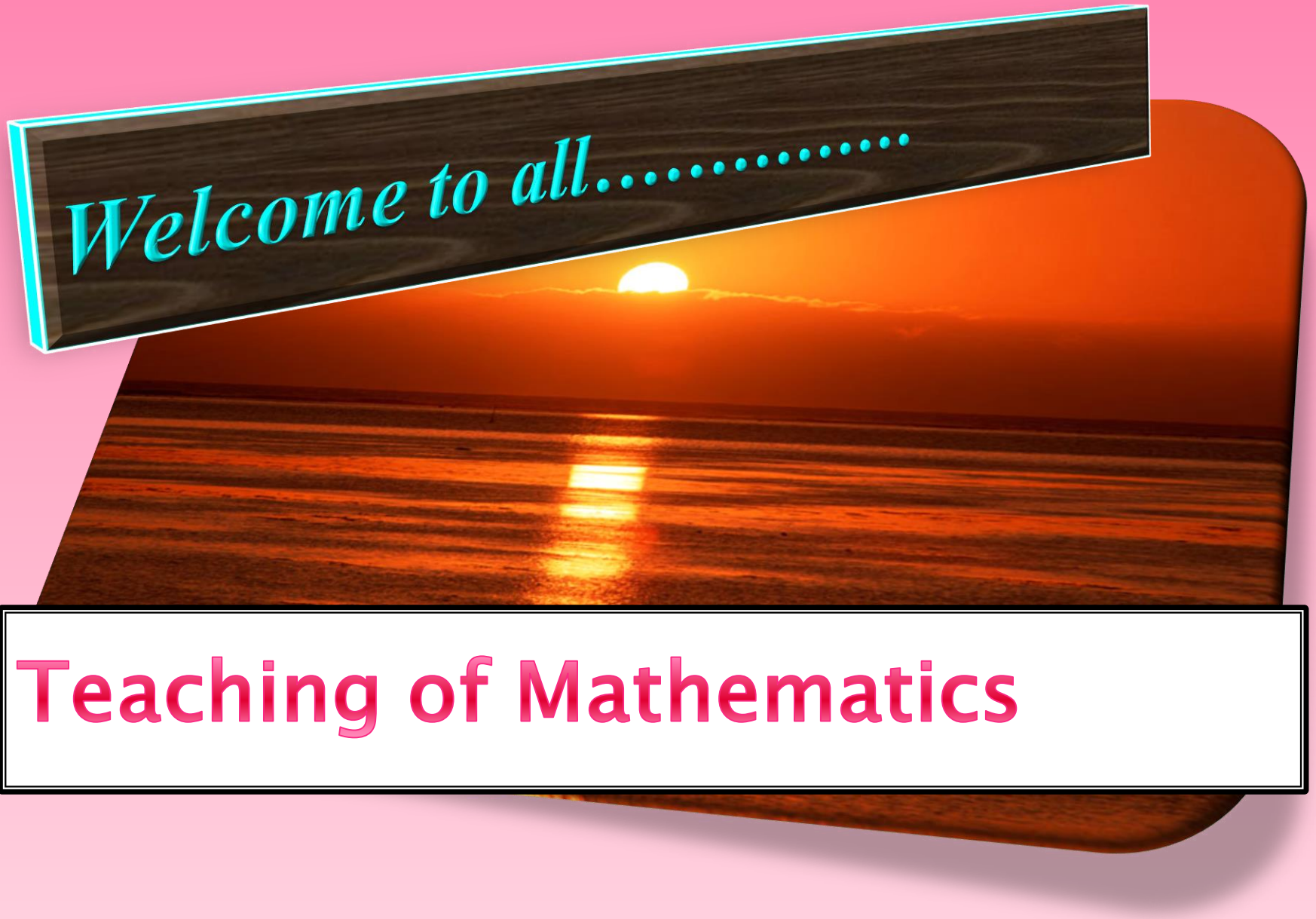
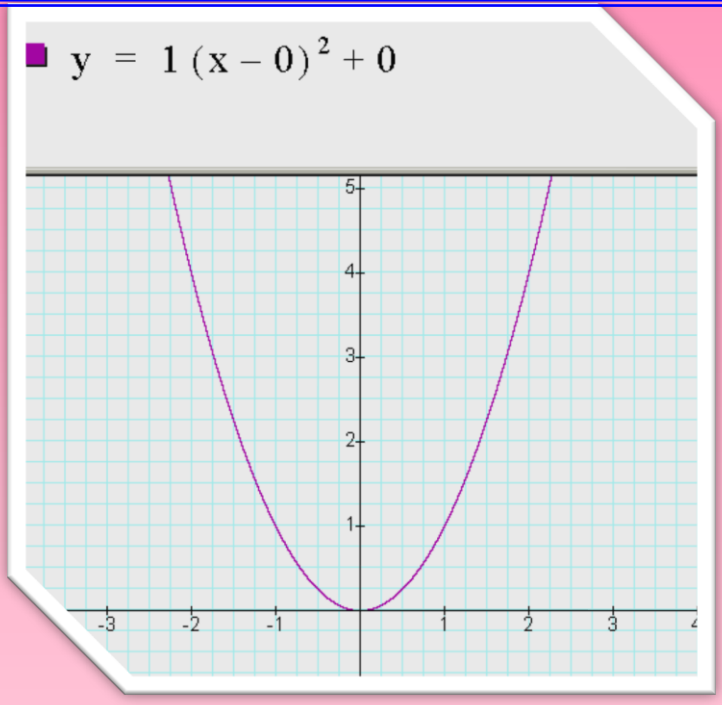
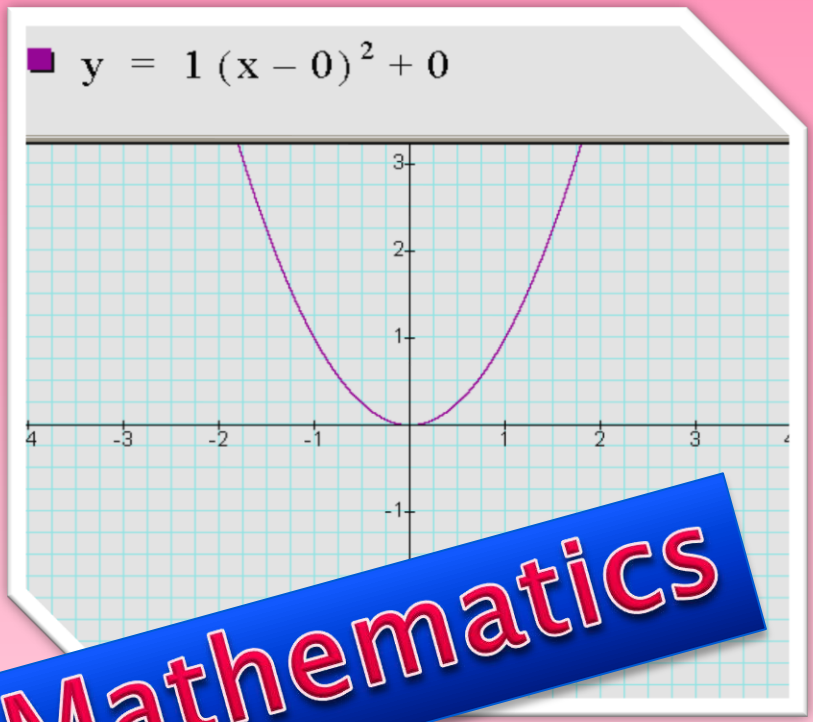


Teaching of Mathematics

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





The Teaching of Mathematics

The Teaching of Mathematics

1. What is education?

Some *Definitions*

Education is the ability to listen to almost anything without losing your temper or your self-confidence.
– Robert Frost.

