Register Number	: 20113270
Course	: Bachelor of Education (I Year)
Subject title	: Pedagogy of Mathematics (Part - I)
Subject code	: A11070
Date	: 9.08.2021
Number of Pages written	: 41
Signature of the Candidate	: S. Ranjani

1.
a) TAXONOMY OF EDUCATIONAL OBJECTIVES OF MATHEMATICS

SYNOPSIS
* Introduction * classification of Educational Objectives * Bloom's Taxonomy * categories in cognitive domain * categories in Affective domain * categories in psychomotor domain * conclusion

INTRODUCTION :-

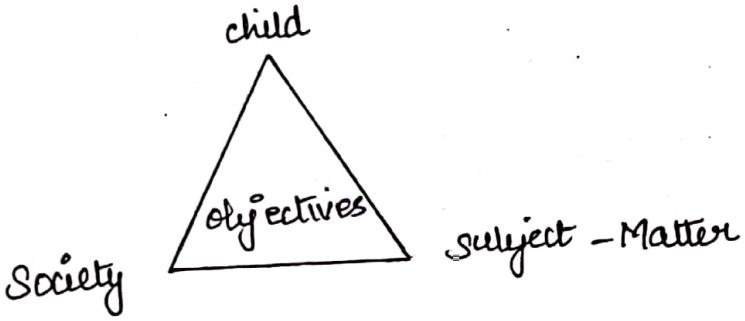
Based on the clarification, objectives related to education as a whole, are known as "Educational Objectives"

In the words of B.S Bloom " By Educational Objectives, we mean explicit formulations of the ways in which students are expected to be changed

educative process, that is, the ways in which they will change in their actions."

The formulation of educational objectives is the matter of careful choise on the part of teacher & administrators. The factors are

1. The need & capabilities of the people
2. The specific demands of his social environment
3. The nature of subject matter.



CLASSIFICATION OF EDUCATIONAL OBJECTIVES

classification is a valuable system to group similar things under one heading based on common characteristics or common relationship that exists btw groups & individuals.

The main functions of classifying educational objectives are as follows

* it is helpful in planning curriculum.

* it is helpful in planning, teaching & learning activities

* it is helpful in identifying desired behavioural outcomes among the learners

The criteria of a good educational objective are

1. In accordance with general aims of education
2. unambiguous
3. useful
4. Specific and
5. Feasible

BLOOM'S TAXONOMY :-

"Taxonomy of Educational objectives" (1956) edited by Benjamin S. Bloom. 'Taxonomy' is a term derived from two Greek words 'taxis' meaning 'arrangement' and 'nomos' meaning 'law'. Taxonomy means 'orderly arrangement'. They are classified the objectives into three domains. The Domains are

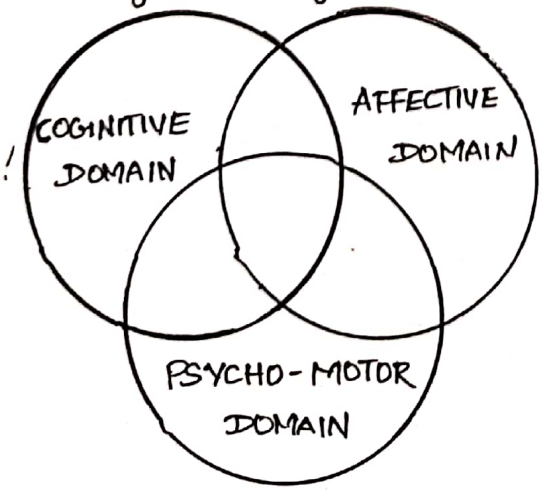
a) COGNITIVE DOMAIN (Knowing)
b) AFFECTIVE DOMAIN (Feeling)
c) PSYCHO-MOTOR DOMAIN (doing)

