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Lesson No.

- 2.1 Mathematics Laboratory and Text Books.
- 2.2 Lesson planning
- 2.3 Assessment and Evaluation
- 2.4 Preparation of diagnostic and achievement test and
Mathematics Club formation & organization of its activities

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Structure of the lesson

- 2.1.1 Objectives
- 2.1.2 Introduction
- 2.1.3 Mathematics Laboratory
 - 2.1.3.1 Apparatus and other aids to the teaching of the subject
 - 2.1.3.2 Materials or audio-visual aids to the teaching of Mathematics
- 2.1.4 Text Books
 - 2.1.4.1 Place of Text books in Mathematics
 - 2.1.4.2 Value of Text book
 - 2.1.4.3 Kinds of Text book
 - 2.1.4.4 Qualities of a good Text Book
- 2.1.5 Summary
- 2.1.6 Key Concept
- 2.1.7 Self Check Exercise
- 2.1.8 Suggested Questions
- 2.1.9 Suggested Books

2.1.1 Objectives

- After going through this lesson learners will be able to-
- Know about mathematics Laboratory
 - Explain about mathematics Laboratory equipments
 - Explain places of text books in mathematics
 - Differentiate between text books
 - Explain qualities of good text- books

2.1.2 Introduction:

In this age of competition, one has to follow latest development in any sphere in which one is interested. If we want our students should compete in different disciplines at international level, we have to review the present set up of our education. In particular to make improvement in the teaching, learning set up of Mathematics, we have to introduce mathematics laboratory to the present day classroom teaching. The relevance of Mathematics library and laboratory in present day situation is derived in the following discussion:

2.1.3 Mathematics Laboratory :

Mathematic is considered a dry subject only because the picture in our mind

about Mathematics is as a collection of mysterious symbols, signs, rules, relationship, formulae and theorems. Though our main aim is to develop the power of abstract thinking and reasoning in the students yet this is not the first step to start with. We have to start with concrete things. All learning follows a set of sequence. So starting from concrete visualization, we have to derive abstract relationship, principles, rules, and formulae. It is very natural process and by applying this we can bring maximum output. This is possible only if we have a well equipped laboratory.

Laboratory serves two fold purposes. Firstly, it provides safe place for placing all the essential mathematical equipments to be used in teaching learning process. Secondly, it provides proper facilities and opportunities for practical work with the help of mathematical equipments. It provides a good platform to make proper integration between theory and practice. While working in mathematical laboratory one can realize the practical nature of this subject. It helps in creating and maintaining interest in Mathematics which is one of the aims of teaching Mathematic.

Laboratory in Mathematics can be useful in the following way :

- It helps the teacher to teach with the help of progressive, scientific and psychological method of teaching.
- It helps in creating and maintaining interest among the students in this subject.
- It helps in developing heuristic and scientific attitude among the students which is very important to solve problems objectively.
- It helps in satisfying creative and constructive urges of the students by providing opportunities to do so in the form of making charts, models, workable and non-workable for various topic. It also canalize pent up energies of the grown up students in more productive ways.
- It creates atmosphere for learning of Mathematics which is evaporating from our school.
- The purely theoretical concepts may be easily clarified by concrete examples.
- It is very useful for the students of lower classes where students learn much from concrete things. Their reasoning powers are yet to develop. By teaching the students of lower classes with the help of concrete things we save much time and energy.

Thus it may be concluded from the above discussion that it is not only desirable rather it is necessary that every school has a well equipped Mathematics

laboratory. What type of material should a Mathematics laboratory has, will be discussed under the heading audio-visual aids to the teaching of Mathematics.

2.1.3.1. Apparatus and other aids to the teaching of the subject

There are no two opinions about the setting up of a Mathematics laboratory but what type of apparatus of material aids should be there, is a matter of discussion. According to our circumstances we cannot afford costly material for our school laboratories. So taking into consideration our limitations, we have to decide which type of audio-visual aids (Material aids) should be kept in our Mathematics laboratories. In other words, we are interested in that type of audio-visual aids which can be made from locally available resources or which are less costly. But one thing should always be kept in mind that these aids should fulfill all the qualities and characteristics of good audio-visual aids. Rather the audio-visual aids prepared in this way has more educational values than readymade ones.

Before the preparation, purchase and collection of the audio-visual aids we should be ensured that the proper place for storing purpose should be available. We can start with one or two almira's and a room. After ward laboratory can shape itself according to its need.

Types of apparatus for the teaching of Mathematics

There are two types of apparatus required in mathematical instructions :

1. Personal equipments of the students.
2. Equipments of the Mathematics laboratory.

Personal Equipments of the Students

This equipment comprises of instruments which are widely used by the students for his personal work. This equipment is not too expensive and generally in the form of a small box called 'Mathematical instruments box'. It is the minimum apparatus which every student possess.

Equipment of the Mathematics Laboratory

Beside the personal equipments of the students there are some others items or apparatus that should be provided by the school Mathematics laboratory. These equipments are costly and it is not recommended that each student should purchase these. These equipments are of somewhat permanent nature. What are the items of Mathematics laboratory and what is their educational implication is discussed below :

2.1.3.2 Materials or audio-visual aids to the teaching of Mathematics

To make his instructions effective a teacher has to use many tactics. Important among them are modern methods, planning according to needs and interests of the student and audio-visual aids. Here we are mainly concerned with audio-visual

aids. As the name shows these call upon the auditory and visual senses of learners. The aids like radio, tape recorder, gramophone etc. which helps in learning through listening are termed as audio aids. Whereas the aids like film strips, charts, models, pictures, black boards are called visuals aids. Aids such as cinema, television where both listening as well as viewing takes place simultaneously are known as audio-visual aids. These aids are very important for Mathematics teaching due to the following reasons :

- The subject matter can easily be grasped with the help of audio-visual aids.
- Almost all abstract concepts of Mathematics can be explained easily with concrete examples.
- By the use of audio-visual aids interest in Mathematics can be created and maintained.
- Use of these aids is very useful in lower classes as children always like to manipulate or observe the new things.
- Even complicated abstract ideas can be made understandable by the proper use of audio-visual aids.
- Senses are gateways of knowledge. Audio-visual aids involve more senses while thinking at a problem and hence facilitate in acquiring knowledge.
- By the use of audio-visual aids we can help all categories of students, such as, gifted, average and slow learners and students with special abilities by providing visual demonstration, to learn at their own pace.
- Use of audio-visual aids encourages activity. Learning by doing and learning by observation are two principles of learning which are properly employed by their use.
- Use of audio-visual aids also helps to develop scientific attitude among the learners.
- If students are encouraged to prepare or construct charts and models by their own then their creative and constructive urges are satisfied.