Education is the root of the nation – Tagore.

Education is an ornament in prosperity and a refuge in adversity. – Aristotle.

Education is something which makes a man self-reliant and selfless. – Rig Veda.

Education is exposition of man's complete individuality. – Swami Vivekananda.

2. What are the Functions of the Education?

1. The child is to be reared , nourished or brought up according to some aims or ends in view.

2. Educator or teacher who is to be the friend, philosopher and the guide.

4. The teacher-centered education still quite and becomes child-centered education.

Educational Values of Mathematics.

Every teacher of mathematics needs to be informed and convinced about the educational values of his subject.

His own conviction about its soundness enables him to convince the students, parents and the society likewise.

Educational Values

There are a number of questions which need to be answered at this stage.

- Why should everybody learn Mathematics?
- Why should this subject be taught to everybody?
- What is the place of mathematics in any scheme of education?
- What is the importance of this subject in life and in school curriculum?

Educational Values

What shall be the advantage of devoting so much effort, time, and money to the teaching of mathematics?

What are the propose and aims of teaching mathematics?

How does it make any contribution in the development of an individual?

Of course a genuine teacher of mathematics will be interested in finding out the answers to these questions.

The knowledge of its values and aims will stimulate and guide the teacher to adopt effective methods, devices and illustrative materials.

4. Values and Aims

Why a child is sent to school?

Acquirement of utilitarian (Knowledge and Skill)

Disciplinary (Intellectual habits and Power)

Cultural values of Education (Desirable attitude and ideals)

Apart from these three values, Mathematics possesses a number of other educational values also.

Such as:-
Social Value
Moral Value
Aesthetic Value
Intellectual Value
Vocational Value, etc.

Now I am not going to reveal all of them.

5. The Place of Mathematics in School Curriculum.

Mathematics is a language for describing common events in everyday life and complex events in business, science, and technology.

For the 21st century, children will need mathematics for complex and common applications

Consequently there is a great controversy over making it optional or compulsory at the high/higher secondary school stage.

5. The Place of Mathematics in School Curriculum.

Teacher and parents are challenged to think about mathematics very differently from the school mathematics they experienced.

The demands of the new century require that all students acquire an understanding of concept,

Proficiency with skill, and positive attitude in mathematics if they are to be successful.

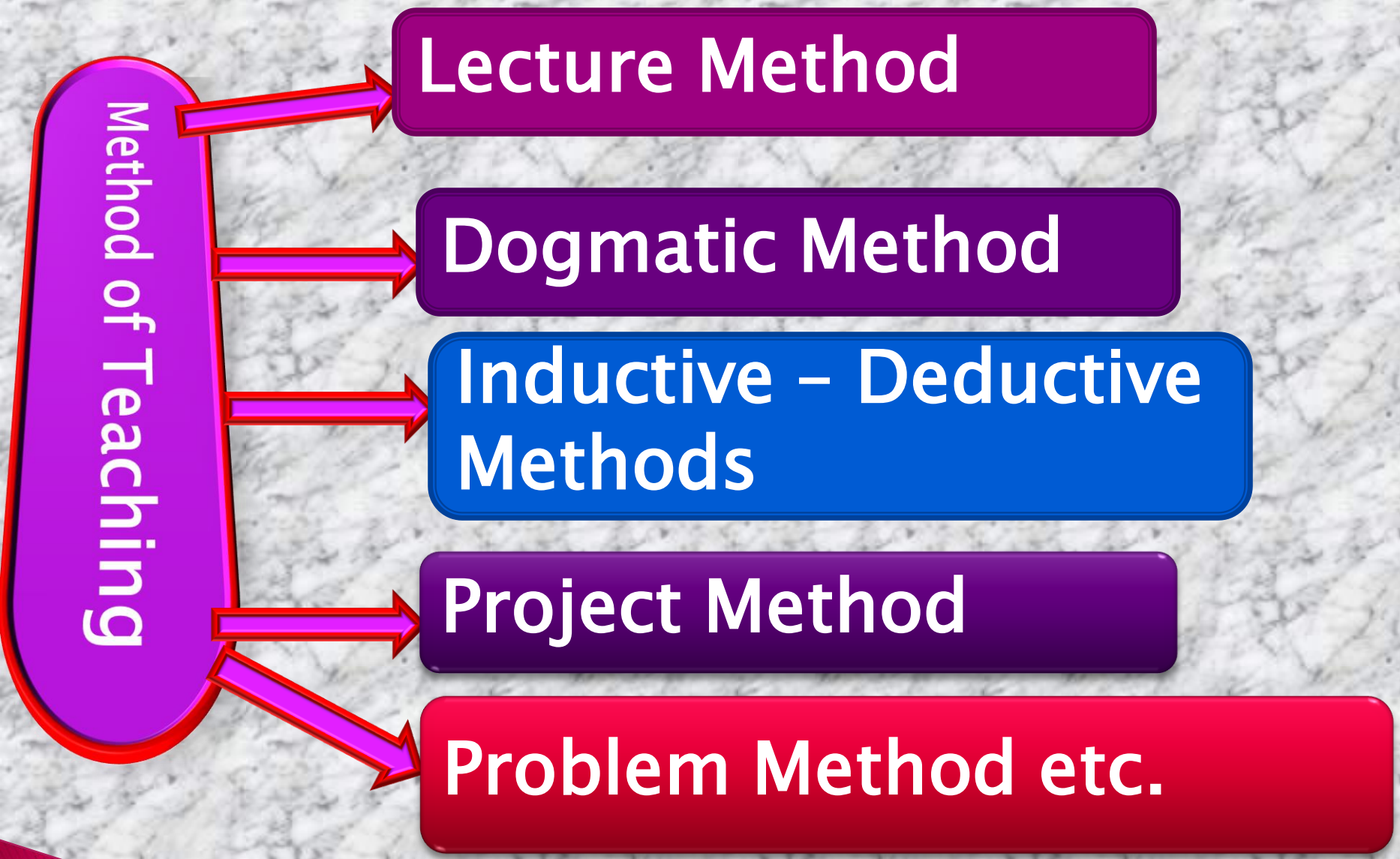
So there can be no true schooling without mathematics.

Method of Teaching

How to teach is a really difficult problem for the teachers

Teaching is an art

Different Methods of teaching have been proposed by different educational thinkers in education.