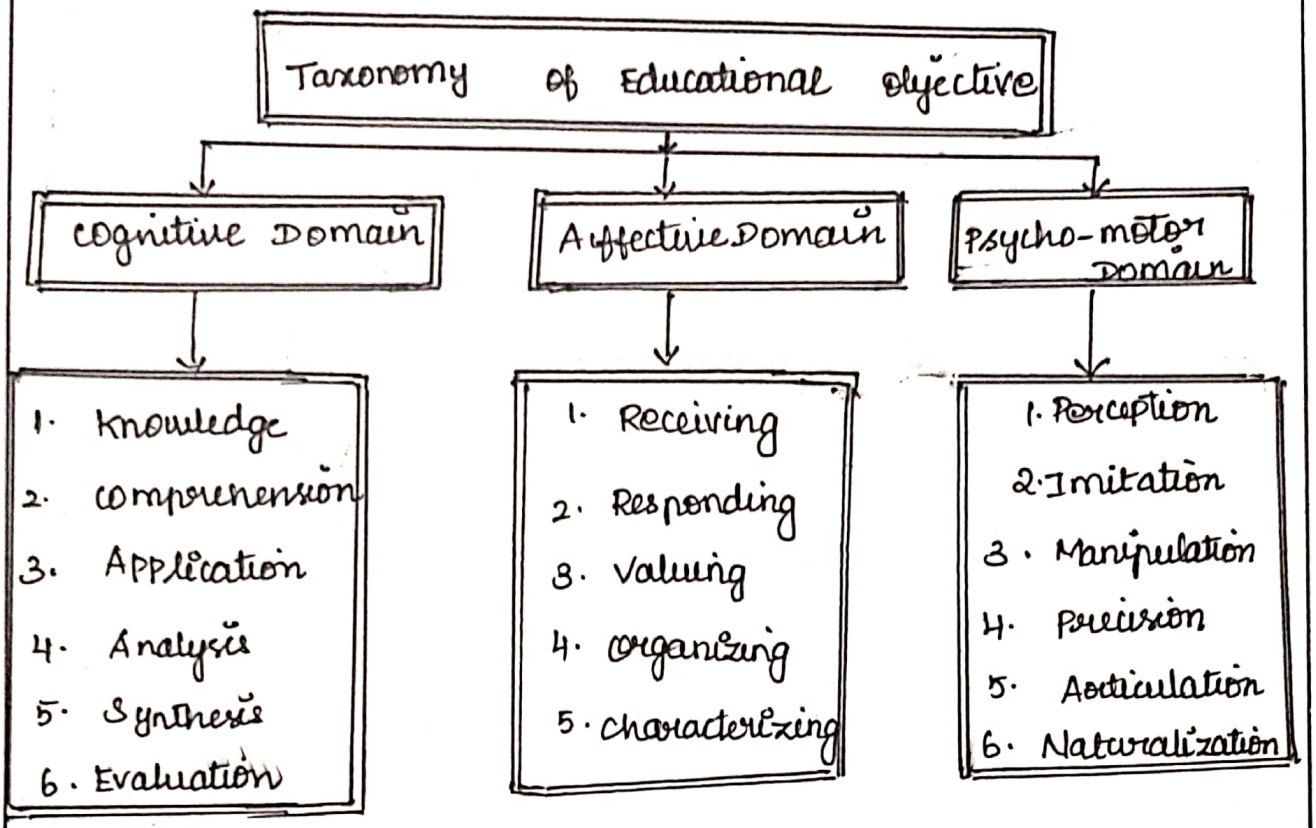
* Three domains are hierarchical because when learning takes place, the first activity is a mental process of trying to understand, analyze, synthesize and associate the information with something already known. This process under cognitive domain.

* In the second stage, the knowledge acquired begins to produce changes in the interest, attitude and feelings of the individual. These types of behavioural changes are grouped under affective domain

* In the third stage, the feeling acquired gives way to exhibit muscular skills and manipulative skills These changes are grouped under psycho-motor domain.

The major categories are as follows.





CATEGORIES IN THE COGNITIVE DOMAIN :-

Cognitive objectives :-

* cognitive objectives stress that the pupils should acquire more and more knowledge
* it deals with the recall or recognition of knowledge and development of intellectual abilities

Knowledge :-

* this is the first and lowest level of cognitive domain
* it includes recall of information such

as specifications, facts, methods, processes, generalizations, Patterns etc

Comprehension :-

This second category includes Translation, Interpretation and Extrapolation. it refers to a type of understanding of materials or communication

Application :-

The third level includes the ability to apply abstract ideas to a concrete situation. The abstractions may be in form of general ideas, rules.

Analysis :-

it means break down of materials into constituent parts and detection of the relationships of the parts and of the way they are organized.

Synthesis :-

it means putting together of elments and parts so as to form whole.

