereby he may be better able to make for himself a wise choice the matter of future education and occupation.

While keeping it 'compulsory the interests' of both types of students will have to be safe guarded. So the syllabus shall contain such subject matters is useful for those who are going to discontinue their education

1.10 OBJECTIVES OF TEACHING MATHEMATICS

The objective of mathematics learning should be to develop the appreciation for the multifarious advantages of the subject, its usefulness in choosing careers and courses, offering aesthetic satisfaction and stressing the evolution of mathematical thought. How physical sciences, biological sciences and social-sciences have gained gradual perfection with the aid of mathematics, should hold our attention to appreciate the wonderfulness of the subject in its various manifestations.

1. To develop a systematic and heuristic-like attitude, should be the objective of teaching mathematics to adolescents so that their creative and instinctive requirements are fulfilled to develop a 'scientific temper' among them.
2. Application of mathematical knowledge and power should be applied to new problems or questions in mathematics to uphold its applications objectives.

3. The objective of mathematics teaching should be to offer mental training for the sake of gaining wisdom, which is a great force to encourage reasoning and thinking among young boys and girls.

1.11 PROBLEMS RELATED TO MATHEMATICS TEACHING AND LEARNING

We should admit it frankly that the present day teaching of mathematics in our schools is far from satisfactory. This is not the fault of any single agency alone. The entire setup stands to be blamed for this.

Everybody has his own complaint against the teaching of mathematics. It is dull, boring, difficult and useless from the point of view of the learner. The teachers complain of excessive work load and lack of facilities in the form of aids and equipment. Headmasters and managements complain, "It is the fault of the teachers who do not make the students put in adequate labour"

1. *Teacher's Qualifications:* Most of the subject teachers are not adequately qualified. Only a properly qualified and trained teacher can do justice to the subject. The teacher must be mature in the subject. Only then he will enjoy self-confidence and act as a source of inspiration to his students.
2. *Teacher's Burden*: The teacher is overburdened on all sides. He cannot adopt and prepare for effective methods as he has no spare time. His burden does not allow him to pay individual attention. His extra and non-academic burden should be removed.
3. *Teacher's Salary:* His economic position is no good. He runs after other activities to supplement his income. He is a frustrated, discontented and half-hearted worker. In these hard days, he must be paid suitably.
4. *Teacher's Attitude:* (Most of the teachers do not have genuine love for their subject and profession) the teacher remains on the lookout for a better job and leaves the profession as soon as he gets a better chance. Only willing and devoted individuals should be recruited in this profession through a process of screening.
5. *Lack of Purpose:* The teachers and pupils do not recognize the purposes behind the study of various topics of Mathematics. The

particular and general aims of every topic should be made clear. The misconception should be uprooted from the minds of the parents and pupils that most of mathematics taught in the school is not purposeful.

6. *Lack of Equipment:* There is an acute absence of equipment. The establishment of mathematics laboratory will remove this defect.
7. *Method of Teaching:* The teacher clings to traditional methods because they are convenient for him. The remedy necessitates a fundamental change in the methodology. The teacher should not teach but guide.
8. *Rigour in Study:* The rules, formulae, and set patterns are strictly enforced. Classroom atmosphere should be charged with freedom and encouragement. The teacher should not be a hard task master, but should be a sympathetic friend, helper and guide
9. *Large Classes :* It is a general defect. It stands in the way of every improvement. It can be removed only by restricting admissions.
10. *Practical Aspect* :The practical and functional aspect of knowledge is ignored. The relations between mathematics and life should be discovered and emphasized.
11. *Syllabus :*It is heavy, lengthy and defective in many other ways. Another defect it that is does not provide hints and instructions for teacher's guidance. The teacher cannot do justice to the syllabus because most of the details are left to him. The syllabus should provide guidelines about the actual procedures to be adopted for.
12. *Text Books:* The authors have not been able to get rid of dogmatism and traditionalism. The text books are mainly written on dogmatic deductive and synthetic lines. They promote cramming. The text books should be prepared afresh to promote understanding, thinking, discovery, originality, induction, analysis and other recommended methods and techniques.
13. *The Students:* Some defects arise on account of the students also. The subjects demands regularity. If a student absent for a few days the sequence is broken and he fails to comprehend the subsequent steps. Similarly irregularity in home work also affects his progress adversely. Also the students form misleading notions about their ability in mathematics. It is the joint responsibility of' the home and the school to keep the student regular in attendance and home work. A proper approach should be adopted in its teaching so that only really intelligent pupils come to the forefront. To remove their nervousness and confusion, the teacher should try to develop self-confidence and sound study habits in them.
14. *Subject Centric Approach:* Teaching has more or less remained subject centred. Knowledge is thrust on the learner. It is presumed that all the students of a class have the same capacity; same aptitude, same interests, same power of understanding and speed of work. Individual differences of the children are completely ignored. Rather the whole process should be child centred. The child should not be subordinated to the subordinate to the subject. His interests, capacities, difficulties, aptitudes etc. should be the main consideration at every step in the teaching-learning process.
15. Libraries and Laboratories: The provision of mathematical libraries and laboratories is almost missing Adequate provisions should be made in these respects without further delay.
16. *Short cut Methods:* The use of short-cut methods has been banned totally. But these are of great value and should be re-introduced wherever possible.
17. *Examinations:* The teaching-learning has been totally dominated by examinations which are full of defects. The aim before the student is to get through the examination somehow. There is emphasis on guess papers rather than on real teaching and understanding. Examination is a matter of chance more in mathematics than in any other subject.

1.12 COMPUTER IN EDUCATION

Involvement in instructional computing in the school of education. Until the summer of 1979. Can best the described as typical of other large universities. Prior to 1978 most computing in education involved statistical work on a large main frame computer or involved the requiring of computing background for these persons in a new select area in education, typically prospective mathematics teachers or persons in academic programmes emphasizing statistical analyses of data for research purposes. At the undergraduate level only students preparing to be secondary mathematics teachers would have computing background. These students were required to complete at least one

course in "Computing" usually completed by taking the first course in computing science which includes programming in the Pascal language, using batch and interactive processing on a large main frame system.

The number of persons completing the secondary mathematics teacher certification programme has varied between five & ten per year and has constituted about five percent of undergraduates in both elementary and secondary teacher education. About 60 percent of graduate students typically would make use of computers but this involvement was almost exclusively statistical analyses for class assignment and to a much lesser degree for research purposes.

1.13 IMPORTANCE OF CAI IN SCHOOLS

Although it may not seem true in a world in which there is a high focus on television and movies, reading is more important in today's society than in the past. Children who have trouble reading transfer this difficulty into content areas, such as social studies, science, and mathematics word problems.

The increased use of computer technologies to deliver instruction is trend noted in research (Ely, 1991; Najjar, 1996). Computer use in the classrooms has boomed since the 1980's, fueling a debate over whether or not computer-assisted instruction (CAI) is an effective means of improving student achievement. CAI generally consists of drill and practice, simulating tasks, instructional games, and tutorials; Instruction can contain new material, and can be used alone or as an enhancement to traditional instructional methods.

Not many researchers dispute the idea that computer technology in the classroom enhances teaching and learning; however, there is a debate as to whether or not a direct link between motivation and academic achievement exists. Advocates of CAI claim that using CAI enhances learning through the overall positive motivational factors associated with technology integration into the curriculum.

1.14 COMPUTER ASSISTED INSTRUCTION

Course is detail the theory, design development implementation and evaluation of computer assisted instruction materials work on both main frame and micro-computers is done in this course. Typically this course attracts students with some background in computing. Some exposure to programming and some background in instructional design.

This course is offered once per academic gear and is designed for person designing in-depth work in the development of computer based instructional materials. It is anticipated that there will be in creating demand for this course.

The design of computer –assisted instruction lessons and interactive systems will be studied students will be asked to design asset of computer – assisted lessons for class roomncice.

The focus is on helping the instructions learn to choose and use good application software in their classroom and to use the computer as a management tool. The following topics are coursed in the in the foundation block for elementary and secondary educational.

1. Computer managed records

(*a*) Grade book

(*b*) Test banks of question

(*c*) Achievement records

2. Drill and practice materials

3. Tutorials

4. Entire curriculum packages

5. Video/ computer interface

6. The computer as an exploratory tool.

7. Software evaluation and selection.

1.15 MATHEMATICS SKILLS THROUGH THE USE OF A COMPUTER BASED INSTRUCTIONAL SIMULATION GAME AND ADVISEMENT

This study looked at the effect of contextual advisement and competition on transfer of mathematics skills in a Computer Based Instructional simulation game and simulation in which game participants helped their "aunt and uncle" fix up a house. Result indicated that non-competitive conditions may be best for transfer learning and that high-contextual advisement (video) may promote transfer.

It is also intended to address three major issues within the body of research on the efficacy of CAI: (a) an aging body of literature; (b) the greater effectiveness of using CAI as a supplement to conventional instruction; and (c) the alleged superiority of CAI over conventional

instruction. The authors conclude that, due to potential shortcomings in some past research comparing CAI as remedial measure with conventional instruction, CAI should be considered to be at least as effective as conventional instruction. Next, they conclude that new studies are needed to clarify the effects of CAI in contemporary student/computer environments. Finally, they conclude that how CAI is delivered can impact its effectiveness.

There has been a dramatic increase in the capabilities of computers, along with reduced cost, that has influenced in increase in the various forms of Computer Delivered Instruction. This increase has been seen in education as well as in other disciplines. This increase has been seen in education as well as in other disciplines. Throughout the 1980's and 1990's computers have been generally heralded as being an effective teaching methodology (Christmann and Badgett, 2000). However, this "heralding" may still lack adequate research in discussing the status of technology use in mathematics education.

1.16 CAI AS A SUPPLEMENT

Using CAI as a complete replacement for conventional teaching may seriously weaken its effectiveness (Kulik and Bangert-Drowns, 1983). CAI is not often used in this way, but Hartley (as cited in Kulik and Bangert-Drowns, 1983) managed to locate a few studies in which CAI totally replaced conventional teaching.

Why do the Students Like CAI?

An earlier section of this report offers research evidence showing that CAI enhances student attitudes toward several aspects of schooling. Some researchers took these investigations a step further by asking students what it is about CAI that they like. The following is a list of reasons given by students for liking CAI activities and or favoring them over traditional learning. These student preferences also contribute to our understanding of why CAI enhances achievement.

Students say they like working with computers because computers. :

- Are infinitely patient
- Never get tired
- Never get frustrated or angry
- Allow students to work privately

- Never forget to correct or praise
- Are fun and entertaining
- Individualize learning
- Are self paced
- Do not embarrass students who make mistakes
- Make it possible to experiment with different options
- Give immediate feedback
- Are more objective than teachers
- Free teachers for more meaningful contact with students
- Are impartial to race or ethnicity
- Are great motivators
- Give a sense of control over learning
- Are excellent for drill and practice
- Call for using sight, hearing, and touch
- Teach in small increments
- Help students improve their spelling
- Build proficiency in computer use which will be valuable
- Eliminate the drudgery of doing certain learning
- Activities by hand (e.g. drawing graphs)
  Work rapidly closer to the rate of thought.

1.17 COMPUTER ASSISTED INSTRUCTION (CAI) AS INTERACTIVE INSTRUCTION

Computer Assisted Instruction (CAI) is an interactive instructional method that uses a computer to present material, track learning, and direct the user to additional material which meets the student's needs. It can be used to describe Internet based instruction through the use of web pages, web bulletin board's and news groups, video and real audio, graphics, and hands-on applications. Additionally, self-teaching programs on CD-Rom or the emerging DVD round out the group of available forms of CAI.

1.18 FORMS OF COMPUTER- ASSISTED INSTRUCTION

Computer Assisted Instruction makes use of multimedia software in the learning process including text, video technology, graphics, sound

and Internet technology. Computer Assisted Instruction is heavily used in the growing field of distance education. Traditionally, Computer Assisted Instruction, like programmed instruction, has been linear in nature.

1.19 CAI AND WEB-BASED INSTRUCTION

Computer Based Instruction has been used several years especially in independent study and distance learning.

Computer Based Education (CBE) and computer-based instruction (CBI) are the broadest terms and can refer to virtually any kind of computer use in educational settings, including drill and practice, tutorials, simulations, instructional management, supplementary exercises, programming, database development, writing using word processors, and other applications. These terms may refer either to stand-alone computer learning activities or to computer activities which reinforce material introduced and taught by teachers.

Computer Assisted Instruction (CAI) is a narrower term and most often refers to drill and practice, tutorial, or simulation activities offered either by themselves or as supplements to traditional, teacher directed instruction.

Computer Managed Instruction (CMI) can refer either to the use of computers by school staff to organize student data and make instructional decisions or to activities in which the computer evaluates students' test performance, guides them to appropriate instructional resources, and keeps records of their progress.

Computer Enriched Instruction (CEI) is defined as learning activities in which computers (I) generate data at the students' request to illustrate relationships in models of social or physical reality, (2) execute programs developed by the students, or (3) provide general enrichment in relatively unstructured exercises designed to stimulate and motivate students.

1.20 TEACHER IN CAI

Though the strategy spins around self learning the teacher plays a vital role in the whole set up. Her role is more than of a friend, philosopher and guide. In fact, his/her very attitude to the subject and the process is a great influencing factor on the students and their achievement through strategy he/she has to be ever vigilant to the level of need for help of the individual, encouraging, helping at every stage,

building up the right attitudes of thinking and work in the students. Thus the effectiveness of the system depends on how organized and enthusiastic the teacher is in the classroom.

What can CAI do?

In a CAI system, the computer stores the lesson in memory and enters into a dialogue with the student. During the interaction the computer presents information, invites answers to the questions, maintains records of student's responses, and provides feedback on performance. The system can also generate and score tests, provide study prescriptions, keep record of study paths and generate reports of course, the entire thing a good teacher can do.

Modes of CAI

The various forms that CAI can take are called modes. The common modes of CAI are drill and practice, tutorials, simulation, modeling, problem-solving and gaming.

Drill and Practice

This mode is designed to teach basic facts, for example, the elementary arithmetic operations. The student is asked to type in answers to questions and the computer tells him about the correctness of his response. The pupil is presented with more questions until the material is committed to memory. Control of learning rests with the computer since it initiates and controls the student's activity. Although drill and practice programmes might help student's memories facts and information they can go beyond this and ask questions which involve the use of procedural knowledge to supply answers and provide reinforcement and feedback. This mode of instruction is very helpful for learning mathematics as meaningful drill and practice plays an important role in fixing the mathematical concepts, rules and formulae in the minds of the students.

Tutorial

Tutorial is used to teach basic concepts or methods. The tutorial type utilizes written explanations, descriptions, questions, problems and graphic illustrations for teaching concepts much like a tutor. Tutorial mode is very useful when students show varying levels of conceptual

understanding and it can provide for individual tutoring needs that may be difficult to satisfy through traditional instructional arrangements. A computer presents information taking into consideration individual differences on aspects like level of understanding, background knowledge and information needs. The computer specifies the tasks and on submission of answers by the student, the computer checks and provides feedback. Control of the learning situation rests with the computer.

Simulation

Simulation deals with the representation of an event, system or equipment. This is an excellent mode which enables students to investigate and experiment with system and processes which are complex, dangerous and expensive. It has the unique ability to compress time and produce expensive, delicate or dangerous systems and equipment. Students can use the pre-stored data or their own date. Simulations allow students to investigate the optimum conditions fro carrying out a particular process and again an appreciation of the situation and constraints.

Modeling

Computer programs can be used to build complex mathematical models and explore them quantitatively, rapidly and in great detail. It is also easy to compare alternative models and investigate their relative behaviour with respect to any parameters.

Problem Solving

Computer provides a wide variety of problems and allows the student to focus on the synthesis of ideas and skills that lead to the solution of problem.

Educational Gaming

Educational games can be programmed where the student is placed in a competitive position with either another student or the computer itself. These are best suited to teach rules, procedures etc.

Steps in Developing CAI

The steps in developing CAI are more or less the same as those of PLM and are listed below.

(*a*) Planning

(*b*) Preparation

(*c*) Testing

Planning

Planning a lesson for CAI involves making decisions about the following aspects.

(*i*) Nature of the target group for whom the instruction is planned:

(*a*) Their age,

(*b*) Previous level of achievement

(*c*) Medium of instruction.

(*ii*) Nature of the topic

(*a*) Potential for paced, sequenced learning

(*b*) Scope for using illustrations

(*iii*) Length of the topic: Neither too long nor too short

(*iv*) Nature of the programme

(*a*) User friendly

(*b*) Opportunities for interactive learning

(*c*) Visual / graphical presentation

(*d*) Programming language

Preparation

Preparation of the lesson for CAI involves the steps listed below.

(*i*) Stating the objectives.

(*ii*) Structuring and organizing the lesson pedagogically.

(*iii*) Writing the program

(*iv*) Editing.

Testing

The programme is to be tried out and its effectiveness assessed with respect to the following:

(*i*) Program contents

(*ii*) Content presentation and arrangement of structure

(*iii*) Learner's motivation

(*iv*) Graphic presentation

Essential elements of educational software.

