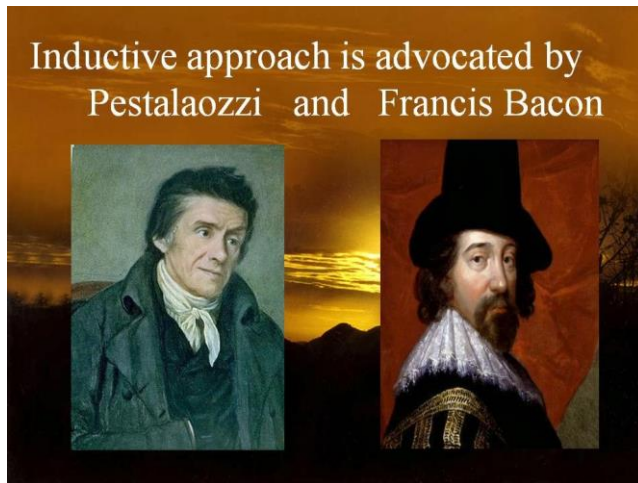


## INDUCTIVE METHOD



- Inductive approach is advocated by Pestalozzi and Francis Bacon
- Inductive approach is based on the process of induction.
- In this we first take a few examples and greater than generalize.
- It is a method of constructing a formula with the help of a sufficient number of concrete examples. Induction means to provide a universal truth by showing, that if it is true for a particular case. It is true for all such cases. Inductive approach is psychological in nature.
- The children follow the subject matter with great interest and understanding. This method is more useful in arithmetic teaching and learning.

Inductive approach proceeds from

- Particular cases to general rules of formulae
- Concrete instance to abstract rules
- Known to unknown
- Simple to complex

Following steps are used while teaching by this method:-

***(a) Presentation of Examples***

In this step teacher presents many examples of same type and solutions of those specific examples are obtained with the help of the student.

***(b) Observation***

After getting the solution, the students observe these and try to reach to some conclusion.

***(c) Generalization***

After observation the examples presented, the teacher and children decide some common formulae, principle or law by logical mutual discussion.

***(d) Testing and verification***

After deciding some common formula, principle or law, children test and verify the law with the help of other examples. In this way children logically attain the knowledge of inductive method by following above given steps.



*(b) Observation*



*(c) Generalization*



*(d) Testing and verification*



**Example 1:**

Square of an odd number is odd and square of an even number is even.

**Solution:*****Particular concept:***

$$1^2 = 1 \qquad 3^2 = 9 \qquad 5^2 = 25 \text{ equation 1}$$

$$2^2 = 4 \qquad 4^2 = 16 \qquad 6^2 = 36 \text{ Equation 2}$$

***General concept:***

From equation 1 and 2, we get

Square of an odd number is odd

Square of an even number is even.

**Example 2 :**

Sum of two odd numbers is even

**Solution:*****Particular concept:***

$$1+1=2$$

$$1+3=4$$

$$1+5=6$$

$$3+5=8$$

***General concept:***

In the above we conclude that sum of two odd numbers is even

**Example 3 :**

Law of indices  $a^m \times a^n = a^{m+n}$

**Solution:**

$$\begin{aligned} \text{We have to start with } a^2 \times a^3 &= (a \times a) \times (a \times a \times a) \\ &= a^5 \\ &= a^{2+3} \end{aligned}$$

$$\begin{aligned} a^3 \times a^4 &= (a \times a \times a) \times (a \times a \times a \times a) \\ &= a^7 \\ &= a^{3+4} \end{aligned}$$

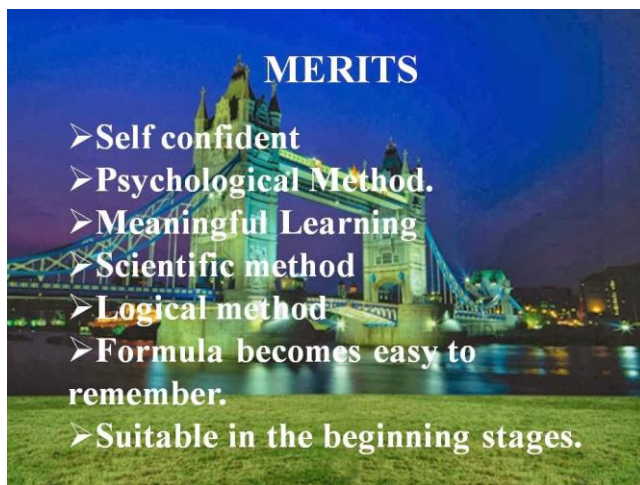
$$\begin{aligned} \text{Therefore } a^m \times a^n &= (\text{axax...m times}) \times (\text{axa ...n times}) \\ a^m \times a^n &= a^{m+n} \end{aligned}$$

***MERITS***

- It enhances self confident
- It is a psychological method.
- It is a meaningful learning
- It is a scientific method
- It develops scientific attitude.
- It develops the habit of intelligent hard work.
- It helps in understanding because the student knows how a particular formula has been framed.
- Since it is a logical method so it suits teaching of mathematics.
- It is a natural method of making discoveries, majority of discoveries have been made inductively.
- It does not burden the mind. Formula becomes easy to remember.
- This method is found to be suitable in the beginning stages. All teaching in mathematics is conductive in the beginning.

***DEMERITS***

- Certain complex and complicated formula cannot be generated so this method is limited in range and not suitable for all topics.
- It is time consuming and laborious method
- It is length.
- It's application is limited to very few topics
- It is not suitable for higher class
- Inductive reasoning is not absolutely conclusive because the generalization made with the help of a few specific examples may not hold good in all cases.



## APPLICABILITY OF INDUCTIVE METHOD

- Inductive approach is most suitable where
- Rules are to be formulated
- Definitions are to be formulated
- Formulae are to be derived
- Generalizations or law are to be arrived at.