Evaluation :-

it is the assignment of symbols to phenomenon, in order to characterize the worth or value of phenomenon

CATEGORIES IN THE AFFECTIVE DOMAIN :-

Affective objective :-

Affective objective is concerned with the attitude, interest, emotions, values & mental tendencies of pupils.

Receiving :-

This is at lowest point on the affective domain sensitivity to existence of certain phenomena & stimuli

Responding :-

Responding refers to a behaviour which goes beyond merely attending to phenomena.

Valuing :-

valuing implies perceiving them as having worth or value

organising :-

This involves building up of organized system of values.

CATEGORIES IN THE PSYCHO-MOTOR DOMAIN :-

Psychomotor objective :-

The third part of taxonomy and includes the manipulative & motor-skill areas.

Perception :-

Skill of keen observation, skill of sensing a problem and skill of developing self motivation.

Imitation :-

Skill of repeating the actions and skill of reflective thinking are specific objectives.

Manipulation :-

Skill of operating upon the intelligence and manage cleverly using unfair method

Precision :-

Skill of experimentation, skill of precised movement

Articulation :-

Skill of global thinking, reflective thinking, Skill of mind & body and development of mathematical skills

Naturalization :-

As we practice a skill, it becomes our natural habit. Skill of attaining success.

Conclusion :-

* Knowledge regarding the strength & weakness of behavioral objectives will assist the nurse educator in framing objectives in a realistic way suitable to aims of nursing education

* Bloom's Taxonomy helpful for a teacher in making his teaching learning process effective.

2) a) USE OF CONCEPT ATTAINMENT MODEL IN TEACHING MATHEMATICS

SYNOPSIS
* Introduction
* Concept Attainment Model (CAM)
* Process of concept Attainment
* Benefits of concept Attainment
* Example of concept Attainment
* conclusion.

Introduction :-

* In 1956, Psychologist Jerome Bruner published a book called "A study of thinking". Bruner was interested in cognitive processing - how people think and how those tendencies might be used to teaching & learning processes.

* He developed a new way of introducing learners to new concepts called concept Attainment

CONCEPT ATTAINMENT MODEL (CAM)

* it can be thought of as game of

"Find the rule"

* concept Attainment is a "backwards conceptualizing" approach to making sense of new ideas.

* It is a teaching strategy characterized by "a patterns of decisions in the acquisition, retention and utilization of information serves to meet certain objectives"

* close relative to inductive thinking (Joyce and Weil 1964) and focuses on the decision making and categorization processes. leading up to creation & understanding of a concept.

PROCESS OF CONCEPT ATTAINMENT :-

* In the concept attainment process, new ideas are introduced and defined by students through the act(s) of categorization.

* students see attributes, example & non examples, form theories and test those theories against one data given until they are able to name the idea.

* This reverses the typical process of introducing an idea (gravity) by narrowly

defining it. (eg force that attracts a body towards another physical body having mass)

Elements of concept :-

Bruner has discussed the five elements of concepts. These are

* Name
* Examples
* Attributes
* Attribute values
* Rule

Variations of the Model :-

There are three variation of the model. These are

* Reception Model
* Selection Model
* Unorganized Material Model

Fundamental elements of concept Attainment Model

Focus :-

In practice, the model works as an inductive model designed to teach concept through the use of eg. The three variation of model have the common target.

Principles of reaction :-

*it guide the teacher's response of the learner

Support system :-

concept attainment lessons require that positive & negative examplars be presented to students

social system :-

In the CAM, the teacher is the controller of the situation. The three major functions of the teacher are to record prompt and present additional data.

BENEFITS OF CONCEPT ATTAINMENT :-

* Concept attainment is designed to clarify ideas and to introduce aspets of content.

* it engages students into formulating a concept through the use of illustrations, word cards or specimens called examples.

* Students who catch onto the idea before others are able to resolve the concept and thenare invited to their own examples.

* Concept Attainment is well suited to classroom use because all thinking alieities can be challanged throughout the activity

* children become skilled at identifying the relationship in the world cards or specimens.

APPLICATION OF CAM IN THE CLASSROOM SITUATION

* This model can be used teaching of language, grammar, science and fundamentals of mathematics
* This model is also an evaluation tool
* This model can be used with students of all grades.