Learning Sequence of CAI

Kemp and Smellie (1989) has listed the following as the learning sequence of CAI:

1. Orientation information: The teacher outlines the topic and presents the objectives verbally
2. Directions and procedure: The directions embedded in the software are read and understood by the student.
3. Learning procedure: The students familiarize themselves with the learning procedure.
4. Answering questions: The students actively participate by answering questions and evaluate the realization of the objectives.

Feedback: The student's responses are confirmed and immediate feedback is given.

Remedial instructions: Remedial instruction is provided whenever it is necessary with supplementary materials and references.

Choosing the next learning sequence: Student choose the direction for the next step to be taken i.e., to go to the next unit, or go back to the original unit or exit from the program.

1.21 BENEFITS OF CAI

1. The benefits of CAI can be enumerated as under.
2. CAI enhances quality of education and saves instructional time.
3. It is interactive and involves the student actively in the learning process.
4. Learning is student-based and self-paced.
5. Learning is more private and the reinforcement and refinement are immediate.
6. CAI is instructor- independent and hence it is consistent, well structured and thorough
7. The system can simulate complex problems and permit students to explore and investigate.

8. CAI is best suited for remedial teaching
9. CAI saves time for teachers and they can devote more time for creative work.
10. CAI is particularly helpful for slow learners.
11. The graphics facility is a powerful aid in enhancing intuition, especially in giving insight into mathematical formulae.
12. CAI is useful for distance learning and continuing education programs.

1.22 NEED OF THE STUDY

We are teaching mathematics on compulsory basis throughout the school stages because of its multifarious and many sided values to human being. National policy of Education (1986) remarkably suggests that --"Mathematics should be visualized as the vehicle to train the child to think, reason, analyse and articulate logically." Attainment or achievement in mathematics is based on mastery of fundamental skills. The new curriculum in Mathematics at secondary school level demands for rapid learning and clear understanding of new curriculum. In this curriculum more concepts, theories, theorems, Principles, Axioms, Postulates, formulae have to be taught and students have to be trained in solving numerical problems.

The researcher had observed the achievement of the students in Mathematics at secondary school level. The achievement of some students may be cent percent in mathematics and at the same time the rate of failure in Mathematics and in different examinations is considerably higher than the other subjects.

Moreover students who is learning Mathematics as compulsory subject has not only to cope with mechanical problem solving but also the problem of drawing, arranging, construction, identifying figures, as demanded by the occasion keeping these requirement of the students learning geometry the present work was undertaken.

Although recent years have seen a significant growth in the development and use of computer aided instructional packages, much less materials is available for teaching mathematics than for other subjects however they are many mathematical programmes using a drill and practice format. These are common in today's school. Unfortunately they are not congruent with our current understanding of how to foster the skills in children.

There is a need of designing educational programs as all curricula, with specific target goals and desired out comes in mind. The goals must be considered before and not after the producing the development.

The methodology being proposed in this study is simply a new application based on techniques that have long been a part of conventional instruction. Considering the complex nature of subject and lack of quality software, there is an acute need for developing a computer software that could aid children in developing skills in geometry. The use of computers for this purpose has certain advantages like inter activity, motivation, self learning etc., To exploit the application of computers for guiding students in developing skills in geometry is hence timely.

Statement of the Problem

"DEVELOPMENT OF COMPUTER ASSISTED INSTRUCTIONAL MATERIAL FOR REMEDIAL MEASURES IN GEOMETRY".

1.23 OBJECTIVES OF THE STUDY

1. To study the relative effectiveness of Computer Assisted Instruction and Traditional Instruction in Geometry.
2. To construct and development of Computer Assisted Instruction as remedial measures in Geometry.
3. To tryout and evaluate Computer Assisted Instruction in terms of student performance.

1.24 OPERATIONAL TERMS

During the course of investigation some technical terms have been used with specific meaning and purpose. They are defined as follows.

Diagnostic Test

It is the process of identifying the difficulties, short comings, gaps in knowledge and hard spots in learning. The term is used to identify the learning difficulties in geometry.

Remedial Measures

Remedy in general term compared to word 'therapy'. It is additional instructional training given to students with learning difficulties.

Conventional Method

It is a teacher centred method with a due weight age given to chalk and Talk. Teaching lessons using charts, maps and models.

Experimental Group

A sample of particular group to whom computer assisted material is provided.

Pretest

A test to be given to students before taking training. It is to know the effect of conventional method.

Post Test

A test to be given at the and of taking training (After CA1 to Experimental group).

Computer Assisted Instruction

It is a general term that refers to learning situation in which the students interact with the course of students; aimed at achieving certain instructional goal with the use of computers. It is an instruction delivered directly to students by allowing them to interact with a lessons programmed in to the computer system.

Content Analysis

The detailed studies of each unit of the subject. Each part of unit is called content.

Flow Chart

Diagrammatic representation of the solution to a problem using symbols which is then translated to a computer language.

Harware

The physical equipment that makes up a computer system.

Instructional Program Development

The process of analyzing needs, determing what content must be mastered, designing materials to help reach the objectives, and trying out.

Instructional Module

A free standing instructional unit, usually used for independent study.

Software

A general term for the programs and supportive documentation that are used in conjunction with computers and other data processing systems.

1.25 SUMMARY

The research based on the review of the preparation for this report indicates that :

The use of CAI as a supplement to conventional instruction produces higher achievement than the use of conventional instruction alone.

Research is inconclusive regarding the comparative effectiveness of conventional instruction alone and CAI as remedial major.

Computer-based education (CAI and other computer applications) produce higher achievement than conventional instruction alone.

Students learn material faster with CAI than with conventional instruction alone.

Students retain what they have learned better with CAI than with conventional instruction alone.

The use of CAI is associated with beneficial outcomes, including greater internal locus of control, school attendance,motivation/time-on-task, and student-student cooperation and collaboration than the use of conventional instruction aloe.

1.26 CONCLUSION

It should be treated as concomitant to any subject involving analysis and reasoning with the recent introduction of computer in schools, Mahithi Sindhu (2001) the newly launched educational programme to introduce computer education in high schools of Karnataka State. On par with the guidelines given by NPE (1986) and to teach Mathematics suitably based on modern technological devices. Hope that, this research will help the teachers and the students to better use the Computer Assisted Instruction for improving the achievement and develop skills, retention powers in Geometry.

Chapter-2

REVIEW OF RELATED LITERATURE

2.1 INTRODUCTION

A research work is not meaningful without a thorough analysis of related works. Such related literature should be completed before proceeding with the actual conduct of the study. According to J.W Best fabularity with the literature in a problem area helps the research to discover what is already known, what others attempted to find out, what method attacks have been promising and what problems remain to be solved.

A careful review of the research journals, books, dissertations, theses and other sources of information's on the problem to be investigated in one of the important steps in the planning of any research study. So, extensive use of the library and thorough investigation of related literature are essential in planning and carrying out the kind of searching involved. The present study is on attempt to develop computer software package for teaching Mathematics to class IX standard students.

2.2 STUDIES ON THE DEVELOPMENT OF SELF STUDY MATERIALS (PROGRAMMED INSTRUCTION MATERIALS, INDIVIDUALIZED INSTRUCTIONAL MATERIALS) OVER CAUSATIONAL METHODS

Between 1960 and 1970's many individualized systems were developed for all novels of education in many developed countries. There systems were used in college classrooms for the first time in the USA and they were used once again in elementary and secondary schools. Besides the individualized instruction programmes mentioned earlier, individualization of rate of instruction has been achieved to a high degree in "probing the natural world". A junior high school curriculum

developed by the intermediate science curriculum (ISCS) at Florida state University some additional individualization of content has also been accomplished through remedial and enrichment "excursions" in ISCS course, which showed positive results (Monill, 1971).

Krishnamurthy (1972) developed a programme in programme in physics on "Thermometer Kapadia (1972) developed and validated a programme in physiology on "Heart and Blood circulation". In English as well as in Gujarati. The findings of all these studies revealed that the group taught through the programmed material achieved higher on the past test as compared to the group which was taught traditionally. These findings were not limited to the Urban areas only. The studies by shama (1969) included samples from rural areas also. The study conducted by SIN (1979) confirmed the findings of above researchers.

Cowan auto – instructional materials were revised for PSSC (1965 second edition) test by siddigai (a) 1973, (b) 1974 at Florida State University in 1972 which he later used in his 1973 research study. "An analysis of the effectiveness of the use of auto – Instructional materials in the teaching of PSSC physics by qualified physics teachers". He found that students using providing support to SIM and individualized programme. Gagne (1974) stated that teaching may, most commonly, be a group activity but learning taken place within an individual. This observation places emphasis on the internal conditions of learning. Viz. the students desire to learn. Willing on to follow directions, attention to the task, attempts to recall relevant information or skills, and receptivity to guidance from teacher. In their experiments in which various modes of self – pacing were compared with traditional methods. Arlen and Westhary (1976) and Koen (1973) reported results that favoured the use of self – paced materials. On the other hand, Hughs and Reid (1975) and Bensavi and Silberetan (1981) have reported finding that favored the conventional methods over the various individualized techniques used and yet many studies have shown no significant differences.

The occurrence of their conflicting results seems to suggest that different teaching strategies are effective for different types of students a course. After literally hundreds of studies therefore, the effectiveness of individualized elementary and secondary school teaching is still open to question. Some reviewers have pointed out a favorable picture of results; some reviewers have drawn negative conclusions. Favorable effects may restricted to certain methods certain fields of different

reviewers may simply be familiar with selected pasts of the literature of an rate, future studies and synthesis will have no explain with different reviewers disagree so sharply in their conclusions about elementary and secondary individualization.

With respect to personalized system of instruction (PSI) there is much research evidences that PSI is a more effective instructional method than the traditional technique (Kellar, 21968, Alba and panny pucker, 1972; Mac Nochael and Corey. 1969; writer and Kent, 1972) and within the PSI methodology there have been a number of improvements based on empirical research. However, very few studies have investigated the effect of combination of traditional methods with PSI on test performance only few studies on PSI have use lectures in their courses. For example, Sheppard and Mac Dermol (1970) and Born et. A1 (1972) employed lectures in combination with PSI but only for purposes of control. Some other like Keller (1968), liooyd, carlington, lowry, Burgen, Evler, knowthon (1969) found no evidence for reinforcing effect of lectures unless material related to subsequent tests was discussed during the lecture.

Despite their criticisms, the use of traditional method in education has continued with at least some degree of effectiveness. An important question then concerning these two instructional methods (TM, PSI) whether learning can be facilitated by combining various aspects of TM with PSI. Very few have suggested such combinations of traditional method and PSI on final examination scores. The variables investigated were use of lectures, group discussions, midterm examinations, mandatory laboratory projects and readiness tests. A comparison of final examination scores showed that the group received PSI combined with enrichment provided with TM scores significantly higher than did the group instructed only by PSI.

In our set up where there is a prescribed syllabus to be completed by each student and final external examination, completed individualization scores to be difficult but a combination of traditional and individualization of rate of instruction may be more effective.

According to Kalik (1982) current educational policies have resulted in more diverse classrooms and schools. Baring major change educational policy, it appears that in the eighties and nineties their classrooms and principal will be dealing with increased diversity within their schools. The tree most viable models for education of the individual in the

eighties and nineties appear to be remediation, diversified instruction and diversified instructions with multiple objectives. Individualized instructions could include all these.

At NCERT, Mathur (1982-83) tried an alternative to the present system which be called individually Guided system of Instruction (IGSI). In the IGSI programme the entire XI class physics syllabus of CBSE was split into 21 parts and 21 self instructional units were developed with the help of experienced physics teacher and educators. For each unit, the students were provided with a study guide containing introduction, objectives, suggested procedure for achieving the objectives, notes problems and self-assessment (mathur, 1983).

The IGSI was tried out for XI class physics in some selected public schools for a whole academic year. On comparison with traditional teaching of physics to class XI, it appeared what there favorable results were. In Delhi public schools the students results were almost the same in IGSI and traditional class. But remaining four experimental sections of Kendriya Vidyalaya, Delhi cantt, Kendriya Vidyalaya, Ambala Cantt, Navyug School Delhi and spring Dales School, Delhi showed 10, 15, 13 and 17 percent gain in marks respectively due to IGSI. The students reactions of IGSI were also reported favorable response to the questionnaire given. The students said that they gained a bit of self-confidence and mastery. Near the end of year two out of three students recommended IGSI to other students (Mathur, 1983). Some limitations of the study are also discussed development of such material can also be tried out in Biology.

Review of evaluation finding at the elementary and secondary levels are for less consistent in their conclusion about individualized system. Some reviewers have reported clear learning gains from individualized system, other reviewers have reported little, or no effect or even negative effects on learning from individualized system. Harkley (1977) carried out a Meta analysis of results of individually paced approaches in to mathematics instructions in elementary and secondary schools included among the studies and 51 on individualized systems. Those 51 papers report result from 139 separate compressional. Hartley in these studies is small, and effects are negative in approximately 30% of all studies.

Dasgupta, Dipti (1988), teaching School Economics by the personalized system of instruction (PSI). In this study, PSI was used as a method for teaching Economics at class IX (school level) to obtain

specific results. The sample consisted of 50 students from class IX of a school situated at chandanagar in the dist Hooghy, west Bengal. The sample group belonged to the age of 14-15 years. The sample group was divided in to 2 equivalent steps – PSI and CLP. The 2 steps were taught separately by the same teacher with equal consideration. In this study the traditional lesson plan method and the PSI method were used. The lesson plan method was used as the conventional method ANOVA and 't' value were used to treat the data. The major findings are:

The Major Findings Are

1. There was a significant difference between PSI and CLP steps in six limit and tests out of a total of 15 unit end tests.
2. On comprehensive retention and attitude tests, there was the significant difference between the two steps.

Nagar, (19880 HAS EXAMINED THE USEFULNESS OF COMPUTERS IN TEACHING Mathematics, which can be taught more effectively through computers and the status of computer aided teaching of mathematics.

Singh, (1988), The effect of the objective based, RCEM system and the personalized system of instruction in physics. The study has compared the effect of the objective based system, PSI and the traditional method on the total cognitive achievement of students.

Joshi, Manju (1988) : A study of the effect of test anxiety and intelligence on the performance of high school students and a segment of science, followed programmed instruction in linear and branching stules. The study had developed linear and branching formats in a segment of sciences and to compare their efficacy. The study was conducted on a target population of class X students of high and Sr. sec schools in simla (h.P). The findings are:

1. Low test anxious students performed significantly better than high test anxious students on the criterion test after being taught through PI material.
2. Both linear and branching programmes formats were equally effective in embracing the achievement of the students.
3. The achievement of students with high intelligence and low-test anxiety was significantly better than the students with low intelligence and high-test anxiety.

4. Both linear and branching programmes were educationally effective for high and low test amicus students irrespective of their level of intelligence. There was no significant difference in the achievement of students with high and low intelligence, when taught through linear and branching programmes, irrespective of their level and anxiety.

The Findings Are

1. The objective based system was superior to the traditional method on total achievement of children in physics.
2. the PSI was better than the traditional method in respect of achievement on the knowledge and understanding objectives. Wangu, and Thomas, (1995) – Attitude towards and achievement in mathematics among high school students of tribal town of Aizawl.

The present study is designed to assess the attitude towards and achievement in mathematics among high school students of tribal town of Aizawl.

The Selected Objectives Were

To study the attitude of students of class – IX towards mathematics and to assess their achievement in it.

The sample of the study comprised 300 students, covering both boys and girls, studying in class IX of high schools of aizwal. They were selected on the basis of stratified random sampling technique. The tools used to collect the data included the achievement test in mathematics for class IX and the attitude towards Mathematics scale. The collected data were treated with mean, so and 't' value and coefficient of correlation.

The Major Findings of the Study Were

1. It was found that there was a significant positive correlation between the scores of attitude.

Attitude towards and achievement in mathematics for the total samples as well as the sub groups.

2. It was observed that on comparing the level of attitude towards and achievement in the mathematics for different subgroups it was found that the attitude towards mathematics did not differ significantly between the groups of students coming form the schools governed by different types of management.
3. It was found that a significant difference is the achievement in mathematics between the two sexes and between the students from mission schools and those from the Government and Deficit schools taken separately. This showed that the achievement of students from Government schools did not vary from that of the students from Deficit schools but the Mission schools students achieved better than both of there schools.

2.3 STUDIES IN CAI PROGRAM IN INDIA

Nagalakshmi, (1997) construction of a problem – solving ability test in mathematics for secondary students and study the problem solving abilities of students of class X in twin cities of Hyderbad. This study examines the construction of a problem – solving ability test in mathematics and also examines the problem –solving abilities of students of class X in twin cities of Hyderabad.

The Objectives Selected for the Study Were

1. to study the construction of problem- solving ability test in mathematics for class X students.
2. To study the relationship between problems – solving ability and demographic factors such as area, sex, community, parental occupation, parental income, parent's educational qualification and the category of schools.
3. To study the selection of sub – tests according to the required priority and weightages.
4. To establish the influencing factors in the development of problem – solving ability in mathematics, and
5. To diagnose the errors which contribute for reduction on problem – solving ability in mathematics.