### **Applicability of inductive method**

Inductive approach is most suitable where

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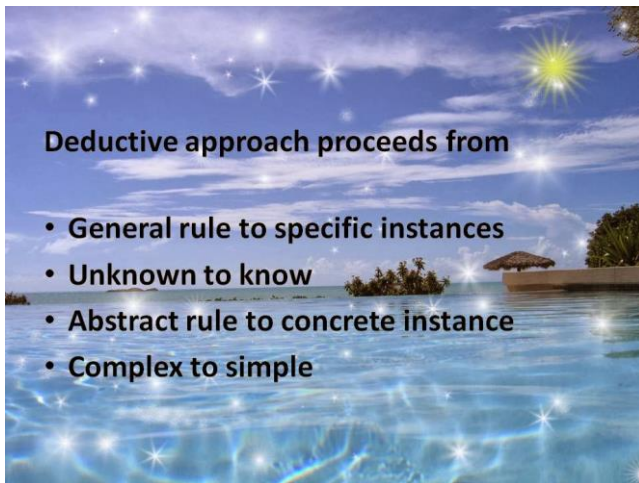


## DEDUCTIVE METHOD

- Deductive method is based on deduction.
- In this approach we proceed from general to particular and from abstract to concrete.
- At first the rules are given and then students are asked to apply these rules to solve more problems.



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Deductive method is based on deduction. In this approach we proceed from general to particular and from abstract and concrete. At first the rules are given and then students are asked to apply these rules to solve more problems. This approach is mainly used in Algebra, Geometry and Trigonometry because different relations, laws and formulae are used in these sub branches of mathematics. In this approach, help is taken from assumptions, postulates and axioms of mathematics. It is used for teaching mathematics in higher classes.

Deductive approach proceeds form

- General rule to specific instances
- Unknown to know
- Abstract rule to concrete instance
- Complex to simple

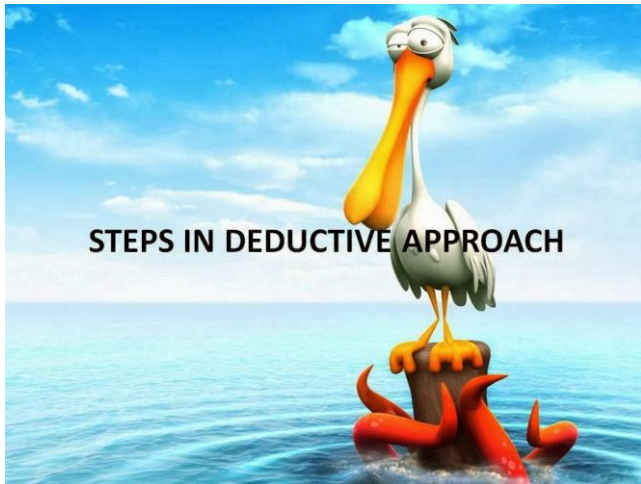
### **Steps in deductive approach**

Deductive approach of teaching follows the steps given below for effective teaching

- Clear recognition of the problem
- Search for a tentative hypothesis



- Formulating of a tentative hypothesis
- Verification





### Example 1:

Find  $a^2 \times a^{10} = ?$

**Solution:**

$$\text{General : } a^m \times a^n = a^{m+n}$$

$$\text{Particular: } a^2 \times a^{10} = a^{2+10} = a^{12}$$

### Example 1:

Find  $a^2 \times a^{10} = ?$

**Solution:**

$$\text{General : } a^m \times a^n = a^{m+n}$$

$$\text{Particular: } a^2 \times a^{10} = a^{2+10} = a^{12}$$

### Example 2:

Find  $(102)^2 = ?$

**Solution:**

$$\text{General: } (a+b)^2 = a^2 + b^2 + 2ab$$

$$\begin{aligned} \text{Particular: } (100+2)^2 &= 100^2 + 2^2 + (2 \times 100 \times 2) \\ &= 10000 + 4 + 400 = 10404 \end{aligned}$$

### ***MERITS***

- It is short and time saving method.
- It is suitable for all topics.
- This method is useful for revision and drill work
- There is use of learner's memory

- It is very simple method
- It helps all types of learners
- It provides sufficient practice in the application of various mathematical formulae and rules.
- The speed and efficiency increase by the use of this method.
- Probability in induction gets converted into certainty by this method.

### ***DEMERITS***

not a psychological method.

not easy to understand

confuses the pupil's mind.

does not impart any training in scientific method

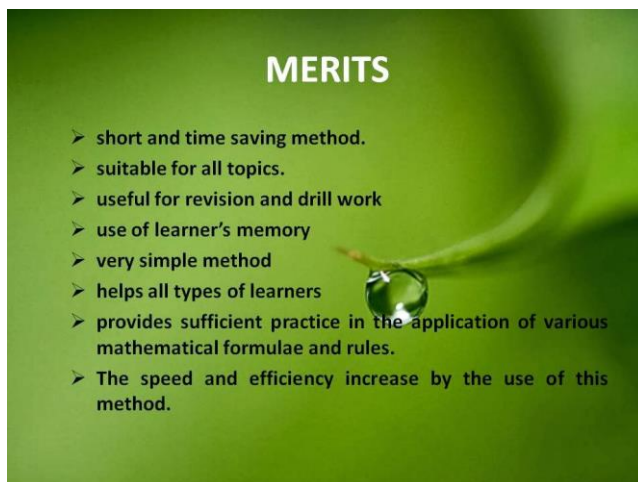
not suitable for beginners.

encourages cramming.

puts more emphasis on memory.

students are only passive listeners.

not found quite suitable for the development of thinking, reasoning, and discovery.



## DEMERITS

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### **Applicability of Deductive Approach**

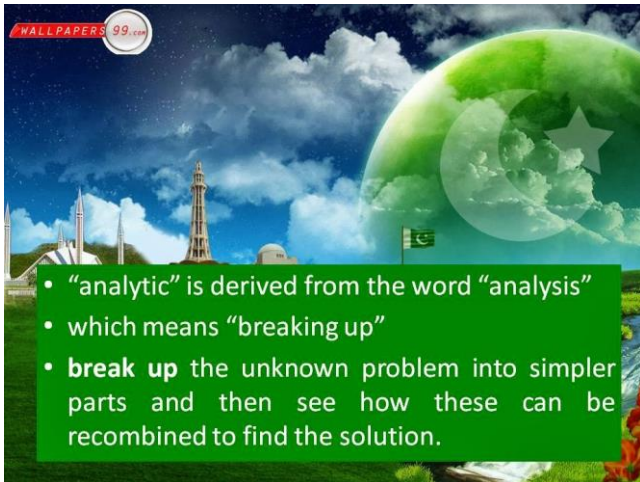
Deductive approach is suitable for giving practice to the student in applying the formula or principles or generalization which has been already arrived at. This method is very useful for fixation and retention of facts and rules as it provides adequate drill and practice.