A MATH EXAMPLES OF CAM :-

* First the Teacher chooses a concept to developed (math facts that equal 10)

Positive Examples :-

* positive Examples contains attributes of the concept to be taught

5+5 , 11-1 , 10×1 , 3+4+3 , 12-2, 15-5

(4×2)+2 , 9+1

Negative Examples :-

6+6 , 3+3 , 12-4 , 3×3 , 4×4, 16-5, 6×2

3+4+6 , 2+(2×3) , 16-10.

* Present the first card and saying. "This is a YES". place it under the appropriate column ie) 5+5 is a YES

* Present the next card and saying "This is a NO". Place it under NO column ie) 6+6 is a NO

CONCLUSION

* CAM has a great relevance for teachers who intend to improve the instructional system

* This model guides teacher to go to the depth of the content and helps students to attain new concepts

* So the model has a great attribute on teaching - learning Process.

4. FEATURES OF VEDIC MATHEMATICS :-

⇒ Vedic Mathematics is the name given to a supposedly ancient system of calculation which was "rediscovered" from the Vedhas between 1911 and 1918 by Sri Bharati krishna Tirtaji Maharaja (1884 - 1960)

⇒ According to Tirthaji all of Vedic Mathematics is based on sixteen sutras or word-formulae

For example, "Vertically and crosswise" is one of these sutras. These formulae are intended to describe the way the mind naturally works, and are therefore supposed to be a great help in directing the student to the appropriate method of solution

⇒ None of these sutras has ever been found in vedic literature, nor are its methods consistent with known mathematical knowledge from vedic era.

⇒ Perhaps the most striking feature of the Tirthaji System is its coherence.

⇒ The whole system is interrelated and unified: The general multiplication method, for example is easily reversed to allow one-line divisions, and the simple squaring method can be reversed to give one-line square roots.

⇒ And, these are all easily understood. This unifying quality is very satisfying it makes arithmetic easy and enjoyable and it encourages innovation.

⇒ Difficult arithmetic problems and huge sums can often be solved immediately by Tirthaji's method

⇒ These striking and beautiful methods are a part of a system of arithmetic which Tirthaji claims to be far more methodical than the modern system.

⇒ "Vedic Mathematics" refers to a technique of calculation based on a set 16 sutras, or

aphorisms, as algorithms and their upa-sutras or corollaries derived from these sutras.

⇒ Vedic Mathematics enthusiasts advance the claim that any mathematical problem can be solved mentally with these sutras

Example :-

1. 11 * 24

Step 1 : 1 * 4 = 4 (last digit)

Step 2 : 4 * 1 + 1 * 2 = 6

Step 3 : 1 * 2 = 2 (first digit)

∴ the correct Answer is 264

⇒ Vedic mathematics introduces the wonderful applications to arithmatical computations, theory of numbers, compound multiplications, algebraic operations, factorisation, simple quadratic and higher order equations, simultaneous quadratic equations, Partial fractions, calculus, squaring, cubing, square root, cube root and co-ordinate geometry etc.

5. GENERAL INSTRUCTIONAL OBJECTIVES FOR TEACHING TRIGONOMETRY IN MATHEMATICS :-

OBJECTIVES OF TEACHING TRIGONOMETRY

a) understanding Geometry for selecting Teaching points

* Trigonometry is a branch of mathematics that studies relationships b/w side lengths and angles of triangles.

* Trigonometry is found throughout geometry, as every straight-sided shape may be broken into a collection of triangles

* Further still trigonometry has astoundingly intricate relationships to other branches of mathematics, in particular complex number infinite series, logarithms and calculus..

* The word Trigonometry is a 16th century latin derivative from the Greek words for triangle (trigonon) and measure (metron)

b) Objectives of Teaching Trigonometry the students will be able.

* To understand trigonometric ratios and identities.
* Find the value of trigonometric ratios of some specific angles.
* Determine the trigonometric ratios of complementary angle
* Apply the trigonometric identities in proving the given statement
* To apply the knowledge of trigonometry to solve daily life problems.
* To find heights and distances.
* To appreciate the use of trigonometry to solve problems.
* To develop creative thinking & reasoning
* To appreciate its usefulness in technology
* To understand the relationship between trigonometry and other branches of mathematics.

6. DIFFERENT APPROACHES FOR WRITING A LESSON PLAN IN MATHEMATICS :-

There are various forms of writting lesson plan in our country and abroad but following three forms are most popular and commonly used.