The following are the important items of ordinary Mathematics laboratory for our school.

Black Board

It is the most important and absolutely necessary type of laboratory item. This is the minimum equipment. It is to much effective as teaching aids that it is

termed as right hand or second tongue of the Mathematics teachers. Teacher of this subject is not thinkable without the aid of blackboard. Use of blackboard starts as the teaching in Mathematics starts and ends as the teaching ends. From lower to higher classes its importance is unchanged. It remains dominant as an aid to the teaching of Mathematics.

Mathematics teacher should be good at blackboard writing and drawing. The teacher should possess all tactics needed to make this aid more effective. It should not be considered as only a mean to write and draw few mathematical problems and figures that student should copy. Rather its effective use lied in the manner by which the subject matter is developed, teacher should encourage active participation of the students while writing on the blackboard, student should also be given opportunity to write and draw on the black board. Use of coloured chalks for writing and drawing important steps and diagrams make the work of blackboard more attractive and effective. If possible sliding wall blackboard should be preferred as it provides more space for righting and drawing purposes.

Charts and Pictures

Charts and pictures are important audio-visual aids and can be prepared for almost all topics. It is impossible to bring everything to the classroom. The well prepared charts and pictures of the concrete and complex things can be used to teach. For instance, the picture of big projects, great mathematicians, charts of almost all geometrical diagrams can easily be made available.

It also helps in creating suitable atmosphere for a topic. Suppose we are teaching Geometry in the class, the charts and pictures related to geometry should be displayed on the walls of the room. As for as the topic changes the charts and pictures of new type would be displayed at the place of previous one and so on. If a teacher is committed to his profession then he will encourage the students to prepare charts on different topics on their own. He should prepare himself and train his students. By the continuous efforts of the teacher soon there will be a rich stock of charts on almost all topics.

Picture showing history and development of theory of numbers should be prepared in good numbers. Pictures of great mathematician should be displayed in the mathematics laboratory so that students may get inspiration from them. Chart can be prepared on topics of varied interest in mathematics such as weights and measures, prices of different articles; school and class pass percentage; different kinds of angles, triangles and other geometrical figures, different types of blank drafts or course; arithmetic terminology such as area, simple interest, compound interest, average, percentages, ratio and proportion etc.

Chart is very cheap and best type of audio-visual aid for our circumstances, as we cannot afford to have those audio-visual aids which are very expensive. By the preparation of audio-visual aids student can best utilize their creative and constructive abilities.

Models

Models of real things are even more effective than picture or chart of the thing. For instance workable model of power house will be more effective than more chart or picture there of. There may be other types of models which are non-workable, these, too have much educational importance. Models can effectively be used in place of real things or projects in classroom situation. As far as possible these should be locally made and should not be costly. It will be good if teachers, with the help of students, prepare models on their own. By working on the models one can grasp the underlying principle easily and effectively than without its help.

A piece of cardboard can be shaped as models to teach topics related to triangles, quadrilaterals, polygons etc. topics such as area of four walls, crossroads, topics related to square, rectangular and circular figure can easily be taught by corresponding models prepared with thick paper or card board.

Concrete Material

Some object of concrete material can effectively be used while teaching few topics. These materials may include, weights, coins, toys, money, sticks, seeds, colored balls, beads, pencils etc. Fundamentals rules, average, fraction, percentage etc. are few topics which can easily taught with the help of concrete material. Few items of the room and even room itself can be used for the purpose of explaining few topics. For instance, topics of area can be taught by actually measuring the class room and then calculating its whole area.

Excursions and Collections

Though excursions has no direct relation with the laboratory yet indirectly these can be useful for mathematics laboratory in many ways. When students visit few places like insurance office, post office, bank, income-tax office etc. they can bring many types of data and material of mathematical importance. Similarly, student should be encourage to collect varied types of information from newspapers, pamphlets, magazines etc. for mathematical laboratory. This rich stock of information is very important for classroom teaching and general awareness point of view.

Radio

Radio can be helpful in many ways. Lectures on the biographies of mathematicians and history of mathematics can be useful for proper motivation of the students. Some experts of different occupations can give information regarding

use of mathematics in their profession. Broadcasting about maximum temperature, rainfall, market rates of different commodities is a good source of latest information and help in the collection of data.

Film Strips

It is a very useful type of audio-visual aid which can bring newness in the monotonous atmosphere of the class, now film strips on many topics are available in the market. These film strips can be shown with projectors in the classroom or laboratory. The teacher may screen different aspects of the picture as the students demand. This is very effective teaching aid to teach topics such as fraction, use of percent in daily life, graphs, measurement etc.

Television

Use of television in imparting education is of recent origin. Television is very effective means for distance education. It can effectively be used to impart non-formal education. To impart education in informal ways by television is now widely gained momentum. It should be encouraged as an aid of teaching as it involves maximum senses.

Some other instruments like angle mirror, sextant, plane table and almanac, level, transit, proportional dividers, slide rule etc. should be kept in a Mathematics laboratory.

Calculating machine should be there and students should be trained to use it effectively.

2.1.4. TEXT BOOKS

To decide what type of subject matter suits to the age, interest, mental level, attitude, capacities, etc. of the students we should consult the text books written for this purpose by some experienced teachers and subject experts. But it is generally noted that teachers and students follow text books prescribed for various classes blindly. The actual place of text books in our teaching learning process is discussed from different angle as follows :

2.1.4.1 Place of Text books in Mathematics

Text books are only guides to the teachers and the students. It is an important source of information regarding what type of subject matter should be studied in a particular class. Text books draw boundaries for teachers and students within which they should work for the relation of aims and objectives. These boundaries are not rigid rather these are only guide lines.

Mathematics requires maximum practice of its formulae, rules and relationship. Due to limited time of school hours it may not be possible for students to do much practice in the classrooms. Hence students should be given home work

and assignment with the help of text book. Thus it plays a unique role to supplement classroom work and practice upon important relationships, rules and formula of Mathematics.