Method of Teaching
Lecture Method
Dogmatic Method
Inductive – Deductive Methods
Project Method
Problem Method etc.

Lecture Method

How to apply this method to the teaching of Mathematics?

What is the shape of this method?

The teacher prepares his talk at home and pours it out in the class.

The students sit silently, listen attentively and try to catch the point.

Eg: Supposing "Profit and Loss" is the topic in hand.

The teacher goes on telling and explaining.

"Well boys,
Profit and lose is always to be calculated on the Cost Price (CP) because the CP is our investment

If you invest less and earn more you gain

∴ Gain is to be calculated by Subtracting CP from Selling Price (SP)

When you invest more or earn less, you lose,
∴ lose is to be calculated by subtracting SP from CP. And so on" .

- If the teacher is extremist in lecturing he may not even write anything on the blackboard simultaneously.
- The method takes the form of a “one man’s show”.
- Where the listeners remain passive.

Advantage:

When the number of students in a class is very large, this method is the only way out.

When a heavy syllabus is to be covered in a short time, this method is suitable.

The teacher does not have to give individual help.

The teacher and the taught feel satisfied at their respective places.

Conclusion:

There is no student participation in the learning process.

Very few mathematical topics lend to effective treatment by this method.

The teachers talks continuously

The Lecture Method is highly unsuitable as a regular method in class work.

Dogmatic Method

In this method of teaching mathematics rigour is extremely emphasized.

The advocates of this method say that the inefficiency of mathematical teaching is mainly due to lack of rigour.

In this method the teacher tells the pupils

What to do? What to observe?

How to attempt and how to conclude?

Dogmatic Method

He works out the model on the blackboard.

And the pupils have merely to follow the patterns.

Merit of Dogmatic Method:

The method save time, energy and good deal of loose thinking.

It can be adopted with advantage at a stage when pupils are adequately advanced in mental development.

It promotes skill, efficiency and speed in the solution of problems.

It glorifies memory.

Conclusion

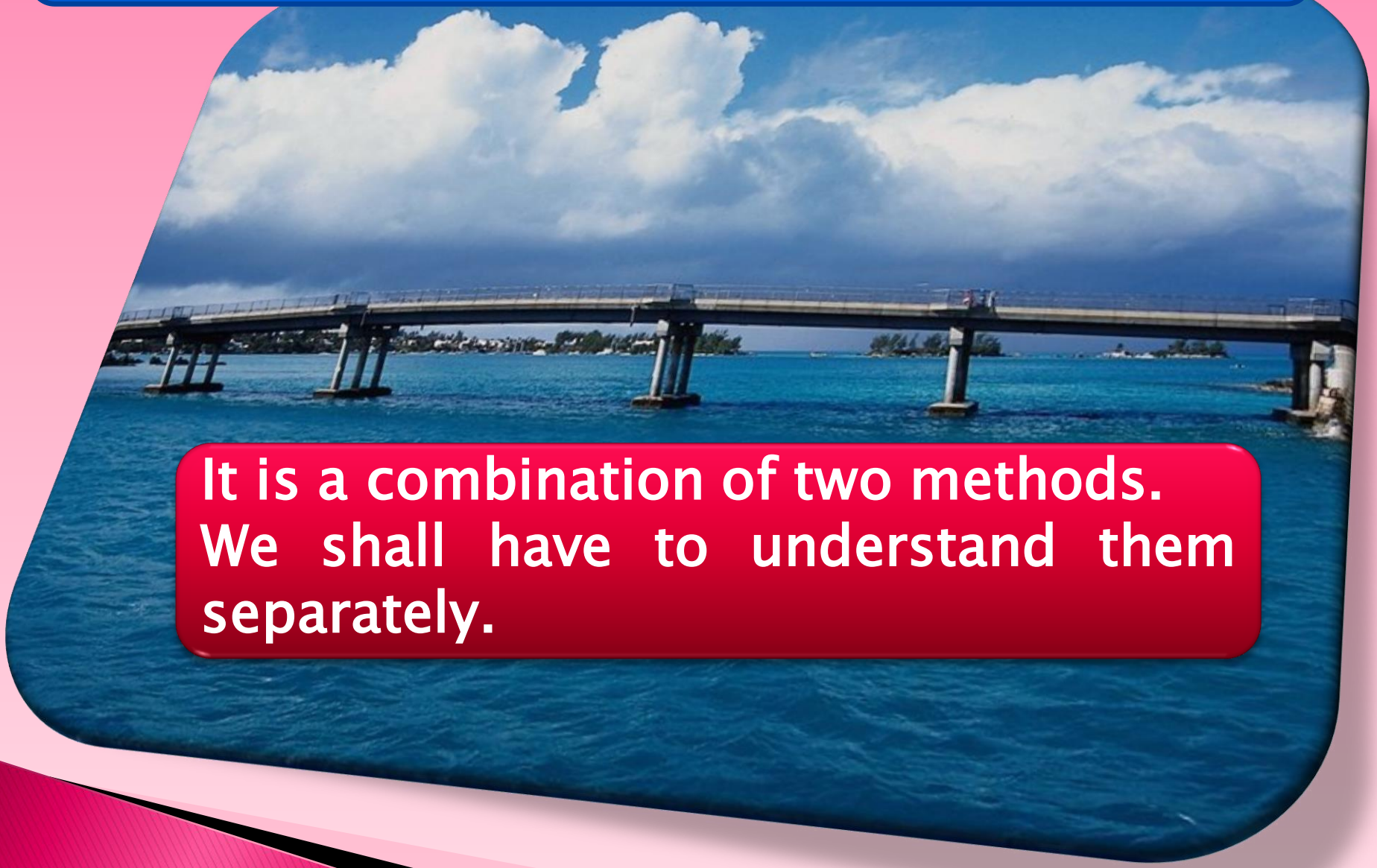
This method suits neither the child nor the subject.

The mind of the student is stuffed with information.

The method will cause stagnation in teaching.