1. Herbartian approach to lesson planning
2. Bloom's approach to lesson planning
3. RCEM approach to lesson planning

HERBARTIAN APPROACH TO LESSON PLANNING

⇒ The Herbartian approach is based on appercetive mass theory of learning

⇒ the proposition of that theory is that the learner is like a clean slate & all the knowledge is given from outside.

⇒ Herbartian approach is also known as Herbartian five steps approach.

⇒ John Foredrik Herbart, a German philosopher and great educationist and his followers adopted and evolved the most famous procedure known as "Herbartian Formal Steps".

1. Preparation
2. Presentation
3. Comparision & Association
4. Generalization
5. Applicature & Repetition

BLOOM'S APPROACH TO LESSON PLANNING :-

⇒ Bloom's approach is based upon the interrelationship among objectives, learning experiences and education techniques

The approach involves the following steps

⇒ Formulating educational objectives

⇒ Creating learning experiences

⇒ Evaluating the changes of Behaviour.

RCEM APPROACH TO LESSON PLAN :-

* RCEM Approach is advocated by the Regional College of Education, Mysore and hence the name

* The rationale behind this approach is a system approach in education.

* A system approach demands the presentation of information in a systematic manner

STAGES IN RCEM APPROACH :-

* The input, otherwise known as Expected Behaviour Outcomes (EBOS)

* Process, otherwise known as communication Strategy

* output, otherwise known as Real learning outcomes (RLOS)

7. PROJECT METHOD :-

⇒ This method is widely used in maths Teaching. Project method is based on philosophy of Pragmatism given by John Dewey.

⇒ His disciple Sir William Kilpatrick propounded this method.

⇒ This method aims to make learning effective and to give student the real training for life.

DEFINITION :-

According to Thomas and Lang, "Project is a voluntary undertaking which involves constructive effort and eventuates into objective results"

According to Ballard, "A project is a bit of real life that has been imported into school."

CONCEPT OF PROJECT METHOD :-

it has the following concept

1. Learning process goes towards a certain aim to acheive it
2. The student designs the process himself
3. The evaluation of the achieved aim is also possible to ascertain that how far the aim has been achieved.
4. The student understands himself in this method

TYPES OF PROJECT METHOD

it is of TWO Types

1. INDIVIDUAL PROJECT :-

The students completes the project himself . But it does not develop social qualities

2. SOCIAL PROJECT :-

In this method students of the class complete the project collectively . it develops social qualities in the students.

STEPS OF PROJECT METHOD

1. Creation of Situation
2. Choosing the Project
3. Planning the Project
4. Executing the project
5. Evaluation
6. Recording

ROLE OF TEACHER IN A PROJECT

The teacher plays a very important role in the project method which are

1. It is very sympathetic towards the students
2. The Teacher should provide democratic atmosphere in the classroom
3. Time to Time he encourages the students
4. The teacher should work as a friend and guide
5. The teacher should have thorough knowledge and experiences.

11. INDUCTIVE METHOD OF TEACHING WITH A TOPIC IN MATHEMATICS :-

⇒ Induction means establish a universal truth by showing that if it is true for Particular case and is further true for a reasonably adequate no of cases then it is true for all such cases

⇒ In Inductive method the rules & formula are established after extensive study of experiences, experiments and examples.

⇒ This method is more useful in lessons where principles, rules, definitions, generalizations and casual connection b/w facts are established.

⇒ The knowledge attained by this method becomes solid and durable and different mental power of the child can also be developed

⇒ it is a very effective method.

DEFINITION :-

According to Joyce; "Induction is the legitimate derivation of universal laws from individual cases"

According to Ladut; "whenever we present the facts, examples of things infront of students and we try to get our own expected answers, then it is called inductive method.

STEPS OF INDUCTIVE METHOD :-

In this method 4 steps are followed

1. Presentation of specific examples.
2. Observations
3. Generalization
4. Testing and verification

Example 1. Find out S.I of Rs 500 at 8% per annum for 3 years.