It may be clearly understood that text book is only a means to an end. It is not all in all, rather it only assists us in the realization of higher aims of education.

2.1.4.2 Values of Text books

Text books is valuable due to the following reasons :

1. It is reliable and cheap source of knowledge. Without its help students may commit mistakes while taking notes. It also saves time and energy required for writing of notes.
2. It is possible to give home work and assignments to the students with its help.
3. Text books are very important from reviewing purposes.
4. A student can make up deficiency with the help of text book even if he may fail to attend classes for some time.
5. It is good to supplement classroom teaching.
6. It provides guide lines for the teachers as well as for the students in the form of topics to be taught, types of audio-visual aids used, methods and techniques most effective for a particular topic and list of reference books for further study etc.
7. Teachers and students may get valuable suggestions regarding ways and means of solving different types of problems.
8. Text books can help students in fixing up the knowledge and skill taught. Oral work can easily be carried out with the help of text books.
9. Text books help in maintaining uniformity of standard in different school of a district or a state having common curriculum and objectives. This uniformity of standard in a state serves the purpose of uniform and common education throughout the state. The public examination and evaluation process becomes possible only due to such uniformity. It also helps the students to seek migration from one school to another with least disturbances to their syllabus.

2.1.4.3 Kinds of Text-Books

There are three kinds of text-books :

(i) Detailed Subject-Matter Books :

In this kind of books, the subject-matter is given in detail. But, still there is scope for further explanations.

(ii) Limited Subject-matter Books :

These books contain limited subject-matter are given and these are not explained properly.

(iii) Confined Perfect Subject-Matter Books :

In this kind of books, facts and figures are properly explained. All the aspects are given in detail. There is no need for further explanation.

2.1.4.4 Qualities of a good Text Book

1. It should possess some overt qualities like good get up, fine paper, errorless printing and tidy binding.
2. It should be less costly and readily available in the market.
3. Figures and diagrams should be there where ever necessary. In case of books for lower classes these should be in sufficient number and coloured, if possible.
4. A book on Mathematics should be error free because a small error in the statement can change the answer altogether.
5. Maximum number of problems should be taken from daily life and also from other subjects. The problems should have practical relevance and appears to be natural.
6. Excess of solved problems should have to be avoided. Rather text books should be written in a way of encourage drill work and application of formulae to the maximum.
7. The subject-matter of the text book should be up to date.
8. Popular signs, symbols and procedure should be used.
9. There should be some problems in the form of auxiliary exercises for intelligent students.
10. Writer should be highly qualified and should possess long teaching experience of the class for which he is writing text book.
11. Provision for the use of progressive psychological and scientific methods of teaching should be there.
12. The principle "from simple to complex" should be followed in the arrangements of the topics of the text book. The subject matter should be organised on the principle of concentric order so that what is being taught may be correlated with the past and future learning.
13. Language of the book should be simple and according to the mental level of the students.

- 14. It should be in accordance with the recommendations of important commissions and committees.
- 15. It should contain a list of reference books for further study at the end.
- 16. It should suggest the type of audio-visual aids that might be used to make the teaching more effective.
- 17. It should contain hints for difficult and typical problems.
- 18. It should make use of national and international standard terminology in terms of symbols, formulae and definitions.
- 19. In the text book every care should be taken for giving correct answers at the end of the book or a section.

Self Check Exercise

- 1. What are the types of apparatus for the teaching of mathematic.
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- 2. Explain the place of Text book in Mathematic
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2.1.5 SUMMARY

Library and laboratory in Mathematics have emerged as important necessities of present day teaching-learning process. Gone are those days when Mathematics was considered to be the subject of chalk and blackboard only. Use of library is the main demand of the day in any field. Audio-visual aids the main body of Mathematics laboratory are helpful in teaching learning to a large extent. It is the duty of Mathematics teachers to enrich his laboratory according to the growing needs of the subject. It is possible only if he encourages his students for improvisation and collection.

Good text books are necessary for good teaching-learning. So text books written by eminent scholars and experienced teachers should be recommended for all stages. So text books are good tools to achieve ultimate aims of education.

2.1.6 Key Concept:

Mathematics Laboratory: It is a place where students can explore mathematical concepts and verify it by different activities and techniques.

Text book: It is a book containing a comprehensive compilation of content in a brach of study with explanation.

2.1.7 Self Check Exercise: Fill in the blanks

- i.equipment comprised of instruments which are widely used by the students for this personal work.
- ii.is an important source of information regarding what type of subject matter should be studied in a particular class.

Ans: i. Personal equipment ii. Text book

2.1.8**SUGGESTED QUESTIONS**

1. What type of audio-visual aids would be suggested for Mathematics laboratory ?
2. Justify the need of Mathematics laboratory for a high school.
3. By what consideration you will be guided while selecting a good text book for Mathematics.
4. How will you as a teacher organize Mathematics laboratory in a high school ?

2.1.9**SUGGESTED BOOKS**

1. SIDHU (Dr.), K.S. : *The Teaching of Mathematics.*
2. CHADHA, B.N. : *The Teaching of Mathematics.*
3. BUTLER AND WREN : *The Teaching of Secondary School Mathematics.*
4. KUPPUSWANI, A.S. : *The Teaching of Mathematics in New Education.*

Structure of the lesson

- 2.2.1 Objectives
- 2.2.2 Introduction
- 2.2.3 Lesson Planning
- 2.2.4 Value and Necessity of lesson Planning
- 2.2.5 Characteristics of good lesson plan
- 2.2.6 Steps for preparing a Lesson plan
- 2.2.7 Examples
- 2.2.8 Summary
- 2.2.9 Key concept
- 2.2.10 Self check Exercise
- 2.2.11 Suggested Questions
- 2.2.12 Suggested Readings

2.2.1 Objectives

- After going through this lesson learners will be able to-
- Define lesson planning
 - Explain Necessity of lesson planning
 - Explain steps for preparing a lesson plan
 - Prepare lesson plan on any topic

2.2.2 Introduction

Planning of lesson in advance is the first and the most important step for the success of a teacher. A lesson plan indicates what has already been done in what direction the pupils should next be guided and the immediate work to be taken-up. So the teacher should know before hand what to teach and how to teach. The teacher should consider the requirements of the subject matter, determine its scope and then adopt his/her teaching to the objective needs of the children. He/she should know how to introduce and present the lesson and about the aids he/she will make use of. The teacher should also know how to evaluate his/her lesson in the light of the aim set. Despite all previous planning the teacher should be prepared to meet the light of the aim set. Despite all previous planning the teacher should be prepared to meet and deal with unexpected development in the class. So he/she should adopt a flexible attitude.