**ANALYTICAL**

**mETHOD**





The word “analytic” is derived from the word “analysis” which means “breaking up” or resolving a thing into its constituent elements. The original meaning of the word analysis is to unloose or to separate things that are together. In this method we **break up** the unknown problem into simpler parts and then see how these can be recombined to find the solution. So we start with what is to be found out and then think of further steps or possibilities the may connect the unknown built the known and find out the desired result. It is believed that all the highest intellectual performance of the mind is Analysis.

- It is derived from the word analysis, its means breaking up.

- It leads to conclusion to hypothesis
- It leads to unknown to known
- It leads to abstract to concrete

***Example:***

if  $a^2+b^2=7ab$  prove that  $2\log (a+b) = 2\log 3+\log a+\log b$

**Proof:**

To prove this using analytic method, begin from the unknown.

The unknown is  $2\log (a+b) = 2\log 3+\log a+\log b$

Now,  $2\log (a+b) = 2\log 3+ \log a+ \log b$  is true

If  $\log (a+b)^2 = \log 3^2 + \log a + \log b$  is true

If  $\log (a+b)^2 = \log 9 + \log ab$  is true

If  $\log (a+b)^2 = \log 9ab$  is true

If  $(a+b)^2 = 9ab$  is true

if  $a^2+b^2=7ab$  which is known and true

Thus if  $a^2+b^2= 7ab$  prove that  $2\log (a+b) = 2\log 3+\log a+\log b$

***Merits***

- It develops the power of thinking and reasoning
- It develops originality and creativity amongst the students.
- It helps in a clear understanding of the subject because the students have to go thorough the whole process themselves.
- There is least home work
- Students participation is maximum
- It this method student's participation is encouraged.
- It is a psychological method.

- No cramming is required in this method.
- Teaching by this method, teacher carries the class with him.
- It develops self-confidence and self reliant in the pupil.
- Knowledge gained by this method is more solid and durable.
- It is based on heuristic method.

### ***Demerits***

- It is time consuming and lengthy method, so it is uneconomical.
- In it, facts are not presented in a neat and systematic order.
- This method is not suitable for all the topics in mathematics.
- This does not find favour with all the students because below average students fail to follow this method.
- Every teacher cannot use this method successfully

#### **EXAMPLE**

if  $a^2+b^2=7ab$  prove that  $2\log(a+b) = 2\log 3 + \log a + \log b$

**Proof:**

To prove this using analytic method, begin from the unknown.

The unknown is  $2\log(a+b) = 2\log 3 + \log a + \log b$

Now,  $2\log(a+b) = 2\log 3 + \log a + \log b$  is true

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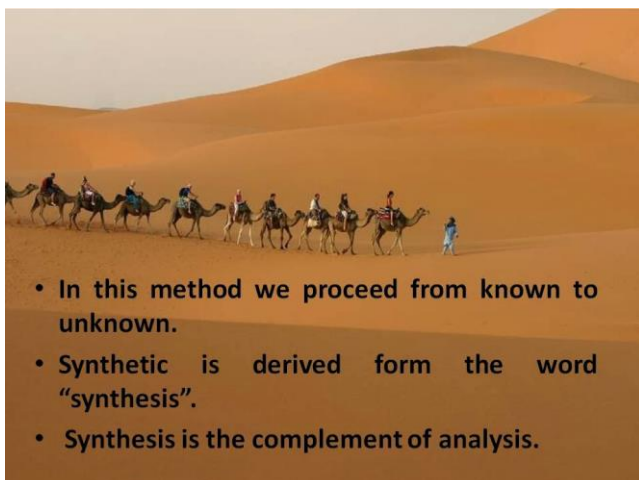
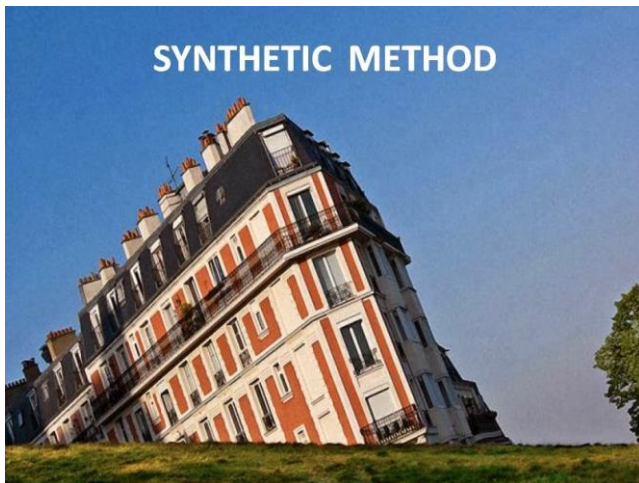
So this method is particularly suitable for teaching of Arithmetic, algebra and Geometry as it analyses the problem into sub-parts and various parts are reorganized and the already learnt facts are used to connect the known with unknown. It puts more stress on reasoning and development of power of reasoning is one of the major aims of teaching of mathematics.

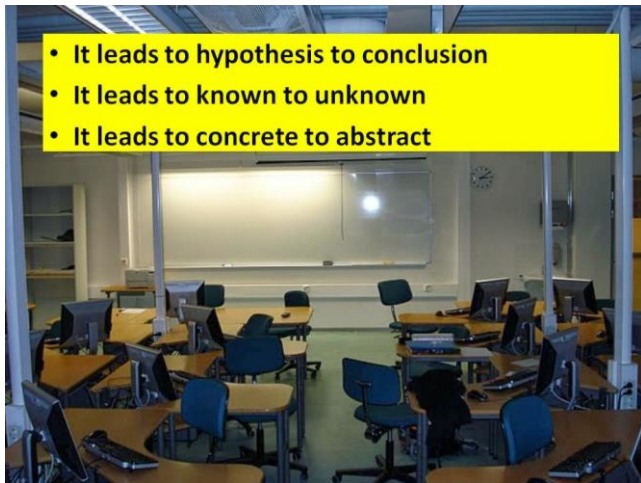
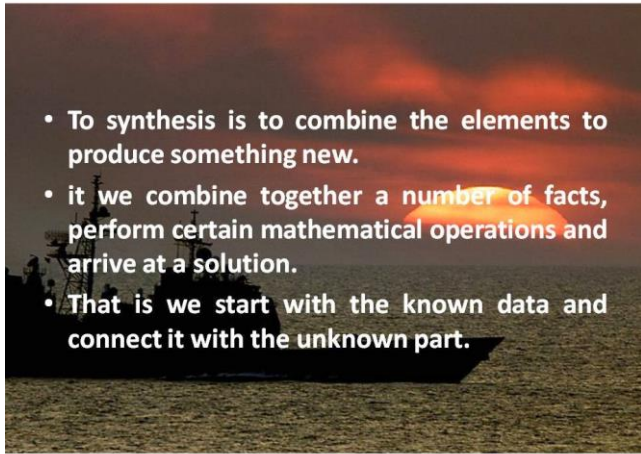
## SYNTHETIC METHOD

In this method we proceed from known to unknown. Synthetic is derived from the word “synthesis”. Synthesis is the complement of analysis.