This study was conducted on one thousand students of class X selected from schools of twin cities in and around Hyderabad using normative survey method tools used to collect the data included problem – solving ability test in mathematics and a personal data blank. The collected data were treated using mean S.D. critical ration, ANOVA and factor analysis.

The Major Findings of the Study Were

1. There was a significant difference in the problem solving ability in mathematics of students of rural and urban areas of favor of the later group.
2. There was no difference between the performance of boys and girls regarding problem – solving ability in mathematics.
3. The increase in parental income was associated with higher performance regarding problem – solving ability in mathematics.
4. The higher qualifications of the parents, the better were the performances of the students with reference to problem – solving ability in mathematics.
5. The subjects whose fathers were Gazelted officers or intellectuals excelled in performance with reference to problem – solving ability in mathematics.
6. The school climate influenced the performance of the students.
7. As indicated in factor analysis there was only one factor i.e., 'analysis of the problem' which was involved in all the five subtests.

Patel, Chatur (1996) – General anxiety

Defensiveness and the achievement in mathematics of the secondary school students. It is an attempt to study the general anxiety, defensiveness and the achievement in mathematics of the secondary school students.

The Objectives of the Study Were

1. To study the effect of general anxiety on the achievement in mathematics of secondary school students.
2. To study the effect of general defensiveness on the achievement in mathematics of secondary school students.
3. To study the sex difference on the achievement in mathematics of secondary school students, and
4. To study the interaction effect of general anxiety, general defensiveness and sex on the achievement in mathematics of secondary school students. The sample of the study comprised 293 secondary school students studying in class IX from Kaira District in Gujarat. They were selected through cluster sampling technique. The tools used to collect the data were general anxiety scale by Wallach, Achievement test in mathematics developed by the investigator and interview schedule prepared by the investigator. The collected data were analysed statistically with mean, so and ANOVA.

The Major Findings Were

1. The effect of general anxiety on the achievement in mathematics was found to be significant.
2. The effect of general defensiveness on the achievement in mathematics was found to be significant.
3. The sex difference on the achievement in mathematics was found to be significant.
4. There was no first order interaction effect of defensiveness and sex but there was significant interaction effect of anxiety and defensiveness. There was significant interaction effect of anxiety and sex.
5. there was no significant interaction effects of anxiety, defensiveness and sex on the achievement in mathematics.

Paria, Debasis (1996) – a comparative study of mathematical achievement of boys and girls at secondary level.

This study compares the mathematical achievement of boys and girls at secondary level.

The Objectives of the Study Were

1. To compare the achievement of boys and girls in mathematics at the Madhyamik level, and
2. To examine the gender variation, if any, in the performances in different items of the question paper and in different branches of mathematics, i.e., algebra, geometry, arithmetic menstruation and trigonometry.

The sample of the study comprised 1000 students (500 boys and 500 girls) of there, 30% belonged to semi – urban areas and the rest belonged to the rural areas. Achievement – cum – Diagnostic test in mathematics was used to collect the relevant data. The collected data were treated with mean, S.D and 't' test.

The Major Findings of the Study Were

1. It was found that girl students had mostly answered the theorem part correctly. Some of the boys answered the rider part correctly but many committed mistakes in answering the theorem part.
2. It was found that girls were better in answering the conventional problems in geometry. Further, it was observed that the variability of boys.
3. It was observed that girls answered conventional problems in greater number than boys, while the boys attempted all types of questions in greater number than girls.

Swarnarekha (1997) – Teacher empowerment strategies to promote problem – solving ability in mathematics through joyful active learning.

The study aims at investigating the inadequacies existing in the students of primary classes in the area of problem – solving ability.

The Objectives of the Study Were

1. To investigate the inadequacies existing in the students of class 11 in solving problems in mathematics.
2. To explore whether language plays any role in comprebending the subject area and if so how to interlink the competencies of mathematics with comprehension skills of language and other non – scholastic area.
3. To design and field test a series of joyful learning strategies for developing problem – solving ability, and
4. To study the effect of relationships between teacher empowerment and students performance and its effect on pupil attachment.

The sample of study included 200 students of class 11 from Bhuvaneswar to identify the inadequacies in the area of problem solving ability. Opinion of 30 primary school teaches were taken regarding the implementation of joyful learning strategies framed by interlinking the competencies of mathematics with some language skills and other non – scholastic area specially health education through games out side the classroom. The new strategies developed were tried out and a sample of 35 students of class 11 A and the results were compared with that of a controlled group of class 11 B of the same school.

Shusterman and Shusterman (1997) utilize molecular modeling in their general and organic chemistry courses, respectively. They have written an excellent article ab out teaching chemistry with electron density models, the philosophy behind why this is pedagogically important, and the chemistry. The article is complete with diagrams that illustrate the salient points. Since electronic structure affects molecular size, shape, bonding, stability, and reactivity, the introduction of computer-generated electron density models will help students begin to have a better understanding of the role that electron structure plays in chemical phenomena.

2.4 STUDIES OF CAI IN ABROAD

Martin (1998) has introduced molecular modeling into the undergraduate curriculum starting in Organic Chemistry laboratory and then proceeding through senior level courses in Advanced Organic Chemistry and Physical Chemistry. In the Organic Chemistry course students learn the theory behind molecular modeling, complete exercises in which they learn how to perform various operations, and then combine what they have learned with a laboratory exercise. The success of this integrated approach has been measured through moderate increases in tested competency and also rapid increase in enrollment in upper-level chemistry courses and an increase in the number of majors and minors.

Aplia is an online course and homework management system developed by Stanford economist Paul Romer in 2001 and first available for use in 2002. Because of its recent development, Aplia benefited from prior research and many of the suggestions to improve CAI have been incorporated into Aplia. The core elements of Aplia include:

1. Interactive content – problem sets, experiments, news analyses, and tutorials.
2. Digital edition of the textbook.
3. Easy-to-use course management system
4. Personalized customer support and,
5. Instant reports and grade book.

While Aolia has generalized course materials that can be used in many courses, the company also has developed materials for specific textbooks.

A study of student Evaluations and Academic performance, David collins etal (2008) computer aided instruction (CAI) encompasses a broad range of computer technologies that supplement the classroom learning environment and can dramatically increase a student's access to information CAI programs, which can include directed drills, practice exercises, and communication between students and teachers, can adapt to the abilities and preferences of individual students and increase the amount of personalized instruction a student receives. Students also benefit from the immediate feedback provided by computers and most of them appreciate the self-paced learning environment. At its best, CAI engages student interest, motivates them to learn, and increases their personal responsibility for learning.

2.5 PROPOSED RATIONAL

From the above cited research studies, it can be said that although majority of studies reported that computer aided instructions could improve the students achievement, it cannot be considered as a general conclusion. There are many variables that affect the achievement. Effectiveness of computer program interms of intended learning is the most important target instruction has to reach, whatever be the means of presentation once the instructional program is tested and its effectiveness is ascertained, proper ground for computer software design has to be decided.

A study of utilization of various computer assisted instructional method helped to select the appropriate method to be adopted for present program. When the task of preparing computer software is completed, it has to be tried out first at pilot testing stage and finally on the actual group. The next two chapters report the investigators attempt to pursue the above rationale and the software with proven effectiveness as remedial measure.

Chapter-3

DESIGN OF THE STUDY

3.1 INTRODUCTION

As discussed earlier in chapter-I, the main objective of the present study was to develop computer Assisted Instructional material for remedial measures in Geometry. Chapter-II provided review of related literature essential for design of the study. This chapter is devoted to development of diagnostic test and development of the computer software. It also includes the details of evaluation procedure followed there in.

Statement of the Problem

"DEVELOPMENT OF COMPUTER ASSISTED INSTRUCTIONAL MATERIAL FOR REMEDIAL MEASURES IN GEOMETRY".

3.2 OBJECTIVES OF THE STUDY

1. To study the relative effectiveness of Computer Assisted Instruction and Traditional Instruction in Geometry.
2. To construct and development of Computer Assisted Instruction as remedial measures in Geometry.
3. To know the significant difference between pre test and post-test scores of IX std students in the topic circles.
4. To know the significant difference between pre-test and post test scores of Ix std boys students in the topic circles.
5. To know the significant difference between pre-test and post-test scores of IX std girls students in the topic circles.
6. To know the significant difference between pre-test and post-test scores of IX std students in the topic polygons.

7. To know the significant difference between pre-test and post-test scores of IX std boys students in the topic polygons.
8. To know the significant difference between pre-test and post-test scores of IX std girls students in the topic polygons.
9. To know the significant difference between pretest and post test scores of IX std students in the topic Areas.
10. To know the significant difference between pre-test and post-test scores of IX std boys students in the topic Areas.
11. To know the significant difference between pre-test and post-test scores of IX std girls students in the topic Areas.
12. To know the significant difference between pre-test and post-test scores of IX std students in the topic Theorems on parallelogram.
13. To know the significant difference between pre-test and post-test scores of IX std boys students in the topic Theorems on parallelogram.
14. To know the significant difference between pre-test and post-test scores of IX std girls students in the topic Theorems on parallelogram.
15. To know the significant difference between post-test scores of IX std boys and girls students in geometry.
16. To know the significant difference between post-test scores of IX std boys and girls students in the topic circles.
17. To know the significant difference between post-test scores of IX std boys and girls students in the topic polygons.
18. To know the significant difference between post-test scores of IX std boys and girls students in the topic Areas.
19. To know the significant difference between post-test scores of IX std boys and girls students in the topic Theorems on parallelogram.

3.3 RESEARCH HYPOTHESES

1. There is no significant difference between pre-test and post-test scores of IX std students in geometry (total).
2. There is no significant difference between pre-test and post-test scores of IX std students in the topic circles.

3. There is no significant difference between pre-test and post-test scores of IX std boys students in the topic circles.
4. There is no significant difference between pre-test and post-test scores of IX std girls students in the topic circles.
5. There is no significant difference between pre-test and post-test scores of IX std students in the topic polygons.
6. There is no significant difference between pre-test and post-test scores of IX std boys students in the topic polygons.
7. There is no significant difference between pre-test and post-test scores of IX std girls students in the topic polygons.
8. There is no significant difference between pre-test and post-test scores of Ix std students in the topic Areas.
9. There is no significant difference between pre-test and post-test scores of IX std boys students in the topic Areas.
10. There is no significant difference between pre-test and post-test scores of IX std girls students in the topic Areas.
11. There is no significant difference between pre-test and post-test scores of IX std students in the topic Theorems on parallelogram.
12. There is no significant difference between pre-test and post-test scores of IX std boys students in the topic Theorems on parallelogram.
13. There is no significant difference between pre-test and post-test scores of IX std girls students in the topic Theorems on parallelogram.
14. There is no significant difference between post-test scores of IX std boys and girls students in geometry.
15. There is no significant difference between post-test scores of IX std boys and girls students in the topic circles.
16. There is no significant difference between post-test scores of IX std boys and girls students in the topic polygons.
17. There is no significant difference between post-test scores of IX std boys and girls students in the topic Areas.
18. There is no significant difference between post-test scores of IX std boys and girls students in the topic Theorems on parallelogram.

3.4 OPERATIONAL TERMS

During the course of investigation some technical terms have been used with specific meaning and purpose. They are defined as follows.

Diagnostic Test

It is the process of identifying the difficulties, short comings, gaps in knowledge and hard spots in learning. The term is used to identify the learning difficulties in geometry.

Remedial Measures

Remedy in general term compared to word 'therapy'. It is additional instructional training given to students with learning difficulties.

Conventional Method

It is a teacher centred method with a due weight age given to chalk and Talk. Teaching lessons using charts, maps and models.

Experimental Group

A sample of particular group to whom computer assisted material is provided.

Pretest

A test to be given to students before taking training. It is to know the effect of conventional method.

Post Test

A test to be given at the and of taking training (After CA1 to Experimental group).

Computer Assisted Instruction

It is a general term that refers to learning situation in which the students interact with the course of students; aimed at achieving certain instructional goal with the use of computers. It is an instruction delivered directly to students by allowing them to interact with a lessons programmed in to the computer system.

Content Analysis

The detailed studies of each unit of the subject. Each part of unit is called content.

Flow Chart

Diagrammatic representation of the solution to a problem using symbols which is then translated to a computer language.

Harware

The physical equipment that makes up a computer system.

Instructional Program Development

The process of analyzing needs, determing what content must be mastered, designing materials to help reach the objectives, and trying out.

Instructional Module

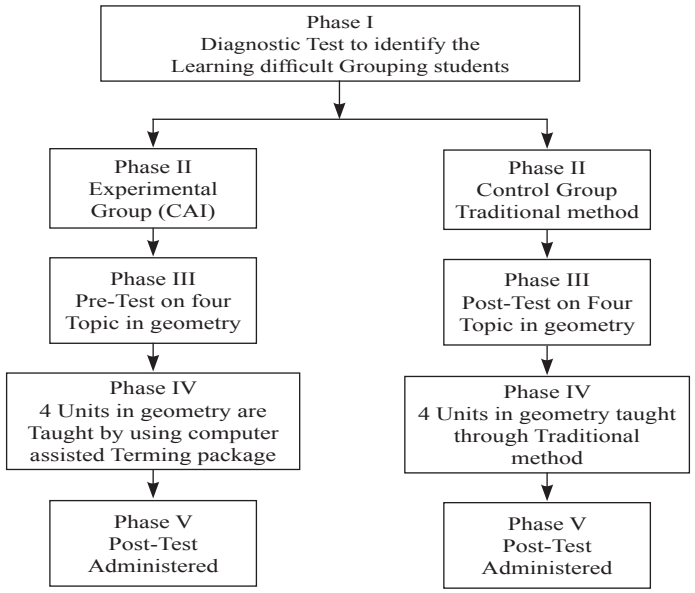
A free standing instructional unit, usually used for independent study.

Software

A general term for the programs and supportive documentation that are used in conjunction with computers and other data processing systems.

3.5 DIAGRAMMATIC REPRESENTATION OF THE STUDY

The procedure followed and the conduct of Experiment as shown below by a diagram.



The present study is an experimental design involving control group and experimental groups. The design of the study is as follow.

3.6 SELECTION OF THE UNIT

The opinions of mathematics teachers regarding difficult topics while learning was collected. The opinionaire was analyzed and four topics of IX std geometry syllabus was identified as difficult topics in learning. They are as bellow.

1. Circles
2. Polygons
3. Areas
4. Theorems on parallelograms

3.7 CONTENT ANALYSIS

Content analysis for the present topic was carried out so as to develop a suitable content structure that would go with the program. The content of the above four identified topics was broken down in to the elements for content analysis.

Content analysis of four identified topics is as follows.

Circles:

Define: A circle is a closed curve, every point on which is equidistant from a given fixed point.

Circle is the locus of a moving point constant in a plane such that it is at a constant distance from the given fixed point.

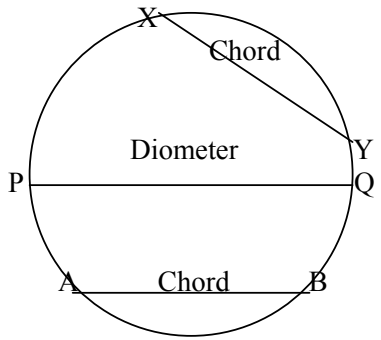
Ex: The wheels of cats, automobiles and trains are circular.

Parts of the Circle

Radius: The line segment joining the centre to any point on the circles is called the radius Radio is the plural of radius.

Circumference: The word circumference means the distance around the circle. It is the perimeter of the circle.

Diameter: A line segment passing through the centre of the circle and having its end position the circle, is called the diameter of the circle PQ is the diameter. Diameter is the longest chord of the circle.



PQ = Diometer

OP or OQ = radius

Diometer = 2 (radius)

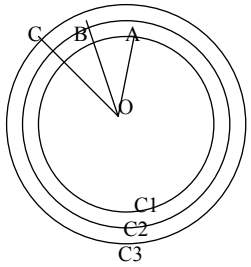
D = 2r

Radius = diameter/2

R = d/2

Concentric and congruent circles:

Concentric circles: These are circles, having the some centre, but different radic.



Circles C1, C2, C3 having the

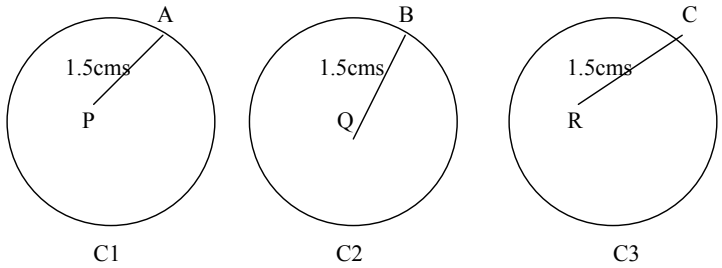
Some centre O and different radic

OA = 1.2 cms, OB – 1.8 cms

OC = 2.5 cms

Such circles are called concentric circles.

Congruent circles: These are circles having the some radic, but different centres.