2.2.3 Lesson Planning

Lesson planning is equally important for a mathematics teacher as it is for other. At different levels, mathematics teacher can adopt the following

accepted scheme of planning.

(i) Long Range Planning : A rough layout is planned for whole the year. The teacher should decide in advance how much time he/she will devote for the various topics in the curriculum.

(ii) Topic or Unit Planning : Detailed planning of the different topics is done which may cover one or several days or weeks. The teacher should decide before hand how many days he/she will devote for particular topic or what is to be covered in each lesson.

(iii) Lesson Planning : In this, detailed planning of each lesson is done in advance. This is the basic unit of planning for teaching on which the success of the teaching depends. On wards we will discuss the lesson planning in detail.

2.2.4 Value and Necessity of Lesson Planning :

Lesson planning is the first requisite of good teaching. It has certain definite functions to perform which are indispensable in good teaching.

1. It helps the teacher to be systematic and orderly as it saves him/her from haphazered and indifferent teaching.
2. It prevents the teacher from wandering away from the topic in hand. Keeping the points of the lesson before him/her in well planned sequence. It ensures a definite objective for each day's teaching.
3. It ensures association between various lessons, the selection and organisation of subject matter, material and activities, and therefore, it provides and encourages continuity in the teaching process.
4. It gives the teacher confidence and self reliance and, hence greater freedom in teaching.
5. It saves time in the sense that the students get a better understanding of the subject matter and form some desirable attitudes and habits which would otherwise have been impossible in the same period.

2.2.5 Characteristics of Good Lesson Plan :

The essential elements of a good lesson plan are as following :

1. The basis of the lesson plan should be the previous experience and present knowledge of the students. In other words, it should not be what the teacher wants to teach, but what the students want to receive.

2. The aims of teaching the lesson in the form of general and specific aims should be clearly stated.
3. The material of the lesson should be clearly stated and organised.
4. A good lesson plan indicates well-selected and directed learning activities of the student.
5. It should include teaching techniques to be used by the teacher how the teacher would present the lesson, what method he/she would follow, which questions he/she would ask and what illustrations he/she would make use of.
6. It should include one or two definite assignments for the students.
7. It should indicate the time allotment of the class to be taught, the average of the students, of the unit and sub-unit.
8. It should be presented with the most interesting illustrations available.
9. There should be provision for self-criticism in each lesson. After the lesson plan is completed and used in an actual situation, the teacher should criticise and write into the plan all the improvements for future references.

2.2.6 Steps for preparing a Lesson Plan :

A good lesson plan is a guide to the teacher. For preparing a lesson plan first of all the topic should be decided. Then the teacher should take into consideration about the children's interest, their ability to understand the topic, time allotment of the period, nature of the topic to be taught and method of teaching etc. These days steps given by Herbart are used in preparing the lesson plans for all subjects which are also applicable for mathematics. His method of lesson planning is based upon the principle—New learning is always based on the learning already acquired. The main steps in the plan given by Herbart are as follows :

1. Introduction of the Lesson Plan :

First of all the introduction of the lesson should be written, in which first of all the roll number of the pupil teacher should be written. Then the class to which the lesson is to be given, average age of the students and date should be written. After this the time of period should also be mentioned.

2. Aims :

Aims for a lesson are general as well as specific.

(i) General :

General aims include all those aims which are the aims of teaching mathematics in general. Some of them may be stated in the plan.

(ii) Specific :

Specific aims include all those aims which are the aims of teaching a particular lesson. These aims are different for different lessons. The teacher should have a clear cut aim before his/her when he/she goes to teach the class.

3. Teaching Aids :

For presenting and teaching a lesson a teacher uses different types of teaching aids. All the aids to be used while teaching the lesson would be mentioned in the lesson plan.

4. Method for Teaching :

Method of teaching should be clearly stated. Use of right method is essential for preparation or transfer of training.

5. Previous Knowledge :

This is the assumed knowledge which the student have already acquired. On the basis of the knowledge the question are asked at the preparation stage.

6. Preparation or Introduction :

Preparation, in fact means the exploration of the pupil's knowledge which helps to the aim of the lesson. The teacher asks question on previous knowledge in a logical manner to prepare the ground for the new lesson he/she proposes to deliver. The question should be in such a form which might arouse the interest and curiosity of the pupils to learn the new matter. The teacher can also introduce he/her lesson by telling a story or an experience. It should, however, be noted that this step should be brief and should not take more than five minutes in any case.

7. Statement of the Aim :

After the preparation step, aim of the lesson should be clearly stated. By this the teacher as well as the students are engaged upon a common pursuit.

8. Presentation :

At this stage the teacher presents the new knowledge and links it with old knowledge. Both the teacher and pupils should be the active participants in the teaching learning process. The lesson should be developed with the help of the pupils with developmental questions. Proper aid should be used to make the lesson more interesting and comprehensive.

9. Comparison of Association :

The teacher gives some examples to the students and they are asked to observe carefully and compare them with other set of examples and facts. This step is more important where some generalisation is to be induced from the students.

10. Generalisation :

At this step the whole knowledge learnt in the presentation systematised which leads to generalisations, formulae, rules etc., through comparison or association. This step completes the enquiry by providing the answer to the problems with which it began.

11. Application :

The main purpose of application is to make the presentation more effective. At this stage, the students make use of the acquired knowledge in familiar and unfamiliar situations. In this way the new knowledge gained by the students will become permanent in the minds of the students and will not fade from consciousness soon.

12. Recapitulation :

In the last step the teacher can put some suitable questions on the topic to the students so that he/she could test the understanding and comprehension of the subject-matter taught by him/her. This will also help the teacher to find out whether his/her method of teaching is effective and successful or not.

13. Home-work :

The teacher also gives some related home work of the students. The teacher may suggest home-work in which the pupils have interest and scope for creativity. The pupils should not be over-burdened at home with the school work.