To synthesis is to combine the elements to produce something new. Actually it is reverse of analytic method. In this method we proceed “from known to unknown.” So in it we combine together a number of facts, perform certain mathematical operations and arrive at a solution. That is we start with the known data and connect it with the unknown part.

- It leads to hypothesis to conclusion
- It leads to known to unknown
- It leads to concrete to abstract





**Example :**

if  $a^2+b^2=7ab$  prove that  $2\log(a+b) = 2\log3+\log a+\log b$

**Proof:**

To prove this using synthetic method, begin from the known.

The known is  $a^2+b^2= 7ab$

*Adding 2ab on both sides*

$$a^2+b^2+2ab=7ab + 2ab$$

$$(a+b)^2 = 9ab$$

***Taking log on both sides***

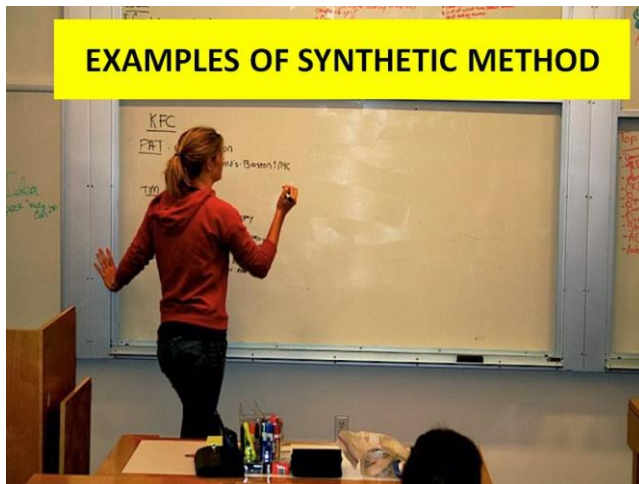
$$\log (a+b)^2 = \log 9ab$$

$$2\log (a+b) = \log 9 + \log ab$$

$$2 \log (a+b) = \log 3^2 + \log a + \log b$$

$$2\log (a+b) = 2\log 3+ \log a+ \log b$$

Thus if  $a^2+b^2=11ab$  prove that  $2\log (a-b) = 2\log 3+\log a+\log b$



**EXAMPLE:**

if  $a^2+b^2=7ab$  prove that  $2\log (a+b) = 2\log 3+\log a+\log b$

**Proof:**

To prove this using synthetic method, begin from the known.

The known is  $a^2+b^2= 7ab$

**Adding  $2ab$  on both sides**

$$a^2+b^2+2ab=7ab + 2ab$$

$$(a+b)^2 = 9ab$$

**Taking log on both sides**

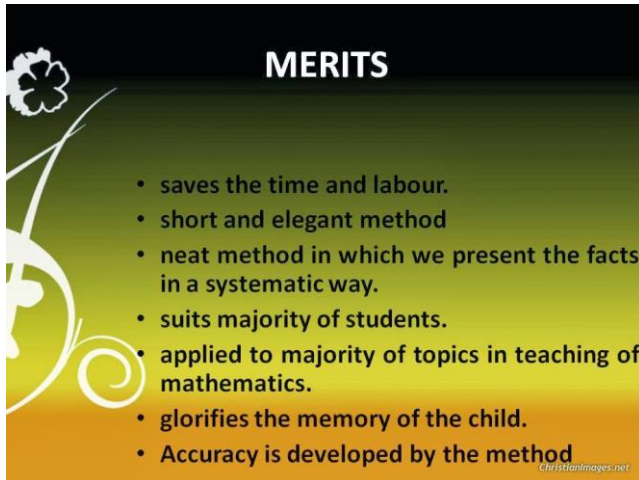
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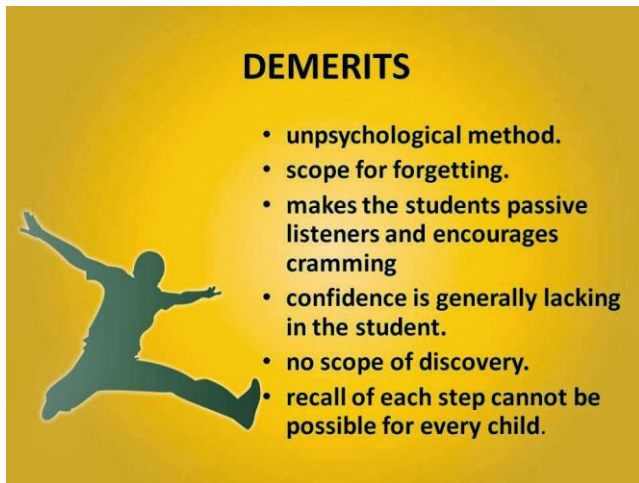
Thus if  $a^2+b^2=11ab$  prove that  $2\log (a-b) = 2\log 3+\log a+\log b$



## MERITS

- saves the time and labour.
- short and elegant method
- neat method in which we present the facts in a systematic way.
- suits majority of students.
- applied to majority of topics in teaching of mathematics.
- glorifies the memory of the child.
- Accuracy is developed by the method

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## DEMERITS

- unpsychological method.
- scope for forgetting.
- makes the students passive listeners and encourages cramming
- confidence is generally lacking in the student.
- no scope of discovery.
- recall of each step cannot be possible for every child.

### *Merits*

- It saves the time and labour.
- It is short method
- It is a neat method in which we present the facts in a systematic way.
- It suits majority of students.
- It can be applied to majority of topics in teaching of mathematics.
- It glorifies the memory of the child.
- Accuracy is developed by the method

### ***Demerits***

- ☐ It is an unpsychological method.
- ☐ There is a scope for forgetting.
- ☐ It makes the students passive listeners and encourages cramming
- ☐ In this method confidence is generally lacking in the student.
- ☐ There is no scope of discovery.
- ☐ The recall of each step cannot be possible for every child.