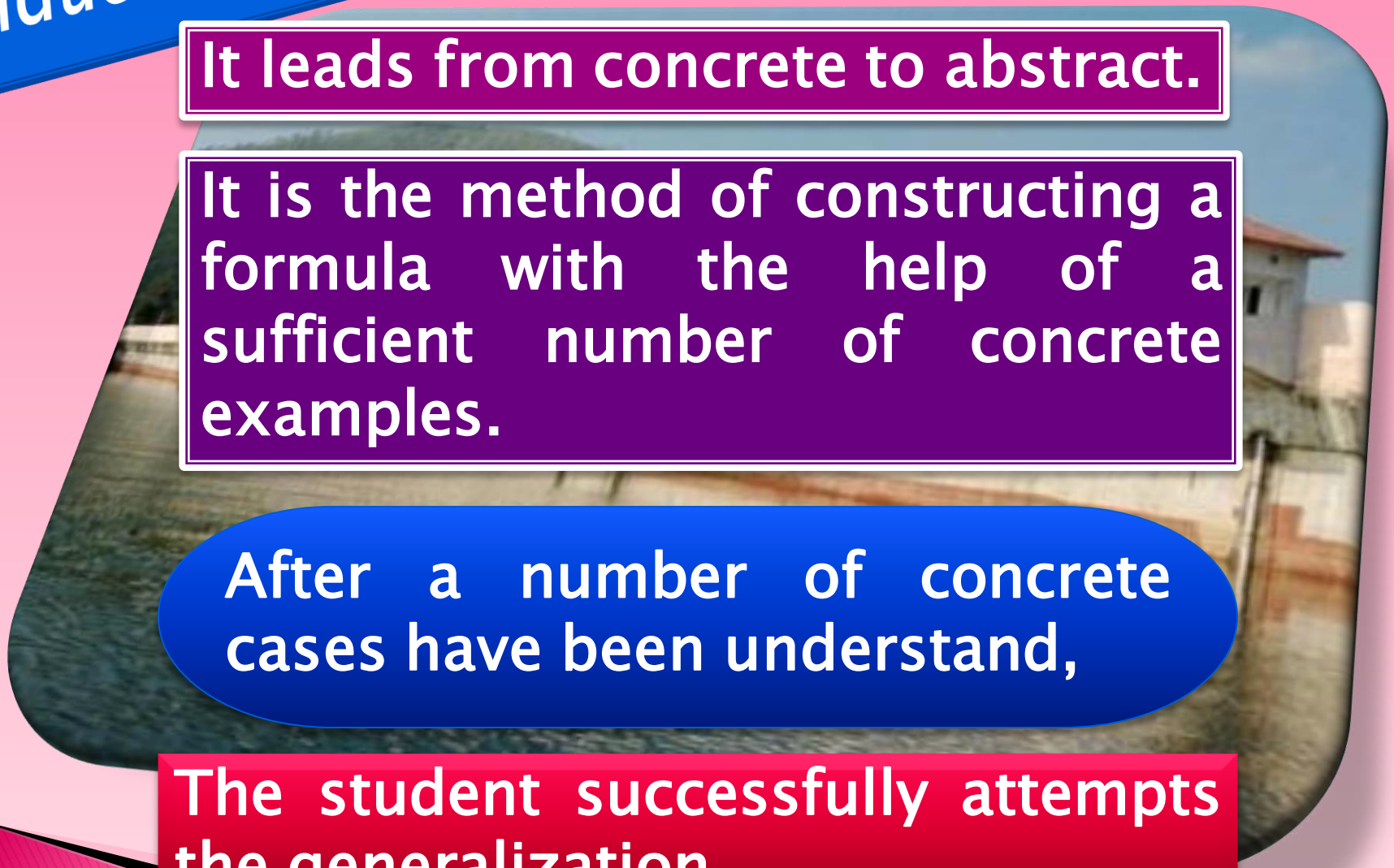
Errors, incompleteness, and vagueness should not be allowed in this case.

Inductive – Deductive Methods



It is a combination of two methods. We shall have to understand them separately.

Inductive Methods



It leads from concrete to abstract.

It is the method of constructing a formula with the help of a sufficient number of concrete examples.

After a number of concrete cases have been understand,

The student successfully attempts the generalization.

Merits of Inductive Method:

It helps understanding

It is easy to understand a mathematical principle established through a number of simple examples.

It is based on actual observation, thinking and experimentation.

It gives the opportunity of active

As it gives freedom from doubts

of formulae.

Deductive Method.

It is the opposite of inductive method

Here the learner proceeds from general to particular

A pre constructed formula is told to the students and they are asked to solve the relative problems with the help of that formula.

Merits of Deductive Method

It is short time – solving

The solving of problems by predetermined formula.

It glorifies memory

It enhances speed and efficiency in solving problems.

PROJECT METHOD

"A project is a bit of real life that has been imported into school" – by Ballard.

There are two types of projects

1. Individual Projects , carried out by a single individual.
2. The Social Project which is carried out by a group of individuals

Eg:- Celebration of Republic Day.

The project can have the following aspects:

1. Why do we celebrate this day?
2. The school programme of its celebration
3. Estimate of expenditure, budget preparation
4. The account of collections from students.
5. The preparation and organization of different items of the programme.
6. Keeping accounts of the expenses.
7. Execution of different programmes.
8. Preparing the report of the programmes
9. Evaluation and monitoring of the celebration

These are the directions for the students to carry out the project.

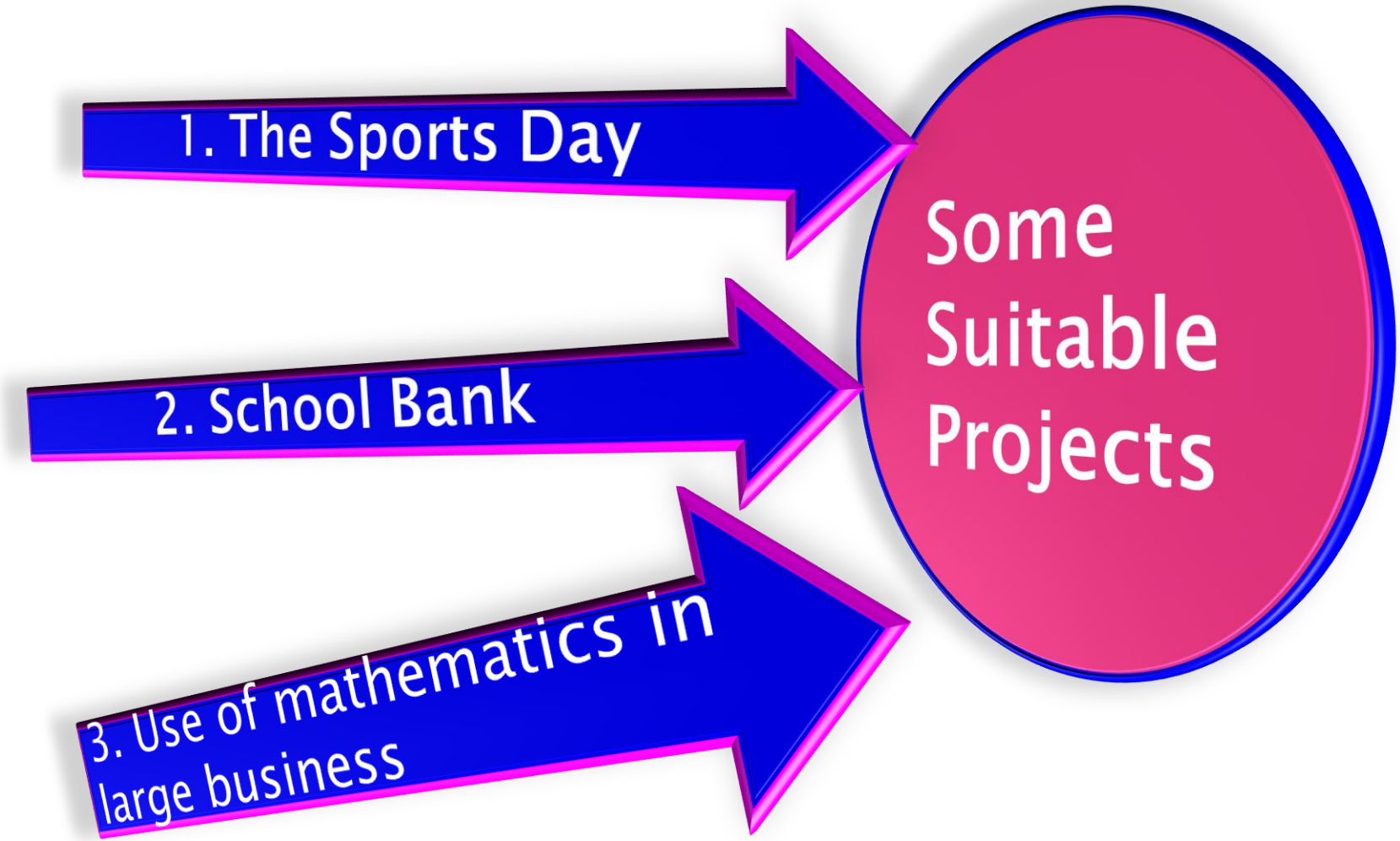
Conclusion:

This method brings life to the school atmosphere

Learning becomes a cooperative affair

It approach is scientific one

The teacher can devise and plan a good project.


1. The Sports Day
2. School Bank
3. Use of mathematics in large business
Some Suitable Projects

Problem Method:

The problem method aims at presenting the knowledge to be learnt in the form of a problem.

The problems are set to the students in a natural way and genuinely interested to solve them.

The procedure of problem method is almost like that of the project method.

Problem solving is a suitable approach in the teaching of mathematics.

7. Techniques of Teaching

There are a number of techniques which can be effectively used for the teaching of mathematics.

Some of them are

Oral work, Drill Work, Home Work
- Assignment, self-study, group work,
- Review and supervised study.

See one by one:

Oral Work

What is oral work?

It is the work which is done orally without the help of written word and record.

It can be defined as mental work.

As a matter of fact, much of mathematical work has to be done mentally

Function of Oral Work

It has an appeal for the eye and ear

And this appeal is liked by the students

Some time can possibly be saved

A few oral questions can make the students alert and active.

It is use full in everyday life

It remove shyness of pupils through oral expression

Function of Oral Work

- It helps in elucidation and illustration
- It is a good mental exercise
- It is an effective means of maintaining discipline
- It is an easy way of testing previous knowledge.
- The teacher can throughout remain in touch with the class.
- It can provide motivation
- It encourages healthy competition

Drill Work

There are four chief devices of fixing an impression on the minds of pupils

Drill, review, asking questions and describing outstanding problems still to be solved

Drill is one of the most widely used devices and practices in our schools

It is a serious activity

Drill Work

It provides opportunity of self-development.

Speed and accuracy in solving mathematical problems without it

The basic facts and operations of mathematics have to be memorised sufficient drill.

See that there should be no mechanical cramming

How to Motivate Drill

A sprit of play should be introduced in order to make the process

This can be achieved by making use of number games, flash cards etc

Underlying Effective Drill

1. Moderate initial practice and systematic review are superior to over learning.
2. The material to be drilled upon should be meaningful.
3. Drill exercises should be chart and over a period of time.
4. Much of the drill work should be individualised.
5. Success in drill let the students feel it.
6. Drill should be varied, should be given in various forms,
   - otherwise it will become monotonous.
7. Achievement of the learner in drill should be frequently tested.

–So effective drill not only develops knowledge and skill, but is a means of maintaining good habits also

Home Work

-It needs

-School time is insufficient to exhaust everything provided in the curriculum of mathematics.

-So home work has to be given regularly to supplement class room teaching

Home Work

- Some educationalists view that home work should be not given to the students.
- Anyway the importance and need of home work cannot be minimized in the case of mathematics of right nature.
- It provides the child opportunity of independent work.
- It shows the students progress in studies and helps the teacher to judge the progress.

#. How to make it useful

1. It should not be considered as a sort of punishment.
2. It should be well graded
3. It should be individualised as far as possible.
4. Home work time table should be prepared in advance.
5. Amount of work allotted should not exceed reasonable limits.
6. Home work should be checked and corrected
7. Home work should be enjoyable, useful and attractive.

Assignment is a work allotment

It is the work assigned to the student, at home or school

The assignment may be a pre lesson or a post-lesson

Assignment is a sort of self-study which supplements class teaching

In Dalton Plan, is based on the assignment system of teaching

Assi gnm ent

The assignment should be a cooperative activity in the teacher and the pupils take an effective part

It must motivate, clear up doubts or misunderstandings

The assignment should be arising out of activities, needs and interest of the pupils

Weekly assignments are preferable or monthly

Assi gnm ent

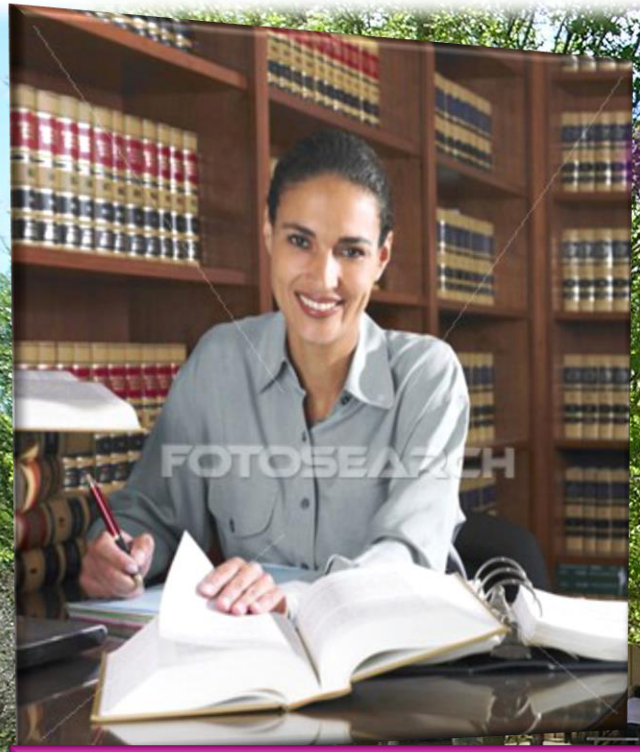
#. Characteristics of Assignment

1. Correlation with previous knowledge and experiences.
2. Clarity and confidence.
3. Removal of the pupil's difficulties
4. Stimulating and directing the learning activity.

-Finally the success and effectiveness of assignment dependent upon the amount of independent work done by the pupils.