Circles C1, C2, C3 having different centres P, Q, R and their radic are the some PA = 1.5cms QB = 1.5cms, RC = 1.5cms such circles are called congruent circles.

The chorc decides the circles in to two parts,

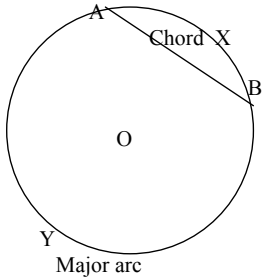
One smaller than the other.

(*i*) The smaller part is called the minor arc. It

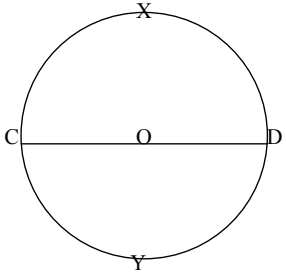
O is denoted by the symbol A X B.

(*ii*) The greater part is called the major arc. It is denoted by the symbol A Y B

Arc of a circle:



Semi circle: When a chord is a diameter of the circle, the two parts in to which it is divided are of equal size. Each part is called the semicircle C X D and C Y D is semicircles.



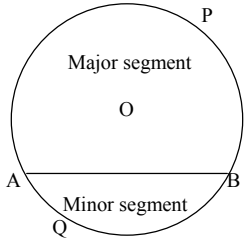
Segment of a circle:

(*i*) The part of the circular region includes by an arc and the chord is called a segment arc and the chord is called a segment.

(*ii*) The region bounded by the chord AB and the major are APB is called the major segment.

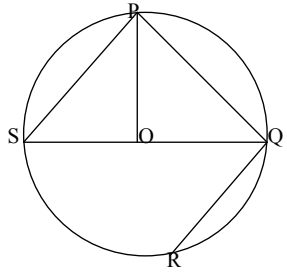
(*iii*) The region bounded by the chord AB and the minor are AQB is called the minor segment.

(*iv*) The region bounded by the diameter and the arc is called the semi circular region.



EXERCISES

1. Name the following with reference to the given figure.



(*a*) OP ____ P

(*b*) PQ ____

(*c*) SQ ____

(*d*) SPQ ____

(*e*) Shaded portion ____

(*f*) Conjugate of APQ ____

2. What is the length of the biggest chord of a circle of radius 4 cms ?

As: The length of the biggest chord of a circle is 2 twice its radius.

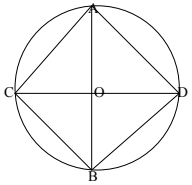
: Radius is 4 cms: Length of the biggest chord = 8 cms

3. Draw a circle of the decimeter 7 cms

4. Draw a circle with centre O. Draw two diameters and label their end points A, B, C, and D.

Draw the chorals that connect the end points of the Diameters.

Name the following.



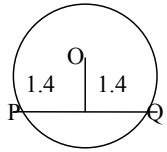
(*a*) Four pair of congruent triangle.
△ BDO congruent △ AOC
△ COD congruent △ AOD

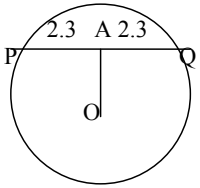
(*b*) a pair of parallel chords
AD & CB are parallel chords

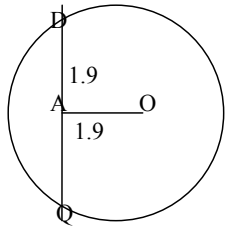
(*c*) Rectangle = ADBC

(*d*) Semicircle = CBD

CHORD PROPERTIES OF THE CIRCLE







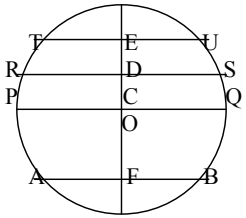
In each of the circles given below, PQ is the chord and OA is the perpendicular to PQ. The measure of PA and QA in each circle is equal.

i.e. PA = QA

So, In a circle, the perpendicular from the centre to the chord, bisects the chord.

Equal chords of a circle and their distance from the centre:

In a circle, you may have any number of chords, they all measure _____ Its distance from the centre is zero.



In the circle given below measure the length of the chords and their distances from the centre. Record the measurement in the table given along side.

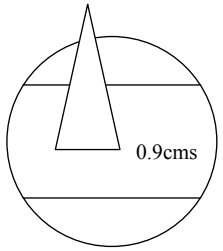
Sl. No	Name & Length of chord	Distance of chord from centre
1	PQ = ------	OC = -----
2	RS = ------	OD = -----
3	TU = ------	OE = ------
4	AB = ------	OF = -----

Notice that chords RS & AB are equal in length and are at equal distance in the centre (OD = OF). Hence we can say that, Euqal chords of a circle are equidistant from the centre.

They are equal in length

Chords of a circle which are equidistant from the centre are equal.

Draw a circle on a ruled sheet of paper using Set Square, draw two chords at equal distance, from the centre of the circle, Measure the lengths of the chords.



Exercise

1. In a circle, with centre O, the chords and their distances from the centre are given.

Arrange them according to the increasing order of their length.

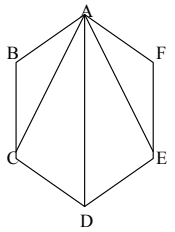
Name of chord	Distance	Arranged in increasing order
PQ	4.6 cms	0 cms
AB	3.6 cms	1 cms
XY	1 cms	2 cms
CD	2.1 cms	3.6 cms
MN	0 cms	4.6 cms

2. The length of chords AB, PQ, MN, DE and XY are 5.1cms, 2.9cms, 6.3cms, 4.5cms and 5.4cms.

Arrange them in decreasing order of their distance from the centre of the circle.

Polygons

A polygon is a figure enclosed by three or more line segments which are co-coplanar, non-collinear and intersecting each other at their and points.



Name of the Polygon

Triangle, Quadrilateral, Pentagon, Hexagon, Heptagon, Octagon, Nonagon, Decagon.

-----n-g on

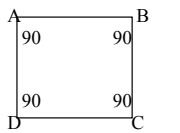
Diagonals of a polygon

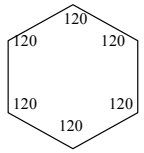
A line segment joining any two non-consecutive vertices of a polygon is called its diagonal.

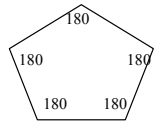
AC, AD, & AE are diagonals

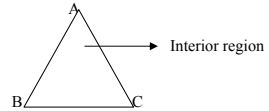
Regular polygon:

A polygon that is both equilateral & equiangular is called a regular polygon







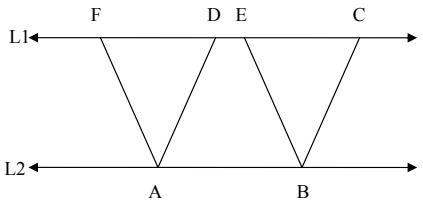


Interior region of a polygon

The interior region of a polygon is the part of the plane enclosed by the polygon.

Areas

1. Observe the two parallelograms ABCD and ABEF



These two parallelograms stand on the some base AB they stand between the some parallel lines L1 & L2.

The area of these two Parallelograms Realest to Each Other

▱ gm ABEF b = ____cm b = ____cm A = ____square

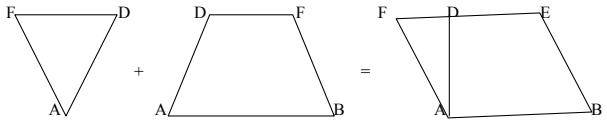
▱ gm ABCD b = ____cm b = ____cm A = ____square

From the above calculations of the areas of ▱ gm ABEF and ▱ gm ABCD, you will find that their areas are equal.

: parallelograms standing on the some base and between the some parallels are equal in area.

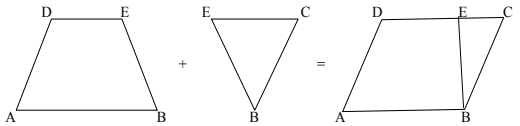
Let us Verify it by doing the Following Activity

Trace the figure ABCF on a sheet of paper cut triangle ADF, triangle BCF and two sets of trapezium ABED place triangle ADF on triangle BCE observe that they comcide. They are congruent triangles and have the same place triangle AFD by the non-parallel side of the trapezium ABED. The figure obtained is parallelogram.



:△ AFD + Trap ABCD = ▱ gm ABEF

Now place triangle BCE by the non-parallel side of the trapezium ABED observe that you get a parallelogram.



: Trap ABDE + △BCE = ▱gm ABCD

Area of ▱ gm ABEF of ▱ gm ABCD when equals are added to equals the wholes are equal axiom

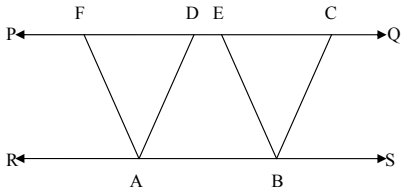
: Verify by placing ▱ gm ABEF on ▱ gm ABCD.

They coincide.

Hence we can conclude that the two parallelograms standing on the some faze & between the some parallels are equal in area.

Logical Proof

Parallelograms standing on the some faze and between the some parallels are equal in area.



Data: Parallelograms ABCD and ABEF stand on the same base AB and between the same parallel lines PQ and RS.

To prove: Area of ▱gm ABCD = Area of ▱gm ABEF

Proof: In △s ADF & BCF

AF = BE ------- [opp sides of ▱ gm ABEF]

∟AFD = BEC ------ [corresponding angles]

∟ADF = BCE ----- [corresponding angles]

: ∟FAD = ∟EBC ------ Remaining angles of the triangle

: △ ADF = △ BCE ----- ASA postulate

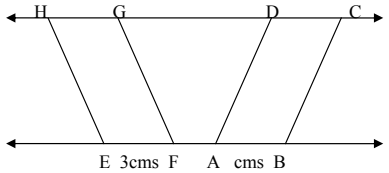
: area of △ ADF = area of △ BCE --- congruent s have equal areas

: area of △ ADF + area of ABED = } Adding quadrilateral ABED to both △

Area of △ BCE + area of ABED = }

: Area of ▱ gm ABEF = Area of ▱ gm ABC

Corollary based on the theorem on area of parallelograms.



Parallelograms ABCD and EFGH are standing on equal bases and between the same parallels. Since they stand on equal bases and their attitudes are equal. Logically it follows that area of ▱ gm ABCD = area of ▱ gm EFGH.

Parallelograms standing on equal bases and between the same parallels are equal in area.

If a triangle and a parallelogram stand on the same base and between the same parallels, the area of the triangle is equal to half that of the parallelogram.

Triangles standing on the same base and between the same parallels are equal in area

Example 1 In the given figure.

AE = 10cm, B is the mid point of AE.

Area of ▱ gm ABCD is 60 sqcms

Find i) area of ▱ gm BEFC

(*ii*) area of ▱ gm ABFC

(*iii*) area of ▱ gm AEFD

(*iv*) area △ ACE

(*v*) attitude of gm ABCE

Given: AE = 10cms AB = BE (B is the mid point of AE) AB = BE = 10/2 = 3cm

Area of the ▱ gm ABCD = 60 sqcms

(*i*) ▱ gm BEFC and ▱ gm ABCD stand on equal base BE and AB and between the same parallels.

: area of the ▱ gm BEFC = area of ▱ gm ABCD

: area of ▱ gm BEFC = 60 sqcms

(*ii*) ▱ gm ABFC and ▱ gm ABCD stand on the same base AB and between the same parallels.

: area of ▱ gm ABFC = area of ▱ gm ABCD

: area of ▱ gm ABFC = 60 sqcms

(*iii*) ▱ gm AEGD and ▱ gm AEFD stand between the same parallels, hence their attitude are equal.

Base AE of ▱ gm AEFD = 2 X Base AB of ▱ gm ABCD

Area of ▱ gm AEFD = 2 X area of ▱ gm ABCD

Area of ▱ gm AEFD = 2 X 60

Area of ▱ gm AEFD = 120 sqcm

(*iv*) △ ACE and ▱ gm AEFD stand on the same base AE and between the same parallels.

Area of △ ACE = ½ X area of ▱ gm ABCD

Area of △ ACE = ½ X 120

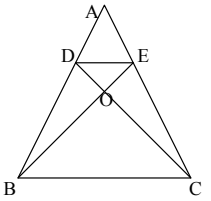
Area of △ ACE = 60 sqcm

(*v*) area of gm ABCD = 60 sqcm

b x b = 60

. s x b = 60

H = 60/5 h = 12 cm



Example 2: In the given figure prove that area of △ BOD = area of △ COE.

Soln : Given DE || BC

To prove: area of △ BOD = area of △ COE

Proof: △ DEB and △ DEC stand on the same base DE and between the same parallels DE and BC

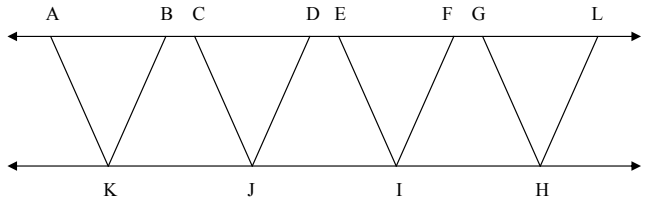
: area of △ DEB = area of △ DEC

: area of △ DEB - △ DOE = △ DEC - △ DOC

[if equals are taken from equals, the wholes are equal]

:△ BOD = △ COE

Exercise 1.1 (a)



In the figure given above identify and write the names of the parallelograms which are equal in area give reasons

▱ gm AKJC = ▱ gm CJIE = ▱ gm EIHG = ▱ gm FIHL = ▱ gm FIJD = ▱ gm DJKB

All the above parallelograms are equal in area, because they are standing on same base between same parallels.

2. In the adjoining figure, if BC = 12 cm and area of triangle EBC = 120 sqcm.

Find the area of the parallelograms

(*a*) BCEF

(*b*) ABCD

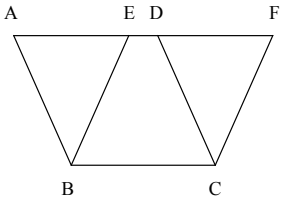
(*c*) Length of the attitude from A on B, C

(*d*) area of △ ECF

Soln

(*a*) ▱ gm EBCF = 2 EBC

▱ gm BCEF = 2 X 120
▱ Gm BCEF = 240 sqcm



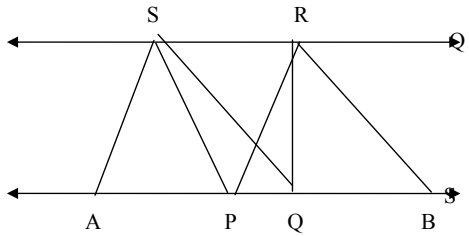
(*b*) ▱ gm ABCD = gm EBCF
▱ gm EBCF = 240 sqcms
▱ gm ABCD = 240 sqcms

(*c*) Length of the attitude from A on BC
area ▱ gm ABCD = 240 sqcm
b xb = 240 sqcm
120
b = $\frac{240}{b}$ = $\frac{240}{12}$ = 240 = 120 cm
b base 12

(*d*) area of △ ECF
area of ▱ gm EBCF = area of △ EBC + area of △ ECF
240 = 120 + area of △ ECF
Area of △ ECF = 240 – 120 = 120 sqcm

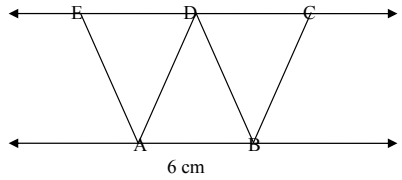
3. A rectangle and a parallelogram lie on the same base and between the same parallel lines. If the length and breadth of the rectangle is 12cms and 14cms reapectively. What is area of the parallelogram?
Area of ▱ gm = Area of rectangle
b x b = b x b Area of rectangle = 1685 sqcm
12 X 14 = 168 sqcm : area of ▱ gm = 168 sqcm
: A rectangle and a parallelogram standing on some base between same parallels are equal area.

4. In the given figure, parallelograms APRS, PQRS and QBRS are between the same parallels and AP = PQ = QB. If the area of parallelogram.
PQRS is 24 sqcm, find the area of ▱ gm QBRS.



▱ gm APRS = ▱ gm PQRS = ▱ gm QBRS
: Parallelograms on same bases between same parallels
gm PQRS = 24 sqcms
▱ gm PQRS = ▱ gm APRS
▱ gm APRS = 245 sqcms
▱ gm QBRS = ▱ gm PQRS
▱ gm QBRS = 245 sqcms

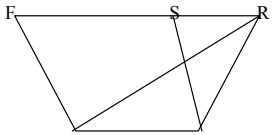
5. Parallelograms ABCD and ABDE are standing on the same base AB and between the same parallels. If the area of ▱ gm ABCD is 24 sqcm. Find



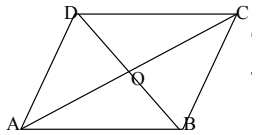
(*a*) area of ▱ gm AVDE
(*b*) Height of. ▱ gm ABCD
(*c*) Length of EC
▱ Gm ABCD = ▱ gm ABDE

They are equal in areas as they are standing on same base between same parallels
: area ▱ gm ABCD = 24 sqcm
: area ▱ gm ABDE = 245 sqcm
Height of ▱ gm ABCD
Area of ▱ gm ABCD = 24 sqcm & base = 6 cm
b x b = 24
b x b = 24
b = $\frac{24}{6}$ = 4 cms
: EC = ED + DC & ED = AB as opp sides of parallelogram are equal in length.
: ED = 6 cm & AB = DC
: DC = 6 cms
: length EC = 6 + ^ = 12 cms

6. Triangle PQR and ▱ gm PRST are on the same base and between the same parallels. If the area of triangle PQR = 12 sqcm. Find the area of gm PQST



Theorems on Parallelograms



Theorem 1A: The diagonals of a parallelogram bisect each other.