### **COMPARISON OF ANALYTIC AND SYNTHETIC METHOD**

#### **Analytic Method**

- (1) Analysis means breaking up into simpler elements.
- (2) It proceeds from the unknown to the known facts.
- (3) It is a method of discovery.
- (4) It is a process of thinking (exploration).
- (5) It is lengthy and laborious.
- (6) It pulls apart or breaks up the statement under solution.
- (7) It can be rediscovered.
- (8) It is slow, round-about and involves trial and error.
- (9) It answers satisfactorily and question that may arise in the mind of pupil.
- (10) It is a general method; it is a method for the thinker and discoverer.

(11) The students can recall and reconstruct easily any step if forgotten.

(12) It develops originality.

(13) It is informal.

(14) It is formational.

(15) It is based on heuristic lines.

(16) It is fore-runner of 16.

### **Synthetic Method**

(1) Synthesis means building up separate element and their combination

(2) It proceeds from the known to the unknown facts.

(3) It is a method of presentation of discovered facts.

(4) It is a product of thought.

(5) It is short and concise.

(6) It puts together or synthesizes known facts.

(7) Once forgotten, it cannot be recalled.

(8) It is quick, straight forward and does without trail and error.

(9) It does not satisfy doubts and questions arising in the mind of the learner.

(10) It is a special device; it is a method for the crammer.

(11) It is not that easy to recall or reconstruct any forgotten step.

(12) It develops memory.

(13) It is informal.

(14) It is simply informational.

(15) There is no heuristic approach in it.

(16) It is the follower of analysis.

### **UNIT III: LEARNING RESOURCES IN MATHEMATICS**

#### **TEXT BOOK**



## **Introduction**

The mathematics text book is another important source for learning mathematics and it plays a key role in effective teaching and learning. Therefore it is important that these text books merely supply information and facts, but also enable the student to understand and appreciate concepts and principles and their relevance in day to day life. A text book should stimulate reflective thinking and develop problem solving ability among students the text books should

present real learning situations which are challenging and interesting for the students and should not render itself as a means of rote learning.

### **NEED AND IMPORTANCE OF A GOOD TEXT BOOK IN MATHEMATICS**

A mathematics text book is very useful for a teacher in the following ways.

- A text book is written according to the syllabus and gives the outline of the course. Therefore it helps the teacher to decide about the limits and depth of the content to be presented to the students while teaching.

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- A text book provides insight to the teacher in planning lesson, in selecting the problems to be worked out, the methods of teaching to be adopted and the teaching aids to be used.
- The logical and psychological sequence followed in a text book helps the teacher in presenting the subject matter in an orderly and systematic sequence
- A good text book presents a variety of worked out examples on each topic. This helps the teacher in getting acquainted with different types of problems and the methods to solve them. This gives more self confidence while teaching
- A text book save a lot of time for the teacher as he need not spend time to

prepare problems and the solutions as they are readily available in the text books.

- A text book is an important aid for learning mathematics. It helps the pupils to relate what they are learning to life.
- It helps to foster the right study attitude among the students since the text book presents defined and concrete details in scientific and intensive manner which could arouse the students interest and curiosity.
- The well graded exercises provided after every topic in the text book help the teacher in assigning suitable homework and assignment to the student.

- It encourages self study and independent work among the students.
- The text book provides important source of materials for reviewing and recapitulating the lessons taught in the class.

## Conclusion

“ Few tools have been so misused as textbooks in teaching.” It will be no exaggeration to say that text book have become ends in education. The teachers follow them blindly. They are read out loudly, para by para in the class by each of the pupils in turn; brief explanations and comments are given by the teachers, and

A **textbook** is a collection of the knowledge, concepts, and principles of a selected topic or course. It's usually written by one or more teachers, college professors, or education experts who are authorities in a specific field. Most textbooks are accompanied by teacher guides, which provide you with supplemental teaching materials, ideas, and activities to use throughout the academic year.

### **Textbooks provide you with several advantages in the classroom:**

- Textbooks are especially helpful for **beginning teachers**. The material to be covered and the design of each lesson are carefully spelled out in detail.
- Textbooks provide organized units of work. A textbook gives you all the plans and lessons you need to cover a topic in some detail.
- A textbook series provides you with a balanced, chronological presentation of information.
- Textbooks are a detailed sequence of **teaching procedures** that tell you what to do and when to do it. There are no surprises—everything is carefully spelled out.
- Textbooks provide administrators and teachers with a complete program. The series is typically based on the latest research and teaching strategies.
- Good textbooks are excellent teaching aids. They're a resource for both teachers and students.

### **Use Textbooks Wisely**

A textbook is only as good as the teacher who uses it. And it's important to remember that a textbook is just one tool, perhaps a very important tool, in your

teaching arsenal. Sometimes, teachers over-rely on textbooks and don't consider other aids or other materials for the classroom. Some teachers reject a textbook approach to learning because the textbook is outdated or insufficiently covers a topic or subject area.

As a teacher, you'll need to make many decisions, and one of those is how you want to use the textbook. As good as they may appear on the surface, textbooks do have some limitations. The following table lists some of the most common weaknesses of textbooks, along with ways of overcoming those difficulties.

<b>Weakness</b>	<b>Student Difficulty</b>	<b>Ways of Overcoming Problem</b>
The textbook is designed as a the sole source of information.	Students only see one perspective on a concept or issue.	Provide students with lots of information sources such as trade books, CD-ROMS, websites, encyclopedias, etc.
Textbook is old or outdated.	Information shared with students is not current or relevant.	Use textbook sparingly or supplement with other materials.
Textbook questions tend to be low level or fact-based.	Students assume that learning is simply a collection of facts and figures.	Ask higher-level questions and provide creative thinking and problem-solving activities.



Textbook doesn't take students' background knowledge into account.	Teacher does not tailor lessons to the specific attributes and interests of students.	Discover what students know about a topic prior to teaching. Design the lesson based on that knowledge.
Reading level of the textbook is too difficult.	Students cannot read or understand important concepts.	Use lots of supplemental materials such as library books, Internet, CD-ROMs, etc.
The textbook has all the answer to all the questions.	Students tend to see learning as an accumulation of correct answers.	Involve students in problem-solving activities, higher-level thinking questions, and extending activities.