Assignment

Self-study

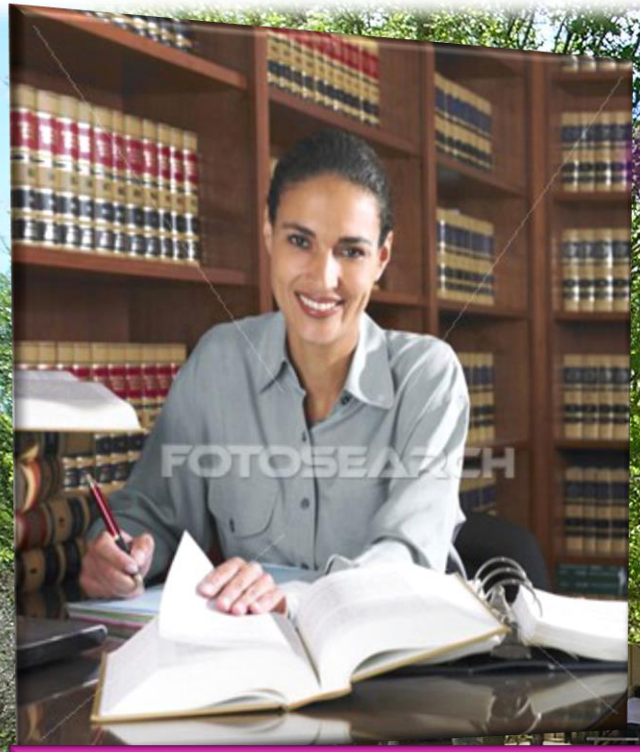


Self study is individual study

Self study is the golden rule for self education

Self study can be made more systematic by giving regular home work

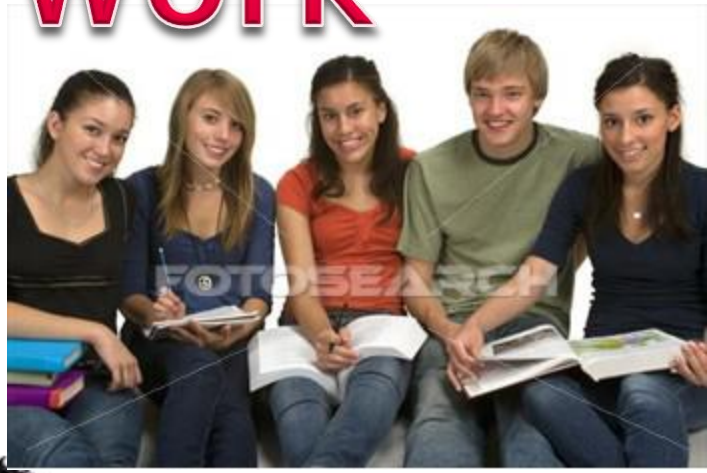
Self-study



In mathematics self study is essential to ensure regular progress

Self study should be checked, corrected and evaluated by the teacher regularly

Group Work



- Be among toppers
- Get more marks
- Build strong concepts

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- Group work is a class teaching and the individual's independent work
- In mathematics, there is ample scope of group work
- In case a teacher by activities, projects, assignments, the students find many opportunities of group work
- The mathematical tables are recited by the students in groups

#. The teacher should keep the following points while using group work as a technique

1. Group should be homogeneous as far as possible in the matter of intelligence and level of achievement.
2. Every member must get the due share of the activity.
3. The purpose of group work should be adequately clear to every member.
4. The group should be unwieldy in size.
5. The best age in which group work can be most profitable is the gang-age.

7.Aids of Teaching Mathematics

- The use of sensory aids in the teaching of mathematics is of recent origin
- Text-books, writing materials, geometrical instruments, the black board have been regarded for mathematics class
- Mathematics is a subject, where doing is more prominent than reading
- So mathematical equipment should be made available through mathematics laboratory as far as possible

7.Aids of Teaching Mathematics

- Models are useful as an aid
- Students should be encouraged to collect data, cuttings of mathematical interest.
- Various filmstrips can be used to give a new and attraction to different ideas of mathematics.
- See a resourceful teacher can obtain them from the market
- But the mathematical laboratory is to provide stimulating and teaching mathematical applications

8.MATHEMATICS TEACHER

- As in the case of other teachers, many things are expected of the mathematics teacher
- His obligation not only confined the class room but extend in many other directions also.
- Of course his first obligation is to teach his subject effectively
- Teaching mathematics is a task , if sincerely undertaken

Maths Teacher Qualities and Activities.

- 1. Prerequisite qualifications
- 2. Professional teaching.
- 3. Selective academic training.
- 4. Supervised practice teaching.
- 5. In-service training.
- 6. Professional activities.
- 7. School activities.
- 8. Mathematical organization.
- 9. Departmental duties.
- 10. Administrative duties.
- 11. Community activities.
- The scope of each of these activities varies considerably from school to school.
- - But they are all significant by the teacher

How to teaching of Mathematics?

At first, what is Arithmetic?

Arithmetic is the science of number and the art of computation

The word “arithmetic” is derived from Greeks.

The teaching of mathematics has two major responsibilities.

1. The inculcation of an appreciative understanding of number system And an intelligent proficiency in fundamental processes.

2. The socialization of number experience.

The arithmetic teacher must have a clear understanding of the place of arithmetic in every affair of adults

The methods already discussed have to be applied for the teaching of arithmetic according to the type and nature of different topics

Let us see the teaching topics

- Addition, Subtraction,
- Method of equal addition
- Multiplication, Division
- LCM and HCF
- Practical applica of LCM and HCF.
- Teachin ractions.
- Deci ractions.
- M Measures, Square root
- atio and Proportion
- Teaching of Percentage
- Profit and Loss
- Interest- simple and compound
- Discount
- Area, Volume, etc.

I am not going to explain of them in this time.

Teaching of Algebra

What is Algebra?

The word Algebra is Arabic in origin.

It is a generalization of Arithmetic

In teaching and learning, its principles are frequently needed to return to corresponding situations in arithmetic

It is useful in other branches of mathematics.

Teaching of Algebra

It has especially simplified for the learner, many problems of arithmetic

It inculcates the power of analysis.

It is a good instrument for mental training

Teaching of different topics of Algebra

- Here also addition, Subtraction, Multiplication,
- The use of brackets.
- First degree equations, Graphs
- Factorization and Formulae
- Method of Factorization
- Division, Indices
- Quadratic Equations etc.,

I am not going to make known all now.

Teaching of Geometry

- Geometry is the science of space and extent.
- It deals with the position, shape and size of bodies.
- But has nothing to do with their material properties.
- Euclid, Greek mathematician was the father of demonstrative geometry.
- It enables the learner to acquire a mass of geometrical facts.
- The geometrical principles of equality, symmetry and similarity are in the very natural of things.
- It develops the ability to draw accurate plan.
- It is the key to mathematical thinking.

Teaching of Trigonometry

- The teaching of trigonometry may be started early in secondary school.
- The trigonometry captures the pupil's interest by helping him to solve practical problems.
- Here is some usage of trigonometry.
- Graphical representations of the trigonometrical functions.
- Trigonometric functions and relations.
- Trigonometrical equations.

LESSON PLAN

Dr.V.S.RaveendraNath M.Sc.,M.Ed.,Ph.D.