2.2.7 Examples: From the following lesson plans in mathematics all the steps will become more clear.

Lesson Plan - I

Class	:	VI
Average Age	:	12 Year
Subject	:	Arithmetic
Topic	:	Profit and Loss
Time	:	40 Minutes

(i) General :

1. To develop the thinking and reasoning power of the students.
2. To arouse interest of the students in mathematics.
3. To enable them to express mathematical facts briefly, systematically and neatly.
4. To enable the students to solve the problems related to daily life.

(ii) Specific :

1. To enable them to understand concept of profit and loss.
2. The students will be able to develop formulae for profit and loss percent.
3. To enable them to solve the sums speedily and accurately with the help of formulas of profit loss.

Teaching Aids :

An ordinary class-room with chalk board, chalks and duster.

Method of Teaching :

The teacher will use the inductive method of teaching.

Previous Knowledge :

The students are expected to know the method of Unitary and Percentage.

Introduction of Preparation :

To test their previous knowledge and to prepare them for the new lesson. The following questions will be put to them —

1. If 14 pencils cost Rs.7, then what will 35 pencils cost ?
2. Find 5 per cent of 200 ?
3. Do you know how the shopkeeper earn their money ?
4. They sell the articles at the same price at which they buy ?

Some students will answer the question as yes or some will say no.

The teacher will tell that although they try to sell their articles at the higher price than the one at which they buy, but sometimes they have to sell at lower price. In that way sometimes they gain or sometimes loss in their business.

Statement of the Aims :

Well Students, today we shall learn about profit and loss.

Presentation :

1st Stage—To find Profit and Loss.

The teacher will tell about the terms cost price (C.P.), selling price (S.P.), Profit and Loss with examples.

Examples—Suppose Ram bought a watch for Rs.350/- and sold it to Suresh for Rs.400/-. Find Ram's profit and loss.

Sol. :

Here the cost price of watch is Rs.350/- and selling price is Rs.400/-. So Ram is left with Rs.50/-. It means this is his profit. But if he would have sold it at lower price, suppose for Rs.320/- then his loss would have Rs.30/-.

So when do we have profit or gain ? When we sell an article at a price

higher than the one at which it is bought.

Therefore, Profit = S.P. - C.P.

And when do we have loss ? When we sell an article at a price lower than the one at which it is bought.

Therefore, Loss = C.P. - S.P.

2nd Stage—To find Profit or loss per cent.

Ex. Suppose Seema buys a pencil for Rs.3/- and sells it for Rs.3/- and paise 20. Sonia buys a pencil for Rs.2/- and paise 50 and sells it for Rs.3/- . Who gains more ?

How will you compare their gains ?

The teacher will tell for such examples we compare profit or loss on 100, she will explain it with the following examples :

Example 1 : Suppose I bought a cow for Rs.250/- and sold it for Rs.300/-. Find my gain per cent ?

Sol. :

Cost price of the cow = Rs.250/-
 Selling price of the cow = Rs.300/-
 Profit = 300-250 = Rs.50/-
 So Profit on Rs.250/- = Rs.50/- Profit on Rs.1/- = 50/250

Profit on Rs.100/- = $\frac{50}{250} \times 100 = 20$ Thus Gain Per cent = 20%

Example 2 : Suppose Kamla bought a bicycle for Rs.400/- and sold it after some time for Rs.380/-. Find her profit or loss percent.

Sol. :

C.P. of the bicycle = Rs.400/-
 S.P. of the bicycle = Rs.380/-
 Loss = Rs.400-380 = Rs.20/-
 Loss on Rs.400/- = Rs.20/-

Loss on Rs.1/- = Rs. $\frac{20}{400}$

Loss on Rs.100/- = Rs. $\frac{20}{400} \times 100 = 5$

Loss per cent = Rs.5%

Comparison or Association :

The students will be asked to solve two more sums on profit % and loss %. Then with the helps of the students the teacher arrive at generalisations.

Generalisation :

The following generalisations will be arrived at —

1. The price at which an article is purchased, is called the cost price (C.P.).
2. The price at which an article is sold, is called its selling price (S.P.).
3. When S.P. is greater than C.P. It is said to be sold at a gain.
Gain = S.P.-C.P.
4. When C.P. is greater than S.P. It is said to be sold at a loss. Loss = C.P.-S.P.
5. Profit or loss per cent is always calculate on C.P.
6. Gain or loss per cent = $\frac{\text{Gain or loss}}{\text{C.P.}} \times 100$

Application :

The student will be asked to solve the following sums with the help formulas.

1. A man buys a horse for Rs.180/- and sells it for Rs.195/-. Find his gain per cent.
2. What is gain or loss per cent when a watch cost Rs.118/- is sold for Rs.130/-.

Recapitulation :

It will be done with the following questions :

1. What is difference between C.P. and S.P. ?
2. When does one get profit ?
3. What is the formula for profit or loss per cent ?

Home work :

The students will be asked to solve 1-5 sums on profit and loss given in the exercise.

Lesson - 2

Class	:	VII
Average Age	:	13 years
Subject	:	Algebra
Topic	:	Identity $a^2 - b^2 = (a + b) (a - b)$
Time	:	40 Minutes

Aims :**(i) General :**

1. To help in developing reasoning, thinking and imagination powers of the students.

2. To develop skill and capacity for mathematical computation with speed and accuracy.
3. To develop the ability to discover the rules and principles of mathematics.
4. To help in making use of mathematics in day to day life.

(ii) Specific :

1. To enable the students to understand and prove the identity $a^2 - b^2 = (a+b)(a-b)$
2. To enable them to apply this identity to algebraic and arithmetical problems.

Teaching Aids :

Chalk board, chalks, duster, a square piece of card board, scissor and a chart.

Method of Teaching :

The teacher will proceed with the help of inductive and Laboratory method.

Previous Knowledge :

The students are expected to know about addition, subtraction, multiplication and division in algebra and also how to find areas of square and rectangular figures.

Introduction or Preparation :

For this purpose the following question will be put to the students :

1. What is the area of a square whose one side is of a ft ?
2. How will you write $a \times a = ?$
3. What is the area of a rectangle whose one side is of a ft., and other of b ft.
4. $4^2 - 2^2 = \dots\dots\dots ?$
5. $15^2 - 11^2 = \dots\dots\dots ?$
6. $128^2 - 98^2 = \dots\dots\dots ?$

The students shall try to do it with long process of finding the squares of each and then their differences.