## AUDIO VISUAL MEDIA

### AIDS

#### **Introduction:**

Audio visual material must be seen in their relationship to teaching as a whole and to the learning process as a whole, until the teacher understands the relationship between audio visual material and teaching learning process.

Audio visual materials are produced, distributed and used as planned components of educational programs. It helps the process of learning that is motivation, classification and stimulation. A.v. aids are multisensory materials which motivate and stimulate the individual. It makes dynamic learning experience more concrete realistic and clarity. It provides significant gains in thinking and reasoning.

Audio visual aids are sensitive tools used in teaching and as avenues for learning. These are planned educational materials that appeal to the senses of the people and quicken learning facilities for clear understanding.

***Definitions:***

1. ***According to Kinder S. James:*** Audio visual aids are any device which can be used to make the learning experience more concrete, more realistic and more dynamic.
2. ***According to Burton:*** audio visual aids are those sensory objects or images which initiate or stimulate and reinforce learning.
3. ***According to Carter.v.Good:*** audio visual aids are those aids which help in completing the triangular process of learning that is motivation, classification and stimulation.
4. ***According to good's dictionary of education:*** audio visual aids are any thing by means of which learning process may be encouraged or carried on through the sense of hearing or sense of sight.
5. ***According to Edger Dale:*** audio visual aids are those devices by the use of which communication of ideas between persons and groups in various teaching and training situations is helped. These are also termed as multi sensory materials.

6. *According to McKean and Roberts:* audio visual aids are supplementary devices by which the teacher, through the utilization of more than one sensory channel is able to clarify, establish and correlate concepts, interpretations and appreciations.
7. *According to KP. Neeraja:* an audio visual aid is an instructional device in which the message can be heard as well as seen.

#### **Purposes:**

- To supplement and enrich teachers own teaching to make teaching-learning more concrete.
- To serve an instructional role in itself.
- To create interest among the group.
- To make teaching as an effective process.

#### **Advantages:**

1. A.V.Aids helps in effective perceptual and conceptual learning.
2. A.V.Aids helpful in capturing and sustaining attention of students.
3. A.V.Aids arouses interest and motivates students to learn.
4. A.V.Aids is helpful in new learning.
5. A.V.Aids helps in saving energy and time of both the teacher's and students.
6. A.V.Aids provides near realistic experience.
7. A.V.Aids can meet individual demands.
8. A.V.Aids is useful in for education of masses.

#### **Characteristics of good teaching aids:**

### **Teaching aids should be**

- Ø Meaningful and purposeful
- Ø Motivates the learners
- Ø Accurate in every aspect
- Ø Simple and cheap
- Ø Improvised
- Ø Large in size
- Ø Up-to-date
- Ø Easily portable

### **According to intellectual level of students Sources of A.V.Aids:**

- Ø Government
- Ø Educational institutions
- Ø Professional organizations
- Ø Non-governmental organizations
- Ø Voluntary organizations(national and international)
- Ø Commercial producers of educational material
- Ø Commercial advertisement
- Ø In nursing organizations like TNAI, INC...etc.

## **CLASSIFICATION OF A.V.AIDS:**

Various classifications are given for Audio visual aids according to the type of projection by various authors.

### **I) Classification of A.V.Aids**

#### **I) Audio aids**

Audio materials are those which can be heard. Ex: - radio, tape recorder, walkman, Headphones.

#### **II) Visual aids: these are helpful to visualize the things. Ex:- graphic aids, 3d-aids, display boards, and print material.**

#### **III) Audio visual aids: these aids can be heard and seen simultaneously. Ex: - projected aids, TV, films.**

### **II) Classification of A.V.Aids**

#### **I) Simple A.V.Aids: It includes graphic aids, display boards, 3d-aids, print material...etc.**

#### **II) Sophisticated A.V.Aids: includes audio-visual aids.**

## **PRINCIPLES TO BE FOLLOWED FOR THE EFFECTIVE USE OF A.V.AIDS:**

- Audio visual materials should function as an integral part of the educational program.
- A.v. aids should be centralized, under specialized direction and leadership in educational programs.
- An advisory committee consisting of representative from all areas of curriculum should be appointed to assist in selection and coordination of a.v. materials.
- An education program should be flexible.
- A.v. material should be carefully located to eliminate duplication, easy accessibility and convenient use.
- A.v. material should be available whenever and wherever they needed for effective utilization as an integral part of curriculum.
- Budget appropriations should be made regularly for a.v. education programs.
- Periodic evaluation to be done to assess the function of, utilization and expenditure of the program.



## **UNIT IV: CURRENT TRENDS IN TEACHING AND LEARNING MATHEMATICS**

## Concept Formation

Psychologists use the term *concept formation*, or concept learning, to refer to the development of the ability to respond to common features of categories of objects or events. *Concepts* are mental categories for objects, events, or ideas that have a common set of features. Concepts allow us to classify objects and events. In learning a concept, you must focus on the relevant features and ignore those that are irrelevant (Bourne & colleagues, 1986). For instance, paperbacks and hardcover editions are all books. But you must also discriminate on the basis of relevant features: a stack of papers is not a book. What is the crucial feature of a book? Usually it is the presence of a binding. Most concepts, however, cannot be identified on the basis of a single critical feature. Most of the words we use refer to concepts and not to particular things. Proper nouns such as "William James" and "California" are exceptions. In learning some of their first concepts, children commonly focus not on names but on the functions of objects. For example, a spoon is something to eat with, and a pan is something to cook in. Other early concepts are based on groupings of objects that are similar in some respect: liquid things, moving things, or soft things. Several theories have been proposed to explain how we learn concepts. The stimulus-response association theory was proposed by Clark Hull (1920). He argued that we learn to associate a particular response (the concept) with a variety of

stimuli that define the concept. For instance, we associate the concept "dog" with all of the characteristics of dogs (four legs, fur, tail, and so on) and are able to generalize the concept to unfamiliar dogs. The hypothesis testing theory was proposed by Jerome Bruner and his colleagues (1956). Bruner believed that we develop a strategy of testing our hypotheses about a concept by making guesses about which attributes are essential for defining the concept. While this tends to be the method used by subjects in an experiment, it might not be appropriate in everyday life (perhaps because we often use natural concepts rather than formal concepts in everyday life). Eleanor Rosch (1978) suggested that the natural concepts in everyday life are learned through examples rather than abstract rules. Her exemplar theory proposes that we learn the concept of "dog" by seeing a wide variety of dogs and developing a prototype of what the typical dog is like. Busemeyer and Myung (1988) studied prototype learning in college students by presenting a series of exemplars and asking the subjects to reproduce the prototype. This type of study allows researchers to gain an understanding of the concept learning process. Over the years, everyone is faced with an infinite number of complex stimuli. How we choose to group and sort them into concepts will depend upon our interests, beliefs, values, and experiences with the environment. Consider the concept "job." To one person it may mean an unpleasant task, while to another it is a means of



achieving fulfillment. Concept formation is a form of thinking that helps us to better understand the world we live in, as well as ourselves.