Lesson Plan

- A lesson plan helps a teacher organize and coordinate all parts of an instructional activity.
- A lesson plan is one way A teacher identifies procedures and sequences activities to assure a unified lesson.

LESSON PLAN

Subject	:	Algebra
Topic	:	Identity
Time	:	40 minutes
Apparatus		

1. Ordinary class room apparatus
2. A square piece of cardboard
3. Scissors
4. A chart.

LESSON PLAN

Aim of the Lesson

1. To develop thinking and reasoning power of the students
2. To arouse the interest of the students in the quantitative side of the world
3. To enable them to understand and prove that the identity $a^2 - b^2 = (a + b)(a - b)$
4. To enable them to apply this identity to algebraic and arithmetical problems

LESSON PLAN

Previous Knowledge. (PK)

The students are expected to know addition, subtraction, multiplication and division in algebra and also how to find out areas of a square and rectangular figure

LESSON PLAN

PK. Testing and Introduction.

To test their PK and to prepare them for the present lesson the following questions will be put to the students.

i) $a \times a = ?$

ii) $b \times b = ?$

iii) What is the area of a rectangle the length of which is 16 cm and the breadth 12 cm?

iv) What is the area of the square of side 10 cm?

v) What is the area of a rectangle the length of which is "*a*" cm and the breadth "*b*" cm?

LESSON PLAN

vi) What is the area of the square of side "*a*" cm?

vii) $4^2 - 3^2 = ?$

viii) $10^2 - 8^2 = ?$

ix) $(101)^2 - (99)^2 = ?$

The students will try to do it by the long process of finding the square of each and them their difference

LESSON PLAN

Statement of Aim.

The teacher announce

"To day we shall try to find out an easier method of solving such problems with the help of algebra".

LESSON PLAN

Presentation:

This stage will be divided and developed in three units.

Unit – 1

Recognition of the form $a^2 - b^2$.

LESSON PLAN

Presentation:

Unit – 2

Tacking the problem with the help of geometry

Unit – 3

Verification through direct multiplication

LESSON PLAN

Unit – 1

The teacher will write the following problems on the black board

i). $(101)^2 - (99)^2$

ii). $(197)^2 - (3)^2$

iii). $(217)^2 - (83)^2$

iv). $(411)^2 - (89)^2$

- He will then ask the students to note the similarity of the expressions

Unit – 1

(All are difference of two squares)

- The teacher asks, “How will you give them a general form?”

  (By writing a^2 as the first square b^2 as the second square)

- He goes on, “Then our problem reduces itself to finding out $a^2 - b^2$.

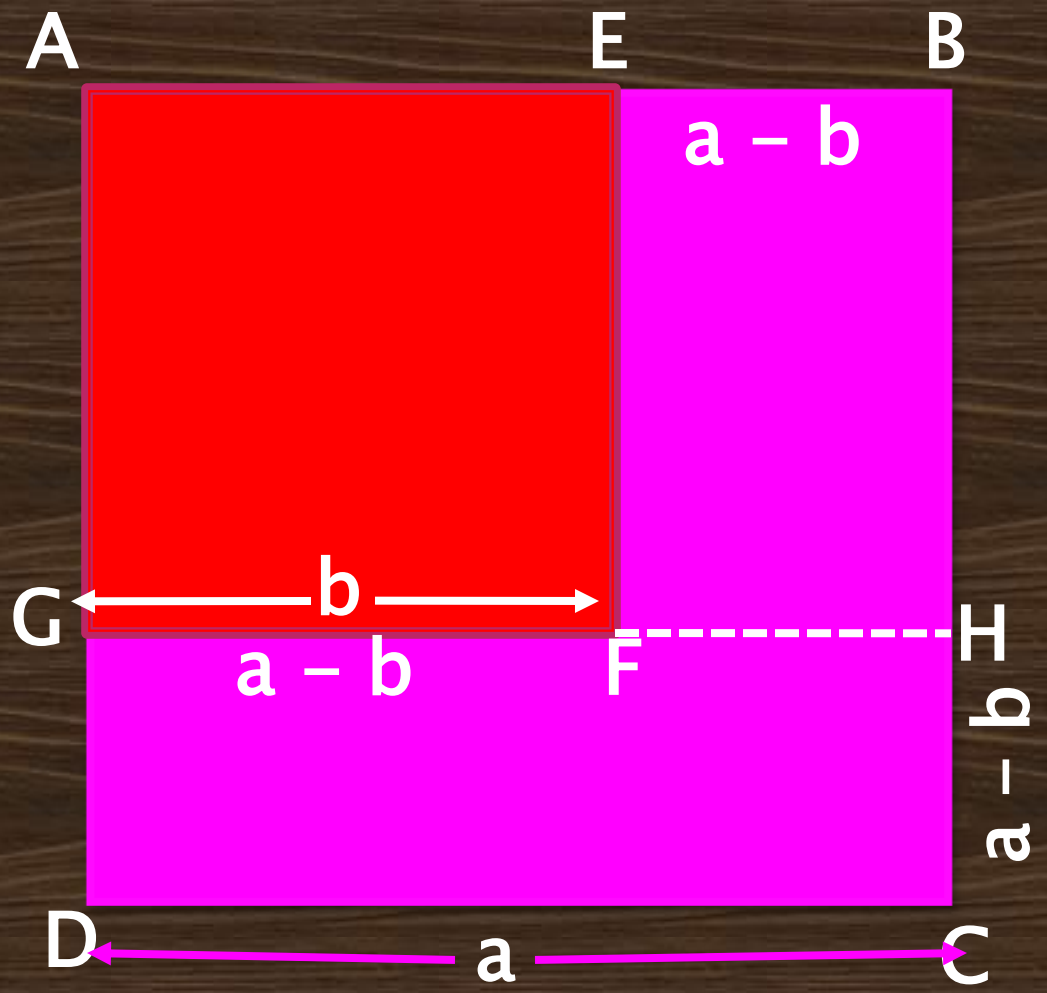
- So let us now solve the general form of the problems in hand

Unit – 2

(By showing the square piece of card board whose side has been labeled as '*a*'