Step : 1 · S.I of Rs 100 for 1 year = Rs 8

S.I of Rs 1 for 1 year = Rs $\frac{8}{100}$

$\therefore$ S.I of Rs 600 for 1 year $= Rs\left(\frac{8}{100} \times 600\right)$

$\therefore$ S.I of Rs 600 for 3 years $= Rs\left(\frac{8}{100} \times 600 \times 3\right)$

Step : 2

$$S.I = Rs\left(\frac{8}{100} \times 600 \times 3\right)$$

$$= Rs\ 144$$

S.I for 3 years

$$S.I = \frac{Rate}{100} \times Principle \times Time$$

$$\boxed{S.I = \frac{P \times R \times T}{100}}$$

Step : 3 Find out the simple interest on Rs 1200 at the rate of 8% yearly for 18 years

$$\boxed{S.I = \text{simple Interest}}$$

Step : 4

Students will be able to verify the derived formula by solving other problems of simple interest based on this formula.

9) LEARNING RESOURCES IN A SCHOOL COMPLEX BE POOLED:-

POOLING OF LEARNING RESOURCES :-

⇒ In the school of classroom is the first physical space that a child associates herself with and feels closest to

⇒ Thus the first pooling of resources can start right from the classroom itself

⇒ In modern educational point of view the theoritical principles which are discussed in the classroom should be practically tested in the laboratory.

⇒ Even every concept is not possible to check in the laboratory, therefore one or two tables can arrange the classroom should be practically tested in the laboraty

⇒ Even every concept is not possible to check in the laboratory, therefore

one or two tables can arrange the classroom for demonstration / activity purpose

⇒ children should be encouraged to bring materials they think are relevant for discussions and display.

⇒ these materials can be used to provide them hands-on experience

⇒ systematic experimentation as tool to discover or verify theoretical principles is an important part of curriculum at secondary and higher secondary stage

⇒ thus, schools require well equipped laboratories for students at this stage

⇒ school of the cluster could plan their timetable so that for half a day, one a week, their mathematics laboratory class is held at the cluster level Laboratory.

8. INQUIRY MODEL IN MATHEMATICS EDUCATION :-

INQUIRY MODEL :-

⇒ Inquiry training model is used for giving training of inquiry to the student. By using this model in the classroom, inquiry skill can be developed.

⇒ Development of Inquiry models skills needs individual attention

ROLE OF INQUIRY MODELS :-

Encounter with the problem :-

⇒ The teacher presents a puzzling situation before the students and explain the inquiry procedures. Its aim is to create new knowledge. The initial inquiry is based on simple ideas.

Data collection and verification :-

⇒ The students here try to collect detailed information about the problem

⇒ They try to seek clarifications about the doubts concerning the problem.

⇒ Teacher virtually prepares the ground for the success of the model

Data gathering for experimentation :-

⇒ This is a stage when the student actually starts putting questions and the teacher is reacting to their questions by saying yes or no as the case may be

Formulating an explanation :-

⇒ In this phase, the teacher will invite the pupils to explain things.

⇒ Through explanation, rules may be formulated. The deviation is also checked so that efforts are applied in the right direction and no energy goes waste.

Analysis of the inquiry process

⇒ In this phase, the students analyse and reflect on the methods they adopted for inquiry

⇒ This helps in finding out a suitable solution to the various issues involved.

ie) the main problem, the right strategy for it etc.

14. WAYS TO INTEGRATE ICT IN MATHEMATICS TEACHING :-

Data bases :-

⇒ The handling of data is a very important part of a mathematics lesson

⇒ It involves analysing information collected by the students themselves during a hands-on, practical activity

⇒ This can be done with real and relevant data making it is an authentic learning experience

Spreadsheets :-

⇒ These are designed to help you work with numbers and students can use to do the same too.

⇒ They can be set up as the no. of machines that can repeat calculation process quickly and easily.

Interactive white boards :-

⇒ Interactive whiteboards with the aid of digital projectors - the combination of these two with the addition of computer itself will allow us to teach mathematics using whole-class teaching methods.

Programmable Toys :-

⇒ Robotic toys can be used as

a catalyst for problem-solving from early childhood to primary education.

DESKTOP PUBLISHING SOFTWARE :-

⇒ This is a great idea for when investigating and designing objects on the screen. They are very useful for studying 2-dimentional objects as they allow you to create simple shapes quickly and easily

Sec- C

2marks :-

15) SYMPOSIUM IN MATHEMATICS :-

⇒ The language for communication of mathematical ideas is largely in terms of symbols and words which everybody cannot understand

⇒ There is no popular terminology for talking about mathematics

For Example :

⇒ The distinction between a number and a numeral could head the list.