## **CONCEPT ASSIMILATION;**



### **Assimilation**

The term 'assimilation' again is in general use, being applied most often to the process whereby large numbers of migrants from Europe were absorbed into the American population during the 19th and the early part of the 20th century. The assimilation of immigrants was a dramatic and highly visible set of events and illustrates the process well. There are other types of assimilation, however, and there are aspects of the assimilation of European migrants that might be put in propositional form. First, assimilation is a two-way process. Second, assimilation of groups as well as individuals takes place. Third some assimilation probably occurs in all lasting interpersonal situations. Fourth, assimilation is often incomplete and creates adjustment problems for individuals. And, fifth, assimilation does not proceed equally rapidly and equally effectively in all inter-group situations.

### **Definitions:**



1. According to Young and Mack, Assimilation is the fusion or blending of two previously distinct groups into one.
2. For Bogardus Assimilation is the social process whereby attitudes of many persons are united and thus develop into a united group.

3. Biesanz describes Assimilation is the social process whereby individuals or groups come to share the same sentiments and goals.
4. For Ogburh and Nimkoff; Assimilation is the process whereby individuals or groups once dissimilar become similar and identified in their interest and outlook.

Assimilation is a slow and a gradual process. It takes time. For example, immigrants take time to get assimilated with majority group. Assimilation is concerned with the absorption and incorporation of the culture by another.

### **What is Concept Attainment?**

Concept Attainment is an indirect instructional strategy that uses a structured inquiry process. It is based on the work of Jerome Bruner. In concept attainment, students figure out the attributes of a group or category that has already been formed by the teacher. To do so, students compare and contrast examples that contain the attributes of the concept with examples that do not contain those attributes. They then separate them into two groups. Concept attainment, then, is the search for and identification of attributes that can be used to distinguish examples of a given group or category from non-examples.

### **What is its purpose?**

Concept attainment is designed to clarify ideas and to introduce aspects 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 then are invited to suggest their own examples, while other students are still trying to form the concept. For this reason, concept attainment is well suited to classroom use because all thinking abilities can be challenged throughout the activity. With experience, children become skilled at identifying relationships in the word cards or specimens. With carefully chosen examples, it is possible to use concept attainment to teach almost any concept in all subjects.

Advantages:

1. helps make connections between what students know and what they will be learning
2. learn how to examine a concept from a number of perspectives
3. learn how to sort out relevant information
4. extends their knowledge of a concept by classifying more than one example of that concept
5. students go beyond merely associating a key term with a definition concept is learned more thoroughly and retention is improved

## **CONCEPT ATTAINMENT MODEL.**

## **CONCEPT ATTAINMENT MODEL**

### **Meaning of teaching models (Models of Teaching)**

View of Paul Eggan and Others: “Teaching models re prescriptive teaching strategies designed to accomplish particular teaching goals.” View of Joyce and Weil: They have given three meanings of teaching models: (i) “Teaching

models are just instructional designs. They describe the process of specifying and producing particular environmental situations which cause the student to interact in such a way that specific change occurs in his behavior.” (1972) (ii) Teaching model is a “pattern or plan which can be used to shape a curriculum or course, to select instructional materials and to guide a teacher’s actions.” (1972) Models are designed to attain specific goals. When a teacher identifies a goal, selects a particular strategy designed to attain that goal, we can say that he is using model approach. (iii) “A model of teaching consists of guidelines for designing educational activities and environments. It specifies ways of teaching and learning that are intended to attain certain kinds of goals.” View of N.K. Jangira: “A model of teaching is a set of inter-related components arranged in a sequence which provides guidelines to realize specific goal. It helps in designing instructional activities and environmental facilities, carrying out of these activities and realization of the stipulated objectives.” (1983) H. C. Wyld, “To confirm in behavior, action and to direct one’s action according to some particular design or ideal.” Families of Teaching Models Information Social Personal Behavior Processing Interaction Development Modification Models Models Models Concept Jurisprudential Inquiry Attainment Model Model

Fundamental Elements of a Teaching Model:

1. Focus
2. Syntax
3. Social system
4. Principles of reaction
5. Support system
6. Application

### **CONCEPT ATTAINMENT MODEL (CAM)**

CAM was developed by J.S.Bruner, J.Goodrow and George Austine in 1956.The model emerged out of the study of thinking process in human beings.

It is based on the assertion that a human being is endowed with the capacity to discriminate and to categorize things in groups. This model is used for teaching concepts to the students. It enables them to understand fully the similarities and relationship among various things of the environment.

**Concept Attainment Model in terms of Elements:**

1. Focus: The main focus of the model is to develop inductive reasoning of the students. Bruner and his associates orient their work for the description of a process by which the students discriminate the attribute of the things, persons, events and place them into categories. The students are also taught about the concept which is of great use to them in order to live successfully in different life situations.
2. Syntax: Structure of the model has the following four phases. Presentation of data □ Analysis of hypothesis • Formation of hypothesis • Teacher reaction • Rejection or confirmation of hypothesis Closure Practice
3. Principle of reaction: Immediate check of wrong answers and acceptance of right answers is a must.
4. Social System: The teaching situation is moderately structured. The teacher has to control all actions of the class-room, but reasonable freedom is given for discussion within different phases of teaching.
5. Support system: The lessons require concepts which can be arranged so that concept may be drawn from the material.
7. Application: Concept attainment model is very useful in teaching the concepts through inductive reasoning. Effects of C.A.M. JURISPRUDENTIAL INQUIRY MODEL (Learning to think about social policy) The model belongs

to the Social Family By Donald Oliver and James Shaver(1971) Assumptions:

Social values legitimately conflict with one another. Negotiations of Difference can help to resolve complex and controversial issues. A skillful citizen is like a competent judge. He/She listens to the evidence, analyzes the legal positions taken by both sides, weighs these positions and the evidence assess the meaning provisions of the law and finally make the best possible decision. To play the role; three types of competencies are required: (1) Familiarity with values (2) Skills for clarifying and resolving issues (3) Knowledge of contemporary political and public issues.