Statement of the Aim :

Teacher will announce that today we shall try to find out an easier method of solving such problems with the help of algebra—

Presentation :

This will be done in three stages :

1st stage : Recognition of the form $a^2 - b^2$

The teacher will write the following problems on the Black board :

- | | |
|--------------------------|--------------------------|
| (i) $(101)^2 - (99)^2$ | (ii) $(197)^2 - (13)^2$ |
| (iii) $(185)^2 - (75)^2$ | (iv) $(487)^2 - (356)^2$ |

She will ask students to find similarity in all the expression. Then she will tell that all are the differences of two squares. We can give them a general form by expressing the first term as a^2 and the other as b^2 .

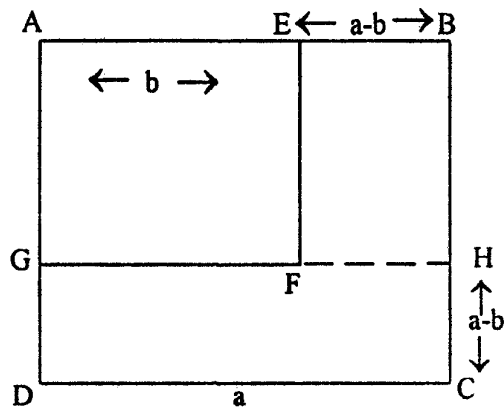
So now our problem is to find out $a^2 - b^2 = \dots\dots\dots ?$

2nd stage : Tackling the problem with the help of Geometry :

The teacher will show the square piece of card board, whose side is labeled as 'a'.

The area of this square ABCD = a^2

Another square will side b is drawn on this cardboard and area of this square AEFB = b^2 . The teacher will remove the AEFB portion of the Card board by cutting it with scissor. The remaining portion thus be EBCDGF.

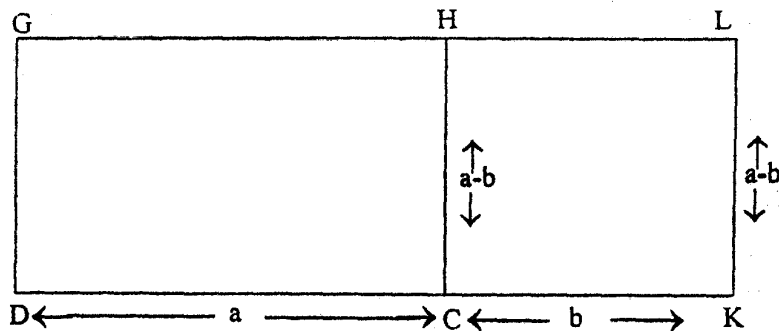


What will be the area of the remaining part of the card board ?

Its area = $a^2 - b^2 \dots\dots\dots (i)$

The teacher will further cut the portion BHEF, and place it in continuation with the remaining rectangle GDCH so that BE coincides with HC.

Now, we are left with a rectangle DKLH.



Its length = $a + b$

and breadth = $a - b$

So the area of DKLG = $(a + b) (a - b)$ (ii)

From (i) and (ii) we can conclude that

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

Then the teacher will show the chart which represents $x^2 - y^2$ and by questioning in the same process, she will lead the students to conclude that

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

3rd stage : Verification through Direct Multiplication :

Here, the teacher will ask the students of actually multiply the expressions and with write the results on the black board.

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

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

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

The results will then be generalised with the active participation of the students.

Generalisations :

From the above examples, we come to the following generalisation.

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

Application :

The teacher will give the following problems for application :

(i) Solve $4x^2 - 9y^2$

While questioning the students he will proceed in the following manner

$$4x^2 - 9y^2 = (2x + 3y) (2x - 3y)$$

(ii) Solve $(101)^2 - (99)^2$

$$= (101 + 99) (110 - 99)$$

$$= 200 \times 2 = 400$$

The students will be asked to solve two similar problems.

Recapitulation :

It will be done with the help of the following questions :

1. What is the difference of the squares of the two quantities equal to ?
2. What is $m^2 - n^2$ equal to ?

3. What is $(81)^2 - (9)^2$ equal to ?

Home work :

The problems of the relevant exercise of their text-book will be given as home work.

Lesson Plan - 3

Class	:	IX
Average Age	:	15 years
Subject	:	Geometry
Topic	:	Sum of the three angles of a Triangle is equal to two Rightangles.
Time	:	40 Minutes

Aims :**(i) General :**

- To provide opportunities for the development of the mental facilities of the student.
- To develop interest in the study of geometry and to acquaint them with the rules and principles of geometry.
- To provide opportunities for the manifestation of creative and constructive urges.

(ii) Specific :

- To enable the students to understand the fact that sum of the angles of a triangle is equal to two right angles and prove it.
- Students will be able to use this fact in solving daily life problems.

Teaching Aids :

Chalk board, chalks, duster, charts, a triangle cut of a thick paper, triangles of different sizes etc.

Method of Teaching :

The teacher can use any one out of the three methods given in this lesson plan i.e. laboratory, Analytic or Synthetic.

Previous Knowledge :

Students are already familiar with the geometrical facts that :

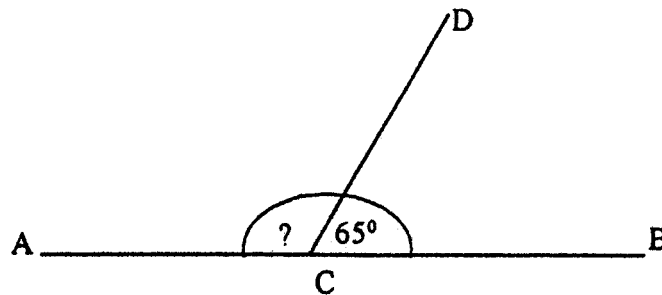
- If one straight line stands on the other, the sum of the adjacent angles so formed is equal to two right angles.
- If one transversal line cuts two parallel straight lines. Then the pairs of alternate and corresponding angles so formed are

equal to one another.