D C

Given: ABCD is a parallelogram.

AC and BD are the diagonals intersecting at O.

O To prove: AO = OC, BO = OD

A B

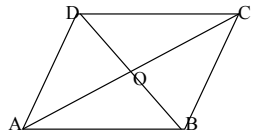
Ptoof:	Statement	Reasons
(*i*)	In △ s AOB & △ COD	
	AD = DC	Opposite side of parallelogram
(*ii*)	∟ AOB = ∟ COD	Vertically opposite angle
(*iii*)	∟ABO = ODC	Alternate angles
		AB || BD & BD is a diagonal
	: AOB congruent COD	ASA postulate
	: AO = OC & BO = OD	-Corresponding side of congruent

△ s

i.e. The diagonals of a parallelogram finest each other.

Theorem 1B

Each diagonal decides the parallelogram in to two congnent triangles.



Given: ABCD is a parallelogram is which AC is a diagonal.

: AB = DC, AD = BC

To prove:△ABC congruent △ ADC

A B

Proof:	Statement	Reason
(*i*)	AB = DC	Opposite side of the parallelogram
(*ii*)	BC = AD	Opposite side of the parallelogram
(*iii*)	AC is common	
	: △ ABC congruent △ ADC	S.S.S postulate

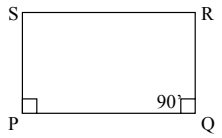
: Diagonal AC dicides the parallelogram ABCD in to two congruent triangles similarly by drawing the diagonal BD we can prove that

△ ABD congruent BDC

: Each diagonal dicider the parallelogram in to two congruent the triangle.

Corollary – 1

In a parallelogram if one angle is a right angle, each of the other angles is a right angle, then it is a rectangle.



Given: PQRS is a parallelogram

To show: PQRS is a rectangle

Proof: Statement Reason

LQ = 90' given

LQ = LS = 90' ⟶ Opposite angles of the parallelogram PQRS

LQ + LR = 180' ⟶ Sum of the consecutive angles of a parallelogram PQRS is Equal to 180'

90' + R = 180' ⟶ by substation

: R = 180'-90' ⟶ By Transposing

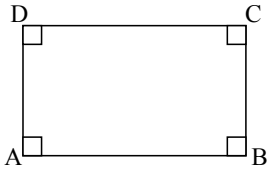
: R = 90' ⟶ : 2) ∟ P = 90' opposite angles of the parallelogram

: ∟ P = ∟ Q = ∟ R = ∟ S = 90' From above of us

Hence PQRS is a rectangle

Corollary – 2

In a parallelogram, is all the sides are equal & all the angles are equal then is a square.



According of property of square if all the side are equal &

Angle are equal in a parallelogram, then it is a square.

Corollary – 3

The diagonals of a square are equal and bisect each other perpendicularly/

Given: ABCD is a square

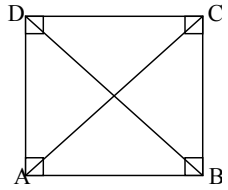
AB = BC = CD = AD

∟ A =∟ B =∟ C =∟ D = 90'

To prove: i) AC = BD

ii) AO = CO, BO = DO

iii)∟ AOB =∟ DOD = 90'



Proof: Consider the △ ABD & △ ABC

(*i*) AD = BC Sides of the square
∟ BAD = ∟ CAB = 90' ABCD are equal
AB is common Angles of the square ABCD are equal
: △ ABD congruent △ ABC S.A.S postulate
: AC congruent BD Congruent part of c△ngruent

(*ii*) AD = CO, BO = DO
Consider the △ s AOB and DOC
Are equal AB = DC ⟶ opp side of the square ABCD
DAB = OCD ⟶ Alternate angle AB || DC
ABO = CDO ⟶ Alternate angle AB || DC
: △ AOB congruent △ DOC ⟶ ASA postulate
: AO = CO, BO = DO
Hence diagonals of a square bisect each other.

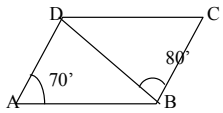
(*iii*) ∟ AOD = ∟ COD = 90'
Consider the △ AOD and △ COD
AD = CD ⟶ sides of the square ABCD are equal
AO = CO
DO is common
: △ ∟ AOD congruent △ ∟COD – S.S.S postulate
: ∟ AOD = ∟ COD – C DC T
But ∟ AOD + ∟ COD = 180' ⟶ linear pair angle
: ∟ AOD = ∟ COD = 90'
Hence the diagonals bisect each other at right angles.

Corollary-4

The straight lines segments joining the extremities of two equal on parallel line segments on the some side are equal & parallel.

Given: In the figure AB = DC and AB || DC, AD & BC are joined.
To prove that AD = BC & AD || BC
Construction: Join AC, prove this corollary using S.A.S postulate of congruency of △les.

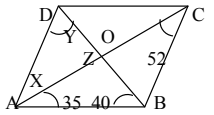
Ex: 1 In the given figure, ABCD is a parallel gram in which ∟ DAB = 70' & ∟ DBC = 80' calculate the angle ∟ CDB & ∟ ADB



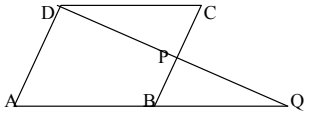
Given: ABCD is a parallelogram

AB = DC, AD=BC AB || DC, AD || BC 80'
∟ DAB = 70' ∟ DBC = 80' 70'
To find: ∟ CDB = ? & ∟ ADB =?
Solution: Statement Reason
∟ DAB = 70' = ∟ BCD Opposite angles of the parallelogram ABCD
In △ BDD
∟ DBC + ∟ BCD + ∟ CDB = 180' ⟶ Sum of the △ BDC
80' + 70' + ∟ CAB = 180' ⟶ by substation
: ∟ CDB = 180'-150' ⟶ By transposing
: ∟ CDB = 30'
∟ DBC = ∟ ADB ⟶ Alternate angles AD || BC
: ∟ ADB = 80' : ∟ DBC = 80'

Example 2: The figure ABCD is a parallelogram finds the measure of X, Y, Z



Given: ABCD is a parallelogram
∟ OAB=35', ∟ OBA = 40', & ∟ OCB = 52'
To find: The measure of X, Y, Z
Is ∟ OAD, ∟ ODA, & ∟ AOD
Soln: Statement
In AOB
∟ DAB + ∟ OBA + ∟ AOB = 180' ⟶ sum of the angles of △
: 35' + 40' + ∟ AOB = 180' ⟶ by substitution
: ∟ AOB = 180'-75' ⟶ by transposing
: ∟ AOB = 105' –(1)
: ∟ AOB + ∟ AOD = 180' ⟶ linear pair
105' + ∟ AOD = 180' substitution from (1)
: ∟ AOD = 180' – 105'
: ∟ AOD 75' = Z
∟ OCD = ∟ OAD ⟶ Given alternate angles AD || BC
∟ OCB = X ⟶ Sum of the angles of
In △OAD ⟶ By substitution by
∟ OAD + ∟ ODA + ∟ AOD = 180' ⟶ Transposing
∟ 52' + ∟ ODA + 75 = 180'
: ∟ ODA = 180 – 127'
: ODA = 53' = Y
: X = 52', Y = 53', Z=75'



Example: 3 In the figure ABCD is a parallelogram. P is the mid point of BC. Prove that AB = BQ

Given: ABCD is a parallelogram D C

'P' is the mid point of BC

BP = PC

To prove: AB = BQ

Proof: Statement

Consider the △ 's BPQ & CPD

BP = PC given

∟BPQ = ∟CPD ⟶ Vertically opp angles

∟PBQ = ∟PCD ⟶ Alternate angles, AB || DC

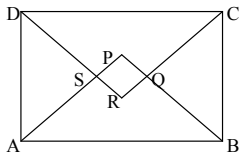
: △ BPQ congruent △ CPD ----------ASA postulate

: BQ = DC -----(1) CPCT

But DC = AB -----(2) opp sides of the parallelogram

: BQ = AB From 1 & 2

Example – 4 In the adjoming figures, the bisectors of the angles of a parallelogram ABCD enclose PQRS. Prove that PQRS is a rectangle.



Given: ABCD is a parallelogram Ap, BP, CR & DR are the angular bisectors of

∟A, ∟B, ∟C, & ∟D respectively.

D C To prove: PQRS is a rectangle &

Proof:

∟BAD + ∟ADC = 180' ⟶ consecutive

R angles of the parallelogram

½ ∟ BAD + ½ ∟ ADC = 90' (SA & SD are angular bisectors)

: ∟ASD = 90' (Sum of the angles of △ASD 180')

∟ASD =∟PSR = 90' –(1) (vertically opp angle)

∟DAB +∟ ABC = 180'

½ ∟ DAB + ½ ∟ABC = 90' PA & PB are angular bisectors)

∟APB = 90'

lllry we com prove ∟SRQ & ∟PQR = 90' Hence PQRS is a rectangle.

3.8 CONSTRUCTION OF DIAGNOSTIC TEST

The purpose of Diagnostic test is to identify learning deficiencies. An objective based, objective type diagnostic test according to blue prints was prepared. The nature of questions for diagnostic test includes

multiple choices, match the following, fill in the blanks, name the parts of the figure, arrange according to order. The total numbers of items were 80. The researcher has followed the steps as laid down by James (2008) and constructed the diagnostic test. The steps described by James (2008) are given below.

1. Identification of the problem areas.
2. Detailed content analysis.
3. Listing all the learning points.
4. Arranging the learning points in the logical sequence.
5. Writing test items.
6. Clubbing the items around the learning points.
7. Providing clear instructions.
8. Preparing a scoring key and a marking scheme.
9. Providing the time limit as required by individual student.
10. Administration of the test.
11. Item-wise analysis of the performance of each student.
12. Qualitative and quantitative analysis for identification the strength and weaknesses.
13. Identification of the causes for learning difficulties.
14. Planning and implanting lights individualized remedial programme.
15. Evaluating the effectiveness of the programme.

3.9 PREPARATION OF BLUE PRINT

A three dimensional blue-print showing coverage of content, instructional objectives and objective type of items was prepared by referring the IX std test book of mathematics (geometry).

Table-1: Blue print for the diagnostic test in Geometry

Sl. No	Objectives/forms of question⟶ content areas ↓	K	U	A	S	Total
1.	Circles	$(5)_5$	$(3)_3$	$(6)_6$	$(6)_6$	$(20)_{20}$
2.	Polygons	$(7)_7$	$(3)_3$	$(2)_2$	$(8)_8$	$(20)_{20}$
3.	Areas	$(2)_2$	$(8)_8$	$(2)_2$	$(8)_8$	$(20)_{20}$
4.	Theorems on parallelogram	$(2)_2$	$(10)_{10}$	$(2)_2$	$(6)_6$	$(20)_{20}$

Note: The number inside the bracket indicate the total marks and the numbers out side the bracket indicate the number of items.

K – Knowledge
U – Understanding
A – Application
S – Skills

Table-2: Weightage to objectives:

Knowledge	Undertanding	Application	Skills
20%	30%	15%	35%

Keeping the above tables 80 items objective based diagnostic test was prepared See Appendix – A for the diagnostic test in geometry.

3.10 ADMINISTRATION

The test has been administered to 50 students of IX std of aided school of Bijapur city, V.B Darbar High school. The purpose of this preliminary study was to select the items.

Item Analysis

Item analysis is a statistical technique which is used for selecting and modifying the items of the test on the basis of their facility index and discrimative index. The items are classified into difficult, moderate and poor items.

Modification of Items

Item analysis is the basic for the modification of items in preliminary draft. The process of determining the relative difficult and discriminating power of the test item is known as item analysis.

It helps to modify the easy and average items.

Stanely's method of item analysis was used that is facility index (F.I) and discriminination index (D.I) were calculated.

$$F.I = \frac{H + L}{N_1 + N_2} \times 100$$

$$D.I = \frac{H - L}{N_1 + N_2} \times 100$$

H: The number in light group getting the item right.

L: the number in lower group getting the item right.

N_1: The total number of students in Higher group.

N_2: the total number of students in lower group.

After administering the test to 50 pupils and on scoring them, the responses were subjected to item analysis.

After completing the scoring of all test answer papers. The answer papers were arranged in the order of scores from highest to the lowest. The top 27% of total group formed the higher group and the bottom 27% formed the lower group. The individual responses to each item for each group (ie., 27% higher group and 27% lower group) were tallied and the total number of correct responses for each item in each group was found out the difficulty level of each item was determined. This index is valuable index for evaluating the quality of test item. The criterion on in using this index as suggested by Stannely is made use in the present study.

Facility index

Index	Item evaluation
60 to 70	Good
40 to 59	Average
76 to 90	
More than	Easy
Less than 90	

Discrimination power

Index	Item evaluation
0.4 and above	Very good item
0.32 to 0.39	Good
0.20 to 0.29	Average
More than 0.2	Easy

Table-3: Table showing Item analysis of 80 items in terms of facility index and discriminative index.

Sl.No	H	L	F.I	Interpretation	D.I	Interpretation
1	16	13	90.62	Easy	0.18	Easy
2	16	15	96.87	Easy	0.06	Easy

Sl.No	H	L	F.I	Interpretation	D.I	Interpretation
3	16	15	96.87	Easy	0.06	Easy
4	16	15	96.87	Easy	0.06	Easy
5	16	13	90.62	Easy	0.18	Easy
6	13	8	65.65	Good	0.31	Good
7	14	10	75.10	Average	0.25	Average
8	16	7	71.12	Good	0.56	Good
9	15	5	62.50	Good	0.62	Good
10	15	5	62.50	Good	0.62	Good
11	15	9	75.00	Average	0.37	Average
12	13	5	56.25	Average	0.50	Good
13	15	7	68.75	Good	0.50	Good
14	16	5	65.62	Good	0.68	Good
15	16	13	90.62	Easy	0.18	Easy
16	16	12	87.50	Average	0.25	Average
17	16	15	96.87	Easy	0.06	Easy
18	14	8	68.75	Good	0.37	Good
19	15	14	90.62	Easy	0.06	Easy
20	12	4	50.00	Average	0.50	Good
21	15	14	90.62	Easy	0.06	Easy
22	16	11	84.37	Average	0.31	Good
23	14	10	75.10	Average	0.25	Average
24	16	8	75.00	Average	0.50	Good
25	12	3	46.87	Average	0.50	Average
26	16	7	71.12	Good	0.56	Good
27	14	8	68.75	Good	0.37	Good
28	5	0	9.37	Easy	0.18	Easy
29	15	5	62.50	Good	0.62	Good
30	16	7	71.12	Good	0.56	Good
31	4	3	21.5	Easy	0.06	Easy

Sl.No	H	L	F.I	Interpretation	D.I	Interpretation
32	9	5	43.75	Average	0.25	Average
33	10	0	31.25	Easy	0.62	Good
34	15	7	68.75	Good	0.50	Good
35	2	1	9.37	Easy	0.06	Easy
36	15	11	81.25	Easy	0.25	Average
37	16	12	87.50	Average	0.25	Average
38	15	7	68.75	Good	0.50	Good
39	2	3	15.62	Easy	0.06	Easy
40	15	7	68.75	Good	0.50	Good
41	16	7	71.12	Good	0.56	Good
42	16	5	65.62	Good	0.68	Good
43	16	15	96.87	Easy	0.06	Easy
44	16	16	100	Easy	0	Easy
45	16	15	96.87	Easy	0.06	Easy
46	9	6	46.87	Easy	0.18	Easy
47	4	3	21.5	Easy	0.06	Easy
48	16	15	96.87	Easy	0.06	Easy
49	15	7	68.75	Good	0.50	Good
50	15	6	65.62	Good	0.56	Good
51	16	5	65.62	Good	0.65	Good
52	15	7	68.75	Good	0.50	Good
53	16	15	96.87	Easy	0.06	Easy
54	16	9	78.12	Average	0.43	Good
55	15	5	62.50	Good	0.62	Good
56	15	7	68.75	Good	0.50	Good
57	14	8	68.75	Good	0.37	Good
58	16	7	71.12	Good	0.56	Good
59	15	5	62.50	Good	0.62	Good
60	16	5	65.62	Good	0.68	Good

Sl.No	H	L	F.I	Interpretation	D.I	Interpretation
61	16	7	71.12	Good	0.56	Good
62	15	6	65.62	Good	0.56	Good
63	15	15	96.87	Easy	0.06	Easy
64	15	6	65.62	Good	0.56	Good
65	15	7	68.75	Good	0.50	Good
66	10	12	68.75	Good	0.12	Easy
67	16	7	71.12	Good	0.56	Good
68	14	8	68.75	Good	0.37	Good
69	16	7	71.12	Good	0.56	Good
70	15	7	68.75	Good	0.50	Good
71	15	5	62.50	Good	0.62	Good
72	16	7	71.12	Good	0.56	Good
73	2	0	6.25	Easy	0.12	Easy
74	5	2	21.00	Easy	0.18	Easy
75	16	15	96.87	Easy	0.06	Easy
76	16	7	71.12	Good	0.56	Good
77	15	6	65.62	Good	0.56	Good
78	16	7	71.12	Good	0.56	Good
79	14	8	68.75	Good	0.37	Good
80	15	6	65.62	Good	0.56	Good

3.11 ITEM DESCRIPTION

Good Items (42)	Average Items (12)	Easy Items (26)
Q.No.: 6,8,9,10,13,14,18,26, 27 29,30,34,38,40,41,42,49,50 51,52,55,56,57,58,59,60,61 62,64,65,66,67,68,69,70,71 72,76,77,78,79	Q.No.: 7,11,12,16,20,22,23,24 25,32,37,54	Q.No.: 1,2,3,4,5,15,17,19 21,28,31,33,35,36 39,43,44,45,46,47 48,53,63,73,74,75

After item analysis the researcher modified / improved the average and Easy items. Modified items were given to experts for correction and final diagnostic test was prepared two parallel sets of question paper consider of 80 items were prepared

Form I Pre-test

Form II Post-test

3.12 FORMATION OF GROUPS

The main objective of the study is to know the effectiveness of computer Assisted Instruction as a remedial measure. The investigator formed two difference groups keeping the achievement of previous year of the students.