## SYNTAX

Phase One: Orientation to the case Teacher introduces materials Teacher review facts

Phase Two: Identify the issues Students synthesize facts into policy issues Students select one policy issue for discussion Students identify values and value conflicts Students recognize underlying factual and definitional questions

Phase Three: Taking positions Students articulate a position Students state basis of position in terms of social value and consequences of decisions

Phase Four: Exploring the stance(s), patterns of argumentation Establish the point at which the value is violated Provide the desirable or undesirable consequences Clarify one value conflict with analogies Set priorities. Assert priority of one value over another

Phase Five: Refining and Qualifying the position Students state positions and reasons for positions and examine number of similar situations Students quality positions Phase Six: Testing factual assumptions behind qualified positions Identify factual assumptions and determine if they are relevant Determine the predicted consequences and examine their factual validity (will they actually occur)

## SOCIAL SYSTEM

Teacher begins the task and then students take over. The social climate is vigorous and abrasive but in a non threatening manner.

## PRINCIPLES OF REACTION

(1) Maintain a vigorous intellectual climate (2) Respect all views and avoid direct evaluation of student opinions (3) See that issues are thoroughly explored (4) Probe for relevance, consistency, specificity, generality, definitional clarity and contunity. (5) Avoid taking a stand (6) Maintain dialectical style.

SUPPORT SYSTEM Sourced documents that focus on a problem situation.

## **Cooperative Learning**

There are many benefits from using Cooperative Learning. Students will appreciate the value of teamwork and make a positive contribution when working with others to solve problems and complete tasks. Students learn research skills more readily when skills are shared through cooperative learning. Cooperative Learning allows students to enhance their ability to manage ideas and information in collaboration with others.

Cooperative Learning allows students to observe, imitate, and learn from each other. Students keep each other on task and share a sense of accomplishment. The encouragement, support, and approval of peers build motivation and make learning an enjoyable experience. In addition, with advances in technology and changes in the workforce infrastructure, the teamwork and cooperation learned through Cooperative Learning activities is of high value for the future success for the students.

### **What is Cooperative Learning?**

Cooperative Learning is a method of teaching and learning in which students form teams for structured activities to achieve a common goal. They are individually accountable for their work, and the work of the entire group. Members of cooperative teams work together and have clearly defined roles. Merely putting students in groups and letting them work together is not enough to constitute Cooperative Learning.

### **Cooperative Learning should include five essentials:**

#### **1. *Positive Interdependence***

Students realize that each individual affects the work and success of the others. The work is structured so that students must share information in order to complete their cooperative tasks.

#### **2. *Student-to-Student Interaction***

The teacher openly encourages students to help each other. Students share resources with each other, provide constructive feedback, challenge other members' reasoning and ideas, keep an open mind, act in a trustworthy way, and promote a safe feeling for all by reducing anxiety.



### 3. *Individual Accountability*

Even though students work together, they also perform independently. Each individual's performance is assessed. Students must take personal responsibility for working toward the group goal(s).

### 4. *Social Skills*

Students learn and use appropriate social skills that include leadership, decision-making, trust building, communication, and conflict-management.

### 5. *Group Process*

To better develop the group process, students must analyze how well they are achieving their goals while maintaining effective working relationships.

## **What are some Cooperative Learning Approaches?**

To be successful, Cooperative Learning tasks are designed by teachers so that students are required to depend on one another to complete the assigned tasks and to master content and skills. There are many Cooperative Learning approaches that are designed to achieve different objectives. When these approaches are used frequently and correctly, students will acquire the positive results of Cooperative Learning. Several Cooperative Learning approaches are described below.

- **Jigsaw** - Each student, in a four to five member team, is given information for only one part of the learning activity. However, each student needs to know all information to be successful. Students work cooperatively in two different teams, their original team and an expert team. All students in the expert team seek the same information, study it, and decide how best to teach it to their peers in the original team. After this is accomplished, students return to their original teams to teach their portion of the lesson to

the others in the team. For additional information on Jigsaw go to [www.jigsaw.org](http://www.jigsaw.org).

- **Think-Pair-Share** - This strategy can be used before introducing new concepts. It gives everyone in the class time to access prior knowledge and provides a chance for them to share their ideas with someone. Think-Pair-Share helps students organize their knowledge and motivates learning of new topics. There are three steps to Think-Pair-Share with a time limit on each step signaled by the teacher. (1) Students are asked to brainstorm a concept individually and organize their thoughts on paper. (2) Students pair up and compile a list of their ideas. (3) Each pair will then share with the entire class until all ideas have been recorded and discussed.
- **Send-a-Problem** - Students are placed in heterogeneous teams of four. Each team designs a problem to send around the class. The other teams solve the problem. Since all of the teams send their own problem, there are a series of problems solved in this one activity. Results are shared with the class.
- **Round Robin** - Students are placed in heterogeneous teams of four. Each student has an opportunity to speak without being interrupted. The discussion moves clockwise around the team; everyone must contribute to the topic. The team may use an item to pass around as a visual aid to determine who has the floor. Round Table is another version. The difference being that a piece of paper is passed around and each member writes instead of speaks about the topic.
- **Mind Mapping** - Mind Mapping is the process of visually depicting a central concept with symbols, images, colors, keywords, and branches. This is a fast and fun way to take visual notes, foster creativity, stretch students' visual

thinking skills, make learning contextual and meaningful, and promote active involvement with the learning content. Pairs of students may create their own mind map or they may simultaneously add to the team and/or class mind map.

## **SUMMER PROGRAMME**

Participants in this math camp will further develop their problem solving and analytical skills while fostering their passion for math. Aligned with the Common Core Standards for Mathematics, the curriculum will enhance and broaden participants' understanding of core concepts learned during the school year. Through modeling, graphing, and solving real-world problems, participants will refine their problem solving strategies. Additionally, games, puzzles, and logic and reasoning challenges will provide fun opportunities for teamwork and confidence building activities.