Q. What is the area of this Square ABCD ?
(Square ABCD = a^2)

Q. What is the area of this Square AEFG ?
(Square AEFG = b^2)

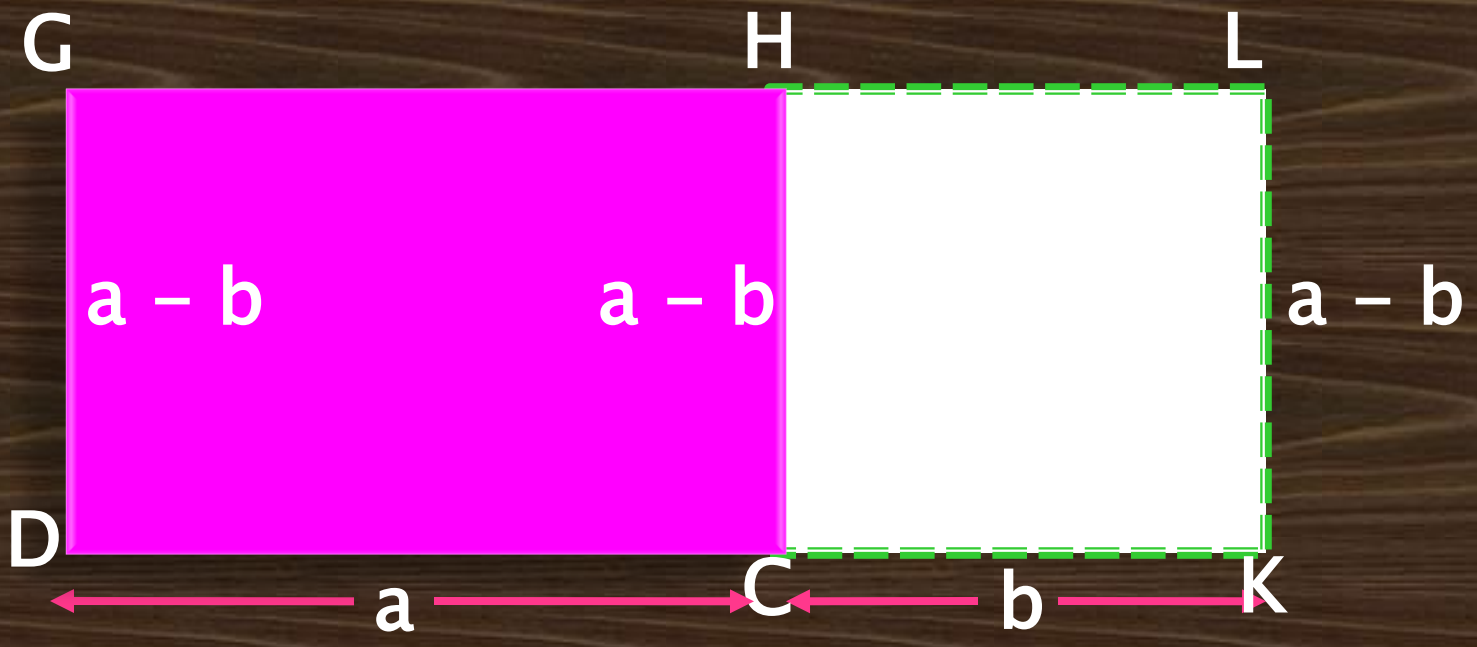


Q. Then, What is the area of the remaining part of the cardboard?

- The teacher will have removed the AEFG portion of the cardboard by cutting it with scissors. The remaining portion will these be EBCDGF

It's area = $a^2 - b^2$.

- The teacher will further cut the portion BHFE and place it in continuation with the remaining rectangle GDCH
- So that BE coincides with CH.



Q. What is the shape of the resulting figure?
(Rectangular)

Q. What is the length of this rectangle DKLG?
(a + b)

Q. What is the breadth? (a – b)

Q. What is the area? (a + b)(a – b)

Q. So what do you conclude from this?

$$a^2 - b^2 = (a + b)(a - b)$$

- The teacher will then show that the chart, which represent $x^2 - y^2$,
- And by the process of questioning on the basis of two diagrams similar to the above as obtained from the cardboard,
- Will lead the students to conclude that $x^2 - y^2 = (x + y)(x - y)$.

Unit – 3

The teacher will ask the boys to actually multiply (a + b) (a – b), (x + y) (x – y) and see what the results are?

Similarly they will be asked to actually multiply in a few more cases.

The results will be written on the black board

$(a + b)(a - b) = a^2 - b^2$

$(x + y)(x - y) = x^2 - y^2$

$(c + d)(c - d) = c^2 - d^2$

$(l + m)(l - m) = l^2 - m^2$

- The remaining will then be generalized with the active participation of the students

Generalisation:

Q. What is the similarity in the terms on the RHS in all results?

(They are the difference of the squares of two quantities)

Q. What is the similarity in the terms on the LHS in all results?

(They are the products of the sum and difference of the respective quantities)

Therefore-

The difference of the squares of two quantities is equal to the product of their sum and difference.

Application:

The teacher will give the following problems for application.

- Solve $9x^2 - y^2$. He will put the equation to the students and proceed in the following manner.

$9x^2 = (3x)^2$ and $y^2 = (y)^2$.
Their sum $(3x + y)$ and difference $3x - y$
So $9x^2 - y^2 = (3x + y)(3x - y)$.

- Solve $(101)^2 - (99)^2$.
  What is the third sum $101 + 99 = 200$
  What is their difference $101 - 99 = 2$
  What is their product $200 \times 2 = 400$.
  Hence etc., etc., …..

- The following problems will be solved by the students independently

1. $a^2 - 9$. 2. $(197)^2 - (3)^2$.

3. $(411)^2 - (89)^2$. 4. $(217)^2 - (83)^2$

Recapitulation:

- It will just serve the purpose of a quick and short over all revision.
- It will be done with the help of the following questions.

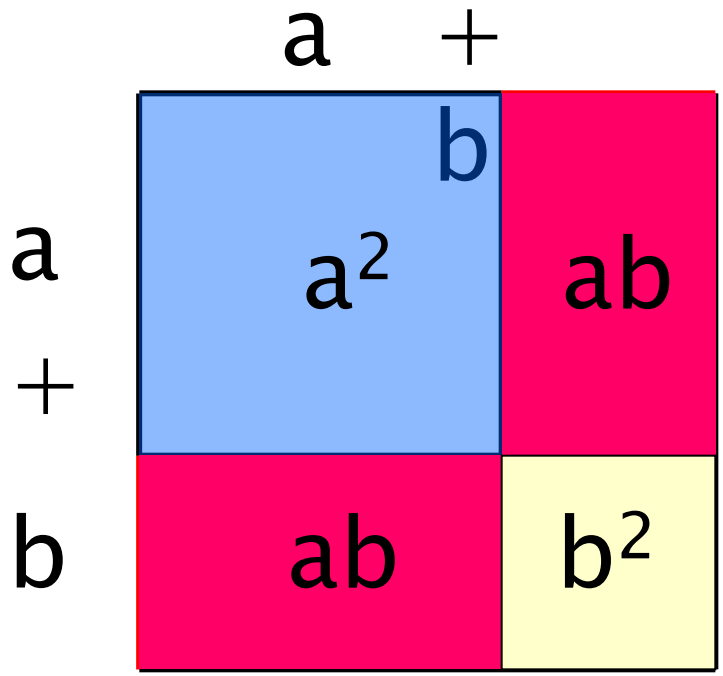
1. What is the difference of the squares of two quantities equal to?
2. What is $m^2 - n^2$ equal to?
3. What is $(91)^2 - (9)^2$ equal to?

Home work:

Five problems of the relevant exercise of their text book will be set as home work.

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

To Show Geometrically That $(a + b)^2 = a^2 + 2ab + b^2$



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

Thanks to all.....

vsr