Group I Experiment group

In this type of treatment, the teacher allowed all the students to the computer lab and gives information about computer and its accessories and its method of operating. Each student is provided with software package to learn four geometry topics according to their own pace.

Group II control group

In this group the teacher, teachers all the four units in usual method using some kinds of teaching materials and learning materials like charts, models, etc.,

School selected for Investigation

1. V.B. Darbar High school, Bijapur Karnataka state (Aided school)

3.13 SAMPLES FOR STUDY

The present study focused on 100 samples in two group conventional / Traditional instruction and computer Assisted Instruction group containing both boys and girls. The study consists of 50 students in control group (25 girls and 25 boys having similar intelligence) and 50 students in Experimental group (25 girls and 25 boys having similar intelligence).

3.14 SCOPE OF THE STUDY

The present study was limited to IX std students of secondary schools. The study was confined to the teaching of geometry of IX standard students of Bijapur city. The study was confined to English medium only. The present study was also limited to cover the factors like, previous year achievement, diagnosis, computer assisted Instruction.

3.15 TOOLS: USED FOR DATA COLLECTION

1. Oponinairare for teacher prepared by investigator.
2. Diagnostic test in geometry constructed by investigator (Pre-test).
3. Post-test constructed by investigator keeping learning difficulties.
4. Computer Assisted Instruction package developed by the investigator.
5. Conventional Teaching lesson plans designed by the researcher.
6. Evaluation of Computer Assisted Instruction prepared by investigator.

3.16 ADMINISTRATION OF THE PRE-TEST (FORM I)

The correct procedure of administration of the test plays on important role in the test development pupils were told the purpose of the test. They were asked to tick the correct answer of each item. In order to measure the learning difficulties, pretest was administered. This was administered to both the groups Experimental and control group. The two groups learnt the four geometry topic with usual method by the time allocated to the students was 80 minutes. Time was noted before starting the test and also at the time when each student completed it. See Appendix-B

Scoring of the Test

The scoring of the test was done by hand with the help of pre-determined key. Each right response was gives one mark and wrong response zero. The number of correct responses determined the individual raw score of the test. The 100 student's raw scores of pretest is in appendix.

3.17 IDENTIFICATION OF LEARNING DIFFICULTIES

The pretest scores of pupils were used to identify the learning difficulties in the four units learning difficulties like drawing, identifying, naming the parts, calculation were listed in all the four topics.

Preparation of lesson plans for remedial teaching with method conventional

The investigator had prepared lesson plans 4 units of geometry from IX standard test book lesson plans were prepared with respect to teaching objectives questions, proper presentation of contents.

3.18 DEVELOPMENT OF COMPUTER ASSISTED INSTRUCTION REMEDIAL INSTRUCTION

For the development of Computer Assisted Instruction package 4 units had selected from IX standard mathematics (geometry) text book prescribed by DSERT, Bangalore from geometry branch circles, polygons, areas and Theorems on parallelogram were units used.

The content for Computer Assisted Instruction was designed by investigator and developed by intense software solutions, Hubli.

Computer Assisted Instruction package consists of

(*i*) Hardware:

1) Computer
2) 128 MB RAM
3) Key board and mouse

(*ii*) Software:

1) Windows 2000
2) Front page, HTML, Java script
3) BMP

The designed of Computer Assisted Instruction package is in see Appendix-C

3.19 REMEDIAL TEACHING WITH CONVENTIONAL METHOD

The control group was provided with traditional / conventional method of Instruction of 4 units in geometry. The Experimental group with computer assisted Instruction group with computer assisted Instruction of 4 unit's geometry.

Remedial teaching with Computer Assisted Instruction

1. Arrangements were made so that subjects could set and go through the program without any physical discomfort.
2. Clear instructions regarding the procedure to go through program were provided.

3.20 ADMINISTRATION OF POST-TEST: (FORM II)

After completing the two instructions methods is traditional and Computer Assisted Instruction, the learner has to take a post test some

of the item included in the post test may be different from those of pretest as learning difficulties are taken into consideration. Both groups control and Experimental group were instructed to response of the post test in 80 minutes.

Scoring of post test

According to predetermined scoring key the individual response was given on mark and no credits to wrong response. The post test raw scores of 100 students is in Appendix-D

3.21 STUDENTS' EVALUATION OF COMPUTER ASSISTED INSTRUCTION

Computer assisted instruction encompasses a broad range of computer technologies that supplement the classroom learning environment and can dramatically increase a students access to information. CAI programs, which can include directed drills, practice exercise, and communication between students and teachers, can adapt to the abilities and preferences of individual students personalized instruction a student receives. Students also benefit from the immediate feed back of them appreciate the self-paced learning environment. At its best CAI engages students interest, motivates them to learn, and increases their personal responsibility for learning. CAI is a form of self-instruction in which material can be presented via text, visual, sound and motion digital files, providing a multimedia approach to learning. Computer can facilitate interaction during the learning process on multiple levels like interaction of students/user with the content and learning material, contents can be updated regularly, encourages greater learning inputs in the areas of subject's interest. Hence the effectiveness of CAI of IX Std Geometry is done with a questionnaire.

Table-1: Table of feedback of CAI collected from sample of 60 students

Sl no	Questions	Yes	No
1	**Did you have difficulty with**		
	a) Reading from the screen?	58	2
	b) Using the terminal (on, off…. etc) devices?	57	3
	c) The movement of the text?	58	2
	d) The computer's keyboard system?	55	5
2	**The content**		
	a) Was it helpful to know how many units were there in the package?	60	0
	b) Did you find it easier to read the content?	57	3
	c) Did you have difficult in understanding the content?	58	2
	d) Was the geometrical figures clear?	60	0
	e) Was the content organization according to your pace?	56	4
	f) Was it helpful to go back and forth in the software?	60	0
	g) Could you manage without assistance of a teacher in going through the units?	56	4
	h) Was the content Well presented?	57	3
	i) Was the content meets your expectations?	56	4
3	**Display of the Material**		
	a) Was it useful to have frequent pauses in the software?	58	2
	b) Would it be better to scroll the text so the user may stop it at his or her own will?	59	1
	c) Did you find the sound synchronization with text clearly?	60	0
	d) Was the sound audible?	60	0
	TOTAL	**985**	**35**
	MEAN	**57.81**	**3.88**
	SD	**1.67**	**1.69**

The seventeen questions Mean and SD:

No. of Questions	Mean of Yes Response	Mean of No response	SD of Yes Response	SD of No response
17	57.81	3.88	1.67	1.69

Statistical Technique used

After the data had been collected, it was processed and tabulated in Microsoft Excel. The data collected on pre test and post test in

both conventional and Computer Assisted Instruction. The data was analyzed with reference to objectives and Hypotheses. The analysis is done by using descriptive statistics and results obtained there by have been interpreted. The master chart of the collected data is enclosed in Appendix.

3.22 ANALYSIS OF DATA

Analysis of the data thus collected was carried out to establish the effectiveness of the Computer Assisted Instruction.

Evidence for the effectiveness was based on the analysis of the following.

1. Testing the significance of post test over pretest by calculating t test.
2. Mean, S.D.S of pre and post tests.

Chapter-4

DATA ANALYSIS AND INTERPRETATION

4.1 INTRODUCTION

In the previous chapter, data analysis described was concerned with various stages of the software development. The analysis mainly consisted of judging test of significance Mean, S.D for Conventional Instruction and Computer Assisted Instruction as remedial measures. After the prior establishment of the effectiveness of these two forms presentation, the final analysis of data was carried out to find out whether these two presentation forms significantly different in terms of Mean, S.D, and 't' and if so which of the two is more effective. The analysis of the data was done to see Computer Assisted Instruction as remedial measures to over come learning difficulties. After the data had been collected it was processed and tabulated using Microsoft Excel. The master chart of the collected data is enclosed in the Appendix----- for reference. Then the data were analyzed with reference to objective and hypothesis and then analyzed by using differential Statistics. The difference between the pretest and posttest scores of both Conventional and CAI groups were calculated by using t-test. The results were discussed in the preceding section.

4.2 TESTING THE SIGNIFICANCE BETWEEN PRE AND POST-TEST OF BOTH FORMS OF PRESENTATION

Hypothesis 1

There is no significant difference between pretest and posttest scores of IX Std students under Conventional Instruction and Computer Assisted Instruction in Geometry.

Table-1: Mean scores difference between the Convention and Computer Assisted Instruction in the pretest and posttest

Method	Test	N	Mean	S.D	t-value	Significance
CAI	Pre test	50	62.96	5.82	2.88	P > 0.05
	Post test	50	75.20	2.56		
Conventional Instruction	Pre test	50	50.58	7.16	0.07	P< 0.05
	Post test	50	51.28	6.92		

The calculated t value in Computer Assisted Instruction is (2.88) and Conventional Instruction is (0.07). The obtained t value in CAI (2.88) is greater than table t value (1.98) which means research hypothesis is rejected at 0.05 level. There is a significant difference between the two means in pre test and posttest under Computer Assisted Instruction. The calculated t value (0.07) in Conventional Instruction is, less than table t value (1.98), therefore research hypothesis is accepted. There is no significant difference between pretest posttest scores under Conventional Instruction.

4.3 TESTING THE SIGNIFICANCE BETWEEN PRE-TEST AND POST-TEST MEANS OF CONVENTIONAL INSTRUCTION AND CAI AMONG BOYS AND GIRLS

Hypothesis 2

There is no significant difference between pretest and posttest scores of IX Std girls under Conventional Instruction and Computer Assisted Instruction in Geometry.

Table-2: Mean scores difference between the Convention and Computer Assisted Instruction in the pretest and posttest scores of girls in Geometry

Method	Test	N	Mean	S.D	t-value	Significance
CAI	Pre test	25	63.64	6.45	3.16	P > 0.05
	Post test	25	75.64	2.69		
Conventional Instruction	Pre test	25	51.20	7.39	0.81	P< 0.05
	Post test	25	51.32	6.89		

The calculated t value in Computer Assisted Instruction is (3.16) and Conventional Instruction is (0.81). The obtained t value in CAI (3.16) is greater than table t value (2.01) which means research hypothesis is rejected at 0.05 levels. There is a significant difference between the two means in pre test and posttest scores of girls under Computer Assisted Instruction. The calculated t value (0.81) in Conventional Instruction is, less than table t value (2.01), therefore research hypothesis is accepted. There is no significant difference between pretest posttest scores of girls under Conventional Instruction.

Hypothesis 3

There is no significant difference between pretest and posttest scores of IX Std boys under Conventional Instruction and Computer Assisted Instruction in Geometry.

Table-3: Mean scores difference between the Convention and Computer Assisted Instruction in the pretest and posttest scores of boys in Geometry

Method	Test	N	Mean	S.D	t-value	Significance
CAI	Pre test	25	62.28	5.16	1.59	P< 0.05
	Post test	25	74.76	3.19		
Conventional Instruction	Pre test	25	49.96	7.03	0.02	P< 0.05
	Post test	25	51.24	7.03		

The calculated t value in Computer Assisted Instruction is (1.59) and Conventional Instruction is (0.02). The obtained t value in CAI (1.59) and Conventional Instruction (0.02) is, less than table t value (2.01) at 0.05 levels, therefore research hypothesis is accepted. There is no significant difference between pretest posttest scores of boys under Conventional Instruction and Computer Assisted Instruction.

Hypothesis 4

There is no significant difference between pretest and posttest scores of IX Std boys and girls under Conventional Instruction and Computer Assisted Instruction in Geometry.

Table-4: Mean scores difference between the Convention and Computer Assisted Instruction in the pretest and posttest scores of boys and girls in Geometry

Method	Test	Sex	N	Mean	S.D	t-value	Significance
CAI	Pretest	Boys	25	62.28	5.16	0.43	P< 0.05
		Girls	25	63.64	6.45		
	Pottest	Boys	25	74.76	3.19	0.35	P< 0.05
		Girls	25	51.32	6.80		
Conventional Instruction	Pretest	Boys	25	49.96	7.03	0.55	P< 0.05
		Girls	25	51.20	7.39		
	Pottest	Boys	25	51.24	7.03	0.97	P< 0.05
		Girls	25	51.32	6.89		

The calculated t value of in Computer Assisted Instruction of pretest of Boys and Girls is (0.43) and posttest of Boys and Girls is (0.35) is less than the table t value (2.01) at 0.05 levels. Therefore research hypothesis is accepted, which means that there is no significant difference between two means of pretest scores of Boys and Girls in Geometry.

The calculated t value of in Conventional Instruction of pretest of Boys and Girls is (0.55) and posttest of Boys and Girls is (0.97) is less than the table t value (2.01) at 0.05 levels. Therefore research hypothesis is accepted, which means that there is no significant difference between two means of pretest scores of Boys and Girls in Geometry

Hypothesis 5

There is no significant difference between posttest scores of IX Std Girls under Conventional Instruction and Computer Assisted Instruction in Geometry.

Table 5-: Mean scores difference between the Convention and Computer Assisted Instruction in their posttest scores of Girls in Geometry

Method	N	Mean	S.D	t-value	Significance
CAI	50	51.32	6.89	2.70	P > 0.05
Conventional Instruction	50	51.20	7.39		

The calculated t value in Computer Assisted Instruction is (2.70), is greater than table t value (1.98) 0.05 levels, therefore research hypothesis is rejected. There a significant difference between posttest scores of Girls under Conventional Instruction and Computer Assisted Instruction in Geometry

Hypothesis 6

There is no significant difference between posttest scores of IX Std Boys under Conventional Instruction and Computer Assisted Instruction in Geometry.

Table-6: Mean scores difference between the Convention and Computer Assisted Instruction in their posttest scores of Boys in Geometry

Method	N	Mean	S.D	t-value	Significance
CAI	50	62.28	5.16	4.28	P > 0.05
Conventional Instruction	50	74.76	3.19		

The calculated t value in Computer Assisted Instruction is (4.28), is greater than table t value (1.98) 0.05 levels, therefore research hypothesis is rejected. There a significant difference between posttest scores of Boys under Conventional Instruction and Computer Assisted Instruction in Geometry

4.4 TESTING THE SIGNIFICANT DIFFERENCE BETWEEN PRE-TEST AND POST-TEST MEANS OF CONVENTIONAL METHOD AND CAI IN THE TOPIC CIRCLES

Hypothesis 7

There is no significant difference between pretest and posttest scores of IX Std students under Conventional Instruction and Computer Assisted Instruction in the topic circles

Table-7: Mean scores difference between the Convention and Computer Assisted Instruction in the pretest and posttest in the topic circles

Method	Test	N	Mean	S.D	t-value	Significance
CAI	Pre test	50	16.34	2.20	9.42	P > 0.05
	Post test	50	19.30	0.81		
Conventional Instruction	Pre test	50	12.30	3.66	0.06	P< 0.05
	Post test	50	13.28	2.97		

The calculated t value in Computer Assisted Instruction is (9.42) and Conventional Instruction is (0.06). The obtained t value in CAI (9.42) is greater than table t value (1.98) which means research hypothesis is rejected at 0.05 level. There is a significant difference between the two means in pre test and posttest under Computer Assisted Instruction. The calculated t value (0.06) in Conventional Instruction is, less than table t value (1.98) at 0.05 level, therefore research hypothesis is accepted. There is no significant difference between pretest posttest scores of IX Std under Conventional Instruction in the topic circles.