Introduction of Preparation :

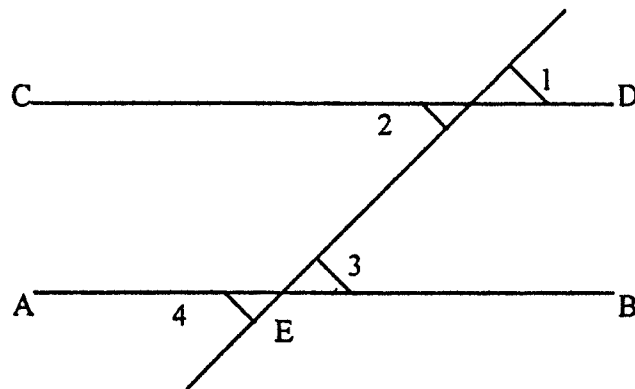
For this purpose the following questions will be put to the students :

1. One of the students will be asked to draw a figure on the black board, showing a right angle. Then teacher will ask how many degrees has it ?
2. The teacher will show a chart of the following figure, and ask.



How many degrees has the angle ACD ?

3. By showing a chart of the following figure she will ask.



- (i) What do you see in this chart ?
 - (ii) How many angles are there in the figure ?
 - (iii) What is the relation between $\angle 1$ and $\angle 2$?
 - (iv) What is the relation between $\angle 2$ and $\angle 3$?
 - (v) What relation do you assume in $\angle 1$ and $\angle 3$?
4. The teacher will ask one of the student to draw a triangle and measure two of the angles and then she will ask.

Can you tell the third angle without actually measuring it ?

Statement of the Aim :

The teacher will tell that we would be able to tell the third angle if we know the sum of the angles of a triangle. Today we will see and prove that sum of the three angles of a triangle is equal to two right angles.

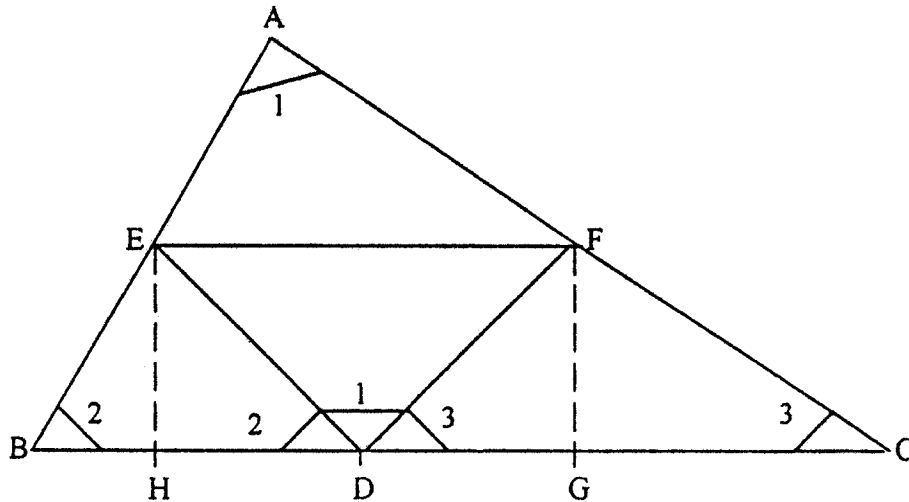
Presentation :

1. Laboratory Method :

The teacher will distribute the cuttings of different triangles to each student and will ask them to measure all the three angles of the triangle and she will write all the measurements on the B.B. For example :

Triangle No.	$\angle A$	$\angle B$	$\angle C$	Total
1	60°	80°	40°	180°
2	50°	30°	100°	180°
3	45°	65°	70°	180°
4	105°	30°	45°	180°

Then the teacher will show a triangle cut out of a thick paper. She will fold it in such a way (shown below) that the angles of the triangle make a straight angle which proves the theorem.



II. Analytical Method

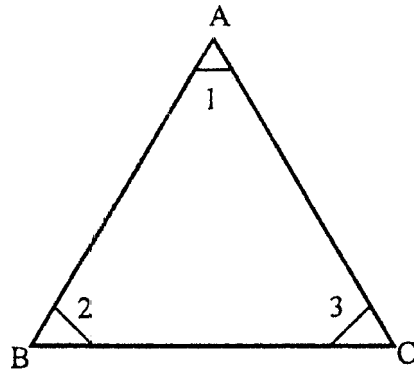
Questions

1. What is given ?
2. What is to be proved ?
3. How can we prove it ?

Subject Matter and B.B. Writing

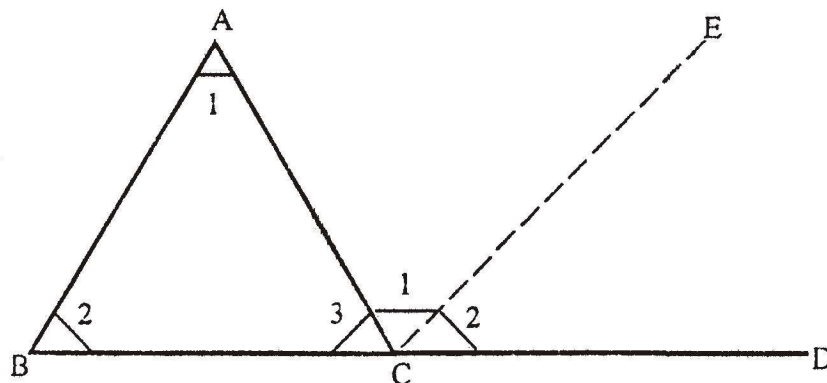
1. A triangle ABC.
2. $\angle A + \angle B + \angle C = 2\text{rt. angles}$
3. We can prove it if we can

show these angles as parts



4. How can these angles be converted into a st. angle ?
5. How can we place $\angle 1$ and $\angle 2$ alongwith $\angle 3$?
6. How will you divide $\angle ACD$ in such a way ?

4. We can do this if $\angle 1$ and $\angle 2$ could placed jointly with $\angle 3$.
5. If BC is extended up to D & $\angle ACD$ is divided in such away that one of the angles is equal to $\angle 1$ and the other equals to $\angle 2$.
6. If we draw a line CE parallel to AB.



The teacher will ask the students to draw it in their note books and verify that $\angle 1$ and $\angle 2$ are properly placed.

III. Synthetic Method :

The teacher will write the theorem step wise on the Black Board with the help of the student.