⇒ A number is a property of a set. All mathematical statements, relations and operations are expressed using mathematical symbols such as

+, −, ×, ÷, <, >, ≡, ≤, √, Σ, & and so on.

16.

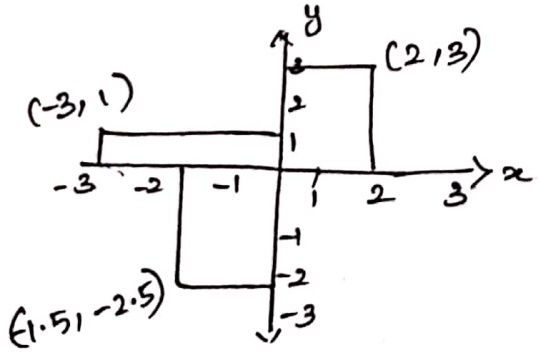
CONTRIBUTION OF RENE DESCARTES:-

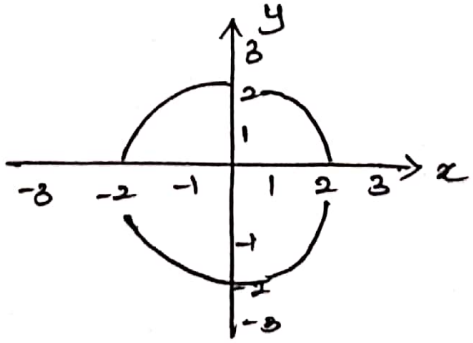
⇒ Rene Descartes has been dubbed the "Father of Modern Philosophy"

⇒ Discourse on the method is one of the most influential works in the history of modern Philosophy

⇒ He invented the influential cartesian co-ordinate system

⇒ cartesian coordinates describe the position of a point in two dimensions by giving its horizontal & vertical locations





17. CULTURE AFFECT MATHEMATICS LEARNING :-

⇒ Taylor has focused his work on how mathematics learning

⇒ it is very difficult to separate issues of culture and learning". he says. For example culture and language can have a tremendous impact on the way a child learns to count

⇒ practices within culture affect understandings

18. YEAR PLAN :-

⇒ Year planning is done by the teacher at the beginning of the year for the entire course

⇒ For example, a teacher who teaches a course in mathematics for a particular class plans then curricular and co-curricular activities as per the syllabus for entire academic year

⇒ The teacher has to prepare year plan keeping in mind

1. The number of units to be covered as per the syllabus during the academic year.

2. The no. of working days per term and for the year

3. The no. of holidays during the academic year.

19. TECHNIQUES OF LEARNING MATHEMATICS :-

⇒ The key to teaching basic math skills that students can apply and remember for future instruction is to use several teaching strategies

* Repetition . A simply strategy teachers can use to improve math skills is repetition

* timed testing
* Pair work
* manipulation tools
* Math games

20. MATHEMATICS :-

⇒ Mathematics includes the study of such topics as quantity, structure, space and change it has no generally accepted definition

⇒ Mathematicians seek and use patterns to formulate new conjectures they resolve

the truth or falsity of such by mathematical proof.

21. FEATURES OF MATHEMATICS CLUB:-

⇒ Maths-clubs are dedicated extra-curricular maths get-togethers. that breath new life into maths beyond the classroom

⇒ they come in all shapes and sizes and there is no one model that works for every school

⇒ However they all focus on two things:- having fun with maths and learning

22) ACADEMIC TRANING IN MATHEMATICS:-

⇒ This is to be acquired through college education in the subject

⇒ It is in a way, a prerequisite for becoming a mathematics teacher

⇒ He should acquire a fair understanding of the broad field of mathematical analysis and reasoning.

23. CHALK AND TALK METHOD :-

⇒ SCF has come up with an alternate pedagogy that goes beyond the confines of classroom teaching

⇒ The forum has been trying to go beyond the chalk-talk method of classroom teaching and popularise a methodology that is interactive and entertaining

⇒ According to Abhijit Bardhan, general Secretary SCF. it is important that students learn to ask questions & explore problem of suience of their own.

24) FOUR AREAS OF DIFFICULTIES IN MATHEMATICS

1. Incomplete Mastery of Numbers Facts
2. Computational weakness
3. Difficulty Transferring Knowledge
4. Making connection