Hypothesis 8

There is no significant difference between pretest and posttest scores of IX Std girls under Conventional Instruction and Computer Assisted Instruction in the topic circles

Table-8: Mean scores difference between the Convention and Computer Assisted Instruction in the pretest and posttest scores of girls in the topic circles

Method	Test	N	Mean	S.D	t-value	Significance
CAI	Pre test	25	16.28	2.56	2.62	P > 0.05
	Post test	25	19.40	0.76		
Conventional Instruction	Pre test	25	13.12	2.30	0.52	P< 0.05
	Post test	25	12.76	3.07		

The calculated t value in Computer Assisted Instruction is (2.62) and Conventional Instruction is (0.52). The obtained t value in CAI (2.62) is greater than table t value (2.01) which means research hypothesis is rejected at 0.05 level. There is a significant difference between the two means in pre test and posttest scores of girls under Computer Assisted Instruction. The calculated t value (0.52) in Conventional Instruction is, less than table t value (2.01) at 0.05 level, therefore research hypothesis is accepted. There is no significant difference between pretest posttest scores of IX Std girls under Conventional Instruction in the topic circles.

Hypothesis 9

There is no significant difference between pretest and posttest scores of IX Std boys under Conventional Instruction and Computer Assisted Instruction in the topic circles

Table-9: Mean scores difference between the Convention and Computer Assisted Instruction in the pretest and posttest scores of boys in the topic circles

Method	Test	N	Mean	S.D	t-value	Significance
CAI	Pre test	25	16.40	1.83	5.31	P > 0.05
	Post test	25	19.20	0.87		
Conventional Instruction	Pre test	25	11.48	4.55	0.01	P< 0.05
	Post test	25	13.80	2.83		

The calculated t value in Computer Assisted Instruction is (5.31) and Conventional Instruction is (0.01). The obtained t value in CAI (5.31) is greater than table t value (2.01) which means research hypothesis is rejected at 0.05 level. There is a significant difference between the two means in pre test and posttest scores of boys under Computer Assisted Instruction. The calculated t value (0.01) in Conventional Instruction is, less than table t value (2.01) at 0.05 level, therefore research hypothesis is accepted. There is no significant difference between pretest posttest scores of IX Std boys under Conventional Instruction in the topic circles.

Hypothesis 10

There is no significant difference between posttest scores of IX Std Girls and Boys under Computer Assisted Instruction in the topic circles.

Table-10: Mean scores difference between the Convention and Computer Assisted Instruction in their posttest scores of Girls and Boys in the circles.

Method	Sex	Mean	S.D	t-value	Significance
CAI	Girls	19.40	0.76	0.42	P < 0.05
	Boys	19.20	0.87		

The calculated t value in Computer Assisted Instruction is (0.42), is less than table t value (2.01) at 0.05 levels, therefore research

hypothesis is accepted. There is no significant difference between posttest scores of Girls and Boys under Computer Assisted Instruction in the circles.

4.5 TESTING THE SIGNIFICANT DIFFERENCE BETWEEN PRE-TEST AND POST-TEST MEANS OF CONVENTIONAL METHOD AND CAI IN THE TOPIC POLYGONS

Hypothesis 11

There is no significant difference between pretest and posttest scores of IX Std students under Conventional Instruction and Computer Assisted Instruction in the topic polygons

Table-11: Mean scores difference between the Convention and Computer Assisted Instruction in the pretest and posttest in the topic polygons

Method	Test	N	Mean	S.D	t-value	Significance
CAI	Pre test	50	15.22	1.84	5.82	P > 0.05
	Post test	50	18.48	0.86		
Conventional Instruction	Pre test	50	11.24	2.39	0.59	P< 0.05
	Post test	50	11.42	2.53		

The calculated t value in Computer Assisted Instruction is (5.82) and Conventional Instruction is (0.59). The obtained t value in CAI (5.82) is greater than table t value (1.98) which means research hypothesis is rejected at 0.05 level. There is a significant difference between the two means in pre test and posttest under Computer Assisted Instruction in the topic polygons. The calculated t value (0.59) in Conventional Instruction is, less than table t value (1.98) at 0.05 level, therefore research hypothesis is accepted. There is no significant difference between pretest posttest scores of IX Std under Conventional Instruction in the topic polygons.

Hypothesis 12

There is no significant difference between pretest and posttest scores of IX Std Girls under Conventional Instruction and Computer Assisted Instruction in the topic polygons

Table-12: Mean scores difference between the Convention and Computer Assisted Instruction in the pretest and posttest of girls in the topic polygons

Method	Test	N	Mean	S.D	t-value	Significance
CAI	Pre test	25	15.24	2.03	2.68	P > 0.05
	Post test	25	18.52	0.77		
Conventional Instruction	Pre test	25	12.12	2.32	0.06	P< 0.05
	Post test	25	11.40	2.65		

The calculated t value in Computer Assisted Instruction is (2.68) and Conventional Instruction is (0.06). The obtained t value in CAI (2.68) is greater than table t value (2.01) which means research hypothesis is rejected at 0.05 level. There is a significant difference between the two means in pre test and posttest of girls under Computer Assisted Instruction in the topic polygons. The calculated t value (0.06) in Conventional Instruction is, less than table t value (2.01) at 0.05 level, therefore research hypothesis is accepted. There is no significant difference between pretest posttest scores of IX Std girls under Conventional Instruction in the topic polygons.

Hypothesis 13

There is no significant difference between pretest and posttest scores of IX Std Boys under Conventional Instruction and Computer Assisted Instruction in the topic polygons

Table-13: Mean scores difference between the Convention and Computer Assisted Instruction in the pretest and posttest of boys in the topic polygons

Method	Test	N	Mean	S.D	t-value	Significance
CAI	Pre test	25	15.20	1.68	8.16	P > 0.05
	Post test	25	18.44	0.96		
Conventional Instruction	Pre test	25	10.36	2.16	0.04	P< 0.05
	Post test	25	11.44	2.47		

The calculated t value in Computer Assisted Instruction is (8.16) and Conventional Instruction is (0.04). The obtained t value in CAI (2.68) is greater than table t value (2.01) which means

research hypothesis is rejected at 0.05 level. There is a significant difference between the two means in pre test and posttest of boys under Computer Assisted Instruction in the topic polygons. The calculated t value (0.04) in Conventional Instruction is, less than table t value (2.01) at 0.05 level, therefore research hypothesis is accepted. There is no significant difference between pretest posttest scores of IX Std boys under Conventional Instruction in the topic polygons.

Hypothesis 14

There is no significant difference between posttest scores of IX Std Girls and Boys under Computer Assisted Instruction in the topic polygons

Table-14: Mean scores difference between the Convention and Computer Assisted Instruction in their posttest scores of Girls and Boys in the polygons

Method	Sex	Mean	S.D	t-value	Significance
CAI	Girls Boys	18.52 18.44	0.77 0.96	0.73	P < 0.05

The calculated t value in Computer Assisted Instruction is (0.73), is less than table t value (2.01) at 0.05 levels, therefore research hypothesis is accepted. There is no significant difference between posttest scores of Girls and Boys under Computer Assisted Instruction in the polygons.

4.6 TESTING THE SIGNIFICANT DIFFERENCE BETWEEN PRE-TEST AND POST-TEST MEANS OF CONVENTIONAL METHOD AND CAI IN THE TOPIC AREAS

Hypothesis 15

There is no significant difference between pretest and posttest scores of IX Std students under Conventional Instruction and Computer Assisted Instruction in the topic Areas

Table-15: Mean scores difference between the Convention and Computer Assisted Instruction in the pretest and posttest in the topic Areas

Method	Test	N	Mean	S.D	t-value	Significance
CAI	Pre test Post test	50 50	14.92 18.60	1.70 0.95	7.22	P > 0.05
Conventional Instruction	Pre test Post test	50 50	11.18 11.36	2.87 2.79	0.59	P< 0.05

The calculated t value in Computer Assisted Instruction is (7.22) and Conventional Instruction is (0.59). The obtained t value in CAI (5.82) is greater than table t value (1.98) which means research hypothesis is rejected at 0.05 level. There is a significant difference between the two means in pre test and posttest under Computer Assisted Instruction in the topic Areas. The calculated t value (0.59) in Conventional Instruction is, less than table t value (1.98) at 0.05 level, therefore research hypothesis is accepted. There is no significant difference between pretest posttest scores of IX Std under Conventional Instruction in the topic Areas.

Hypothesis16

There is no significant difference between pretest and posttest scores of IX Std Girls under Conventional Instruction and Computer Assisted Instruction in the topic Areas.

Table-16: Mean scores difference between the Convention and Computer Assisted Instruction in the pretest and posttest of girls in the topic Areas

Method	Test	N	Mean	S.D	t-value	Significance
CAI	Pre test Post test	25 25	15.12 18.76	2.73 0.88	1.95	P< 0.05
Conventional Instruction	Pre test Post test	25 25	11.56 11.32	2.43 2.64	0.50	P< 0.05

The calculated t value in Computer Assisted Instruction is (1.95) and Conventional Instruction is (0.50). The obtained t value in CAI (1.95) and in Conventional Instruction is (0.50), which is less than table t value (2.01) at 0.05 level, therefore research hypothesis is accepted.

Hence there is no significant difference between pretest posttest scores of IX Std girls under Computer Assisted Instruction and Conventional Instruction in the topic Areas.

Hypothesis 17

There is no significant difference between pretest and posttest scores of IX Std Boys under Conventional Instruction and Computer Assisted Instruction in the topic Areas.

Table-17: Mean scores difference between the Convention and Computer Assisted Instruction in the pretest and posttest of boys in the topic Areas

Method	Test	N	Mean	S.D	t-value	Significance
CAI	Pre test Post test	25 25	14.72 18.44	1.24 1.00	3.43	P < 0.05
Conventional Instruction	Pre test Post test	25 25	10.80 11.40	3.25 3.00	0.30	P< 0.05

The calculated t value in Computer Assisted Instruction is (3.43) and Conventional Instruction is (0.30). The obtained t value in CAI (2.68) is greater than table t value (2.01) which means research hypothesis is rejected at 0.05 level. There is a significant difference between the two means in pre test and posttest of boys under Computer Assisted Instruction in the topic Areas. The calculated t value (0.30) in Conventional Instruction is, less than table t value (2.01) at 0.05 level, therefore research hypothesis is accepted. There is no significant difference between pretest posttest scores of IX Std boys under Conventional Instruction in the topic Areas

Hypothesis 18

There is no significant difference between posttest scores of IX Std Girls and Boys under Computer Assisted Instruction in the topic Areas

Table-18: Mean scores difference between the Convention and Computer Assisted Instruction in their posttest scores of Girls and Boys in the Areas

Method	Sex	Mean	S.D	t-value	Significance
CAI	Girls Boys	18.76 18.44	0.88 1.00	0.26	P < 0.05

The calculated t value in Computer Assisted Instruction is (0.26), is less than table t value (2.01) at 0.05 levels, therefore research hypothesis is accepted. There is no significant difference between posttest scores of Girls and Boys under Computer Assisted Instruction in the Areas.

4.7 TESTING THE SIGNIFICANT DIFFERENCE BETWEEN PRE-TEST AND POST-TEST MEANS OF CONVENTIONAL METHOD AND CAI IN THE TOPIC THEOREMS ON PARALLELOGRAM

Hypothesis19

There is no significant difference between pretest and posttest scores of IX Std students under Conventional Instruction and Computer Assisted Instruction in the topic Theorems on Parallelogram.

Table-19: Mean scores difference between the Convention and Computer Assisted Instruction in the pretest and posttest in the topic Theorems on Parallelogram.

Method	Test	N	Mean	S.D	t-value	Significance
CAI	Pre test Post test	50 50	16.42 18.82	2.75 1.37	1.58	P < 0.05
Conventional Instruction	Pre test Post test	50 50	15.78 15.28	3.78 4.39	0.51	P< 0.05

The calculated t value in Computer Assisted Instruction is (1.58) and Conventional Instruction is (0.51). The obtained t value in CAI (1.58) is greater than table t value (1.98) which means research hypothesis is rejected at 0.05 level. There is a significant difference between the two means in pre test and posttest under Computer Assisted Instruction in the topic Theorems on Parallelogram. The calculated t value in Conventional Instruction is(0.51), less than table t value (1.98) at 0.05 level, therefore research hypothesis is accepted. There is no significant difference between pretest posttest scores of IX Std under Conventional Instruction in the topic Theorems on Parallelogram

Hypothesis 20

There is no significant difference between pretest and posttest scores of IX Std Girls under Conventional Instruction and Computer Assisted Instruction in the topic Theorems on Parallelogram.

Table-20: Mean scores difference between the Convention and Computer Assisted Instruction in the pretest and posttest of girls in the topic Theorems on Parallelogram.

Method	Test	N	Mean	S.D	t-value	Significance
CAI	Pre test Post test	25 25	16.88 18.96	2.82 1.06	0.0005	P< 0.05
Conventional Instruction	Pre test Post test	25 25	14.44 15.88	3.51 4.59	0.11	P< 0.05

The calculated t value in Computer Assisted Instruction is (0.0005) and Conventional Instruction is (0.11). The obtained t value in CAI (0.0005) and in Conventional Instruction is (0.11), which is less than table t value (2.01) at 0.05 level, therefore research hypothesis is accepted. Hence there is no significant difference between pretest posttest scores of IX Std girls under Computer Assisted Instruction and Conventional Instruction in the topic Theorems on Parallelogram.

Hypothesis 21

There is no significant difference between pretest and posttest scores of IX Std Boys under Conventional Instruction and Computer Assisted Instruction in the topic Theorems on Parallelogram.

Table-21: Mean scores difference between the Convention and Computer Assisted Instruction in the pretest and posttest of boys in the topic Theorems on Parallelogram.

Method	Test	N	Mean	S.D	t-value	Significance
CAI	Pre test Post test	25 25	15.96 18.68	2.65 1.63	0.0001	P< 0.05
Conventional Instruction	Pre test Post test	25 25	17.12 14.68	3.62 4.19	0.04	P< 0.05

The calculated t value in Computer Assisted Instruction is (0.0001) and Conventional Instruction is (0.04). The obtained t value in CAI (0.0001) and in Conventional Instruction is (0.04), which is less than table t value (2.01) at 0.05 level, therefore research hypothesis is accepted. Hence there is no significant difference between pretest posttest scores of IX Std boys under Computer Assisted Instruction and Conventional Instruction in the topic Theorems on Parallelogram.

Hypothesis 22

There is no significant difference between posttest scores of IX Std Girls and Boys under Computer Assisted Instruction in the topic Theorems on Parallelogram.

Table-22: Mean scores difference between the Convention and Computer Assisted Instruction in their posttest scores of Girls and Boys in the Theorems on Parallelogram.

Method	Sex	Mean	S.D	t-value	Significance
CAI	Girls Boys	18.96 18.68	1.06 1.68	0.52	P < 0.05

The calculated t value in Computer Assisted Instruction is (0.52), is less than table t value (2.01) at 0.05 levels, therefore research hypothesis is accepted. There is no significant difference between posttest scores of Girls and Boys under Computer Assisted Instruction in the Theorems on Parallelogram.

4.8 DISCUSSION

At the outset it can be said that analysis of the data has established that fact that Computer Assisted Instruction is as good as or effective comparative conventional instruction earlier in the data analysis, it was proved that there is a significant difference between computer assisted instruction and conventional instruction by the results of test of significance for pretest scores and posttest scores. But the performance of the student in the posttest in better than the conventional program.

Like wise 't' test were compared which shows the better performance when total scores were considered. The presence of the teacher is required for instructional program. But in computer software as everything is done by computer, teacher can concentrate on other tasks. The use of computers teaching and learning is becoming more prevalent in school everywhere. As has been pointed out in introduction these software are often the result of computer knowledge without any involvement of an educational expert so, the counter the effect there is a need for software's prepared by teachers.

Chapter-5

SUMMARY AND CONCLUSION

Having discussed all the details of development of computer assisted instruction as a remedial measure in the previous chapters; an attempt is made to bring the salient points in the form of summary in this chapter.

The study of mathematics begins with few well known uncomplicated definitions and postulates and proceeds step by step, to quite elaborate steps. Mathematics learning always proceeds from simple to complex and from concrete to abstract. It is a subject in which the dependence on earlier knowledge is particularly great Algebra depends on arithmetic, the calculus depends on algebra, dynamics depends on the calculus, and analytical geometry depends on algebra and elementary geometry and so on. Thus gradation and sequence can be observed among topics in any selected branch of mathematics.

The present study is an effort to make available a quality software that could provide assistance to children in learning skills in mathematics.

5.1 THE PROBLEM

"DEVELOPMENT OF COMPUTER ASSISTED INSTRUCTIONAL MATERIAL FOR REMEDIAL MEASURES IN GEOMETRY".

5.2 OBJECTIVES OF THE STUDY

1. To study the relative effectiveness of Computer Assisted Instruction and Traditional Instruction in Geometry.
2. To construct and development of Computer Assisted Instruction as remedial measures in Geometry.
3. To know the significant difference between pre test and post-test scores of IX std students in the topic circles.

4. To know the significant difference between pre-test and post test scores of Ix std boys students in the topic circles.
5. To know the significant difference between pre-test and post-test scores of IX std girls students in the topic circles.
6. To know the significant difference between pre-test and post-test scores of IX std students in the topic polygons.
7. To know the significant difference between pre-test and post-test scores of IX std boys students in the topic polygons.
8. To know the significant difference between pre-test and post-test scores of IX std girls students in the topic polygons.
9. To know the significant difference between pretest and post test scores of IX std students in the topic Areas.
10. To know the significant difference between pre-test and post-test scores of IX std boys students in the topic Areas.
11. To know the significant difference between pre-test and post-test scores of IX std girls students in the topic Areas.
12. To know the significant difference between pre-test and post-test scores of IX std students in the topic Theorems on parallelogram.
13. To know the significant difference between pre-test and post-test scores of IX std boys students in the topic Theorems on parallelogram.
14. To know the significant difference between pre-test and post-test scores of IX std girls students in the topic Theorems on parallelogram.
15. To know the significant difference between post-test scores of IX std boys and girls students in geometry.
16. To know the significant difference between post-test scores of IX std boys and girls students in the topic circles.
17. To know the significant difference between post-test scores of IX std boys and girls students in the topic polygons.
18. To know the significant difference between post-test scores of IX std boys and girls students in the topic Areas.
19. To know the significant difference between post-test scores of IX std boys and girls students in the topic Theorems on parallelogram.

5.3 RESEARCH HYPOTHESES

1. There is no significant difference between pre-test and post-test scores of IX std students in geometry (total).
2. There is no significant difference between pre-test and post-test scores of IX std students in the topic circles.
3. There is no significant difference between pre-test and post-test scores of IX std boys students in the topic circles.
4. There is no significant difference between pre-test and post-test scores of IX std girls students in the topic circles.
5. There is no significant difference between pre-test and post-test scores of IX std students in the topic polygons.
6. There is no significant difference between pre-test and post-test scores of IX std boys students in the topic polygons.
7. There is no significant difference between pre-test and post-test scores of IX std girls students in the topic polygons.
8. There is no significant difference between pre-test and post-test scores of Ix std students in the topic Areas.
9. There is no significant difference between pre-test and post-test scores of IX std boys students in the topic Areas.
10. There is no significant difference between pre-test and post-test scores of IX std girls students in the topic Areas.
11. There is no significant difference between pre-test and post-test scores of IX std students in the topic Theorems on parallelogram.
12. There is no significant difference between pre-test and post-test scores of IX std boys students in the topic Theorems on parallelogram.
13. There is no significant difference between pre-test and post-test scores of IX std girls students in the topic Theorems on parallelogram.
14. There is no significant difference between post-test scores of IX std boys and girls students in geometry.
15. There is no significant difference between post-test scores of IX std boys and girls students in the topic circles.
16. There is no significant difference between post-test scores of IX std boys and girls students in the topic polygons.

17. There is no significant difference between post-test scores of IX std boys and girls students in the topic Areas.
18. There is no significant difference between post-test scores of IX std boys and girls students in the topic Theorems on parallelogram.

5.4 LIMITATION OF THE STUDY

1. The present programme is developed for Ixth std students who are studying mathematics as compulsory subject.
2. The programme provides for developing skills like drawing, calculation, arranging in order.

1. The present study is limited to IX standard mathematics of Karnataka state.
2. The study is also limited to few units of IX standard mathematics (four units from Geometry of the present syllabus).
3. The CAI package is developed on selected topics (four Units) of IX Standard.
4. The language used to prepare CAI package is visual basic, which is becoming some times older since lot of innovations and progressive taking place in computers software field.

5.5 OPERATIONAL TERMS

During the course of investigation some technical terms have been used with specific meaning and purpose. They are defined as follows.

Diagnostic Test

It is the process of identifying the difficulties, short comings, gaps in knowledge and hard spots in learning. The term is used to identify the learning difficulties in geometry.

Remedial Measures

Remedy in general term compared to word 'therapy'. It is additional instructional training given to students with learning difficulties.

Conventional Method

It is a teacher centred method with a due weight age given to chalk and Talk. Teaching lessons using charts, maps and models.

Experimental Group

A sample of particular group to whom computer assisted material is provided.

Pre Test

A test to be given to students before taking training. It is to know the effect of conventional method.

Post Test

A test to be given at the aend of taking training (After CA1 to Experimental group).

Computer Assisted Instruction

It is a general term that refers to learning situation in which the students interact with the course of students; aimed at achieving certain instructional goal with the use of computers. It is an instruction delivered directly to students by allowing them to interact with a lessons programmed in to the computer system.

Review of Related Literature

The investigator collected the related literature with respect to :

1. In achievements of students in Mathematics.
2. In improvement of teaching and learning of Mathematics.
3. Preparing programmed instruction packages for teaching Mathematics.
4. Developing Computer Assisted Instruction, a new programme for improving learning of Mathematics of students and to use computers in education and evolution of computers in education.

The present study is an experimental design involving control group and experimental groups. The design of the study is as follow.

5.6 SELECTION OF THE UNIT

The opinions of mathematics teachers regarding difficult topics while learning was collected. The opinionaire was analyzed and four topics of IX std geometry syllabus was identified as difficult topics in learning. They are as bellow.

1. Circles

2. Polygons
3. Areas
4. Theorems on parallelograms

5.7 CONTENT ANALYSIS

Content analysis for the present topic was carried out so as to develop a suitable content structure that would go with the program. The content of the above four identified topics was broken down in to the elements for content analysis.

5.8 CONSTRUCTION OF DIAGNOSTIC TEST

The purpose of Diagnostic test is to identify learning deficiencies. An objective based, objective type diagnostic test according to blue prints was prepared. The nature of questions for diagnostic test includes multiple choices, match the following, fill in the blanks, name the parts of the figure, arrange according to order. The total numbers of items were 80. The researcher has followed the steps as laid down by James (2008) and constructed the diagnostic test.

Item Analysis

Item analysis is a statistical technique which is used for selecting and modifying the items of the test on the basis of their facility index and discrimative index. The items are classified into difficult, moderate and poor items.

Modification of items

Item analysis is the basic for the modification of items in preliminary draft. The process of determining the relative difficult and discriminating power of the test item is known as item analysis.

It helps to modify the easy and average items.

Stanely's method of item analysis was used that is facility index (F.I) and discriminination index (D.I) were calculated.

Formation of groups

The main objective of the study is to know the effectiveness of computer Assisted Instruction as a remedial measure. The investigator formed two difference groups keeping the achievement of previous year of the students.

Group I Experiment group
Group II control group
School selected for Investigation

1. V.B. Darbar High school, Bijapur Karnataka state (Aided school)

Samples for study

The present study focused on 100 samples in two group conventional / Traditional instruction and computer Assisted Instruction group containing both boys and girls. The study consists of 50 students in control group (25 girls and 25 boys having similar intelligence) and 50 students in Experimental group (25 girls and 25 boys having similar intelligence).

5.9 SCOPE OF THE STUDY

The present study was limited to IX std students of secondary schools. The study was confined to the teaching of geometry of IX standard students of Bijapur city. The study was confined to English medium only. The present study was also limited to cover the factors like, previous year achievement, computer assisted Instruction, diagnosis.

Tools: Used for Data Collection

1. Oponinairare for teacher prepared by investigator.
2. Diagnostic test in geometry constructed by investigator (Pre-test).
3. Post-test constructed by investigator keeping learning difficulties.
4. Computer Assisted Instruction package developed by the investigator.
5. Conventional Teaching lesson plans designed by the researcher.
6. Evaluation of Computer Assisted Instruction prepared by investigator.

5.10 ADMINISTRATION OF THE PRE-TEST (FORM I)

Scoring of the Test

The scoring of the test was done by hand with the help of pre-determined key. Each right response was gives one mark and wrong response zero. The number of correct responses determined the individual raw score of the test. The 100 student's raw scores of pretest is in appendix.

Identification of learning difficulties

The pretest scores of pupils were used to identify the learning difficulties in the four units learning difficulties like drawing, identifying, naming the parts, calculation were listed in all the four topics.

Preparation of lesson plans for remedial teaching with method conventional

The investigator had prepared lesson plans 4 units of geometry from IX standard test book lesson plans were prepared with respect to teaching objectives questions, proper presentation of contents.

5.11 DEVELOPMENT OF COMPUTER ASSISTED INSTRUCTION REMEDIAL INSTRUCTION

For the development of Computer Assisted Instruction package 4 units had selected from IX standard mathematics (geometry) text book prescribed by DSERT, Bangalore from geometry branch circles, polygons, areas and Theorems on parallelogram were units used.

The content for Computer Assisted Instruction was designed by investigator and developed by intense software solutions, Hubli.

Computer Assisted Instruction package consists of

(*i*) Hardware:
   1. Computer
   2. 128 MB RAM
   3. Key board and mouse

(*ii*) Software:
   1. Windows 2000
   2. Front page, HTML, Java script
   3. BMP

The designed of Computer Assisted Instruction package is in Appendix.

5.12 REMEDIAL TEACHING WITH CONVENTIONAL AND CAI

Remedial teaching with conventional method

The control group was provided with traditional / conventional method of Instruction of 4 units in geometry. The Experimental group

with computer assisted Instruction group with computer assisted Instruction of 4 unit's geometry.

Remedial teaching with Computer Assisted Instruction

1. Arrangements were made so that subjects could set and go through the program without any physical discomfort.
2. Clear instructions regarding the procedure to go through program were provided.

5.13 ADMINISTRATION AND SCORING OF POST-TEST

Post-Test: (FormII)

After completing the two instructions methods is traditional and Computer Assisted Instruction, the learner has to take a post test some of the item included in the post test may be different from those of pretest as learning difficulties are taken into consideration.

Scoring of post test

According to predetermined scoring key the individual response was given on mark and no credits to wrong response. The post test raw scores of 100 students is in Appendix.

STUDENTS' EVALUATION OF COMPUTER ASSISTED INSTRUCTION: It is done through feedback questions.

5.14 ANALYSIS OF DATA

Analysis of the data thus collected was carried out to establish the effectiveness of the Computer Assisted Instruction.

Evidence for the effectiveness was based on the analysis of the following.

1. Testing the significance of post test over pretest by calculating t test.
2. Mean, S.D.S of pre and post tests.

5.15 FINDINGS

1. There is a significant difference between the two means in pre test and posttest under Computer Assisted Instruction. There is no significant difference between pretest posttest scores under Conventional Instruction.

2. There is a significant difference between the two means in pre test and posttest scores of girls under Computer Assisted Instruction. There is no significant difference between pretest posttest scores of girls under Conventional Instruction.
3. There is no significant difference between pretest posttest scores of boys under Conventional Instruction and Computer Assisted Instruction.
4. There is no significant difference between two means of pretest scores of Boys and Girls in Geometry.
5. There is no significant difference between two means of pretest scores of Boys and Girls in Geometry
6. There a significant difference between posttest scores of Girls under Conventional Instruction and Computer Assisted Instruction in Geometry
7. There a significant difference between posttest scores of Boys under Conventional Instruction and Computer Assisted Instruction in Geometry
8. There is a significant difference between the two means in pre test and posttest under Computer Assisted Instruction.
9. There is no significant difference between pretest posttest scores of IX Std under Conventional Instruction in the topic circles.
10. There is a significant difference between the two means in pre test and posttest scores of girls under Computer Assisted Instruction.
11. There is no significant difference between pretest posttest scores of IX Std girls under Conventional Instruction in the topic circles.
12. There is a significant difference between the two means in pre test and posttest scores of boys under Computer Assisted Instruction.
13. There is no significant difference between pretest posttest scores of IX Std boys under Conventional Instruction in the topic circles.
14. There is no significant difference between posttest scores of Girls and Boys under Computer Assisted Instruction in the circles.
15. There is a significant difference between the two means in pre test and posttest under Computer Assisted Instruction in the topic polygons.
16. There is no significant difference between pretest posttest scores of IX Std under Conventional Instruction in the topic polygons.

17. There is a significant difference between the two means in pre test and posttest of girls under Computer Assisted Instruction in the topic polygons.

18. There is no significant difference between pretest posttest scores of IX Std girls under Conventional Instruction in the topic polygons.

19. There is a significant difference between the two means in pre test and posttest of boys under Computer Assisted Instruction in the topic polygons.

20. There is no significant difference between pretest posttest scores of IX Std boys under Conventional Instruction in the topic polygons.

21. There is no significant difference between posttest scores of Girls and Boys under Computer Assisted Instruction in the polygons.

22. There is a significant difference between the two means in pre test and posttest under Computer Assisted Instruction in the topic Areas.

23. There is no significant difference between pretest posttest scores of IX Std under Conventional Instruction in the topic Areas.

24. There is no significant difference between pretest posttest scores of IX Std girls under Computer Assisted Instruction and Conventional Instruction in the topic Areas.

25. There is a significant difference between the two means in pre test and posttest of boys under Computer Assisted Instruction in the topic Areas.

26. There is no significant difference between pretest posttest scores of IX Std boys under Conventional Instruction in the topic Areas

27. There is no significant difference between posttest scores of Girls and Boys under Computer Assisted Instruction in the Areas.

28. There is a significant difference between the two means in pre test and posttest under Computer Assisted Instruction in the topic Theorems on Parallelogram.

29. There is no significant difference between pretest posttest scores of IX Std under Conventional Instruction in the topic Theorems on Parallelogram.

30. There is no significant difference between pretest posttest scores of IX Std girls under Computer Assisted Instruction and Conventional Instruction in the topic Theorems on Parallelogram.

31. There is no significant difference between pretest posttest scores of IX Std boys under Computer Assisted Instruction and Conventional Instruction in the topic Theorems on Parallelogram.

32. There is no significant difference between posttest scores of Girls and Boys under Computer Assisted Instruction in the Theorems on Parallelogram.

5.16 CONCLUSIONS

There are many modes of assisting the students to learn in the schools. There are many projects launched by the Government to introduce computer in teaching learning process. To create awareness among school students about the computer and its uses in teaching - learning process and in modem world so that they make full benefit of information and communication technology in their daily life and in education at every level. In 2001 Government of Karnataka Department of Public Instruction as introduced Computer-Education in High Schools in the Karnataka State. The proposal is that selected agencies will provide is on lease computer, hardware, software and connected accessories, Internet Service and provide computer education Services on a basis in the 1000 High Schools selected by the commissioner for public instruction Govt. of Karnataka.

Through computer education children can learn hardware, software terminology and Internet services so as to impart computer education in multimedia format for the students during school hours. These centers will also provide resource for the students for their class projects like word process by making writing easier: This helps a lot in creative process. Multimedia can be used in creative presentations in various effects and these can be stored in the CD-ROM. By using CD-ROM more information can be stored. In one way, by computer education people make more production is to provide tools that support the creative process. Word Processors make writing easer by reducing the retyping work. Multimedia can be used to create desktop presentations. In corpora ting the elements of multimedia enhances existing applications and creates entire new generations of tools for creative development. The

present study has successfully full fill the objective setup. Certainly, there will a great demand for educational softwares especially designed by the teachers.

The present study offers an opportunity to provide a new experience to students in geometry learning. These experiences progressively enlarge the students horizon through the introduction of new medium for communication adding to there sense of pleasurable achievement.

5.17 SUGGESTIONS FOR FURTHER RESEARCH

1. It can be taken further as a big project to prepare planned computer programming for all the units of IX standard mathematics in the form of CAI Package.
2. In feature instead of producing the softwares, it would be more useful to produce coursewares.
3. It can be taken as a study to prepare planned computer programming for all the units of VIII, IX and X standard mathematics.
4. Similar studies can also be undertaken for other computer studies in languages, Social sciences, General and applied sciences.
5. A comparative study of Computer Assisted Instruction (CAI) to the self study through the text may be undertaken.
6. Similar studies can be taken as a programme for vivid and individualistic approach of teaching different subjects at secondary school level.
8. Computer Assisted Instruction (CAI) can be converted in to Data Base programme in future.
9. To create awareness among school students about the computer and its uses in teaching –learning process and in modern world so that they make full benefit of information and communication technology in their daily life and in education at every level.
10. Using Computer Assisted Instruction as a complete replacement for conventional teaching may seriously weaken its effectiveness (Kulik and Bangert-Drowns, 1983). CAI is not often used in this way but, hardly managed to locate a few studies in which CAI totally replaced conventional teaching. Other studies also support the use

of CAI primarily as a supplement, or enhancement, to conventional instructions. Scholars like, Edwards, Norton, Taylor, Weiss, and Dusseldorp(1975) reviewed studies at various educational levels and in a range of subjects, they found he effectiveness of CAI was most apparent when it was used as a supplement to conventional teaching.

Therefore, CAI can also be used as a supplement within conventional teaching of Mathematics, because students like, to play with computer and learn many things and achieve more is the ambitious study of the present investigation.

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