Given	:	ABC having interior angles A, B and C.
To Prove	:	$\angle A + \angle B + \angle C = 2\text{rt. angles}$
Construction	:	BC is extended to D and CE is drawn parallel to AB from C. (The figure given above will be drawn on the B.B.)
Proof	:	<p>AB and CE are parallel and AC cuts these parallel lines</p> <p>$\angle BAC = \angle ACE$ (Alternative angles).....(i) (AB and CE are parallel and BD cuts these parallel lines)</p> <p>$\angle ABC = \angle ECD$ (Corresponding angles).....(ii)</p> <p>Adding (i) and (ii)</p> <p>$\angle BAC + \angle ABC = \angle ACE + \angle ECD$</p> <p>Adding $\angle ACB$ to both sides</p> <p>$\angle BAC + \angle ABC + \angle ACB =$</p> <p>$\angle ACE + \angle ECD + \angle ACB$</p> <p>$\angle A + \angle B + \angle C = \text{A straight angle}$</p> <p>$\angle A + \angle B + \angle C = 2\text{rt. angles}$</p> <p>Hence proved</p>

Generalisations :

Sum of the angles of a triangles is equal to two right angles.

Recapitulation and Application :

1. How many degrees have each of the angles of an equilateral triangle ?
2. Prove that the exterior angle of a triangle is equal to the sum of the two interior opposite angles ?
3. Find the third angle of a triangle whose two angles are 40° and 60° ?

Home-work :

The student will be asked to do the following work in their note-book :

1. Write down the proof of the theorem in your note books ?

- 2. Try to prove following on the basis of the theorem you have learnt : Sum of the interior angles of a quadrilateral is equal to 4rt. angles.
- 3. Prove the theorem by drawing a st. line through the vertex, parallel to the base.

Self Check Exercise

- 1. Explain value and Necessing of lesson planning.
.....
.....
- 2. Define unit planning
.....
.....

2.2.8 Summary

In this lesson we learnt about the lesson planning and pupaiahing of lesson plan. Regarding lesson plans, it should be noted that Herbartain steps need not the followed in teaching mathematics.

The type of the lesson plan should depend upon the nature of the topic to be taught and the method of teaching. It should be flexible not rigid.

2.2.9 Key Concept: Lesson Plan- It is a road map for the teacher of what students need to learn and how it will be done effectively in classroom.

2.2.10 Self check Exercise: Fill in the blanks

- 1.is the first requiste of good teaching.
- 2. Types of objection in lesson plan are.....and.....

Ans: 1. Lesson planning 2. General, specific.

2.2.11 SUGGESTED QUESTIONS

- 1. What are the advantages of preparing lesson plan ?
- 2. Which essential qualities are needed in a good lesson plan ?
- 3. Describe the different steps involved in lesson planning ? Give importance of each step.
- 4. What points should be kept in mind while observing and criticising a lesson in mathematics ?
- 5. Prepare a detailed lesson plan on an of the topics included in the current syllabus.

2.2.12 SUGGESTED BOOKS

- 1. Aggarwal, S.M. : Teaching of Modern Mathematics.
- 2. Bhatia and Bhatia : Principles and Methods of Teaching.
- 3. Mangal, S.K. : Teaching of Modern Mathematics.
- 4. Sharma, R.C. : Modern Science Teaching.
- 5. Sidhu, Kulbir : The Teaching of Mathematics.

Assessment and Evaluation for Mathematics Learning

Structure of the Lesson

- 2.3.1 Objectives
- 2.3.2 Introduction
- 2.3.3 Assessment and Evaluation in Mathematics
- 2.3.4 Diagnostic test
- 2.3.5 Identification of hard spots and remedial measures
 - 2.3.5.1 Identification of hard spots
 - 2.3.5.2 Remedial measures
- 2.3.6 Error Analysis
- 2.3.7 Formative assessment/evaluation
- 2.3.8 Summative Assessment/Evaluation
- 2.3.9 Tools and techniques for formative and summative assessment
- 2.3.10 Summary
- 2.3.11 Key Concept
- 2.3.12 Self Check Exercise
- 2.3.13 Suggested questions
- 2.3.14 Suggested readings

2.3.1 Objectives

After going through this lesson learners will be able to:-

- i) define assessment and evaluation in Mathematics
- ii) differentiate between error analysis and hard spots in Mathematics
- iii) recall the meaning of diagnostic test
- iv) elaborate the importance of diagnostic test and remedial technique in
- v) teaching of Mathematics
- vi) describe formative assessment
- vii) describe summative assessment
- viii) analyze tools and techniques for formative and summative assessment

2.3.2 Introduction

The whole system of teaching and learning in one or the other subjects of the school curriculum always works towards the realization of the stipulated teaching-

learning objectives by following a well thought programme. The same is equally true for the teaching of mathematics. Here also a mathematics teacher while adopting a definite curriculum and methodology of teaching strives hard for the achievement of the desired aims and objectives of teaching mathematics within the specific time period. In this way, meanwhile he naturally becomes eager to know about the results of his efforts, either for providing necessary magnitude and direction to the ongoing teaching-learning process, or for taking some educational and administrative decisions in the interest of his students. For doing so he however, needs some specific information related to the nature of the realization of the set teaching-learning objectives and individual achievements of his students in terms of the expected behavioural changes. In this task he is more often helped by the data derived through various modes like test, measurement, assessment and evaluation.

2.3.3 Assessment and Evaluation in Mathematics

Assessment and evaluation can have different meanings for different people in a variety of situations. While assessment and evaluation are often used interchangeably we shall adopt the following terminological definition of assessment and evaluation:

Assessment in mathematics education is to take into concern the judging of the mathematical capability, performance and achievement-all these notions to be taken in their broadest sense of students whether as kindergarten pupils till the level of Ph.D. students. Assessment thus addresses the outcome of mathematics teaching at the student level. Evaluation in mathematics education is taken to be judging of educational or instructional systems, in its entirety or in parts, as far as mathematics teaching is concerned. Evaluation may concern system components such as curricula, programs, teachers, teacher training and specific segments of the educational system such as schools or school districts. so, evaluation addresses mathematics education at the system level.

When tests and exams are considered to be ways of judging students performance they are special forms of assessment and are thus assumed under the assessment category. As a contradiction, when tests and exams are an educational system or when the outcomes of tests and exams are used as indicators of the quality of such a system as in the case with international performance, comparisons, exams and tests belong to the realm of evaluation. This duality shows features of the general relationships between assessment and evaluation. Assessment items-in particular assessment results, but also assessment modes-may be involved in the judging of system aspects, hence they would form a part of an evaluation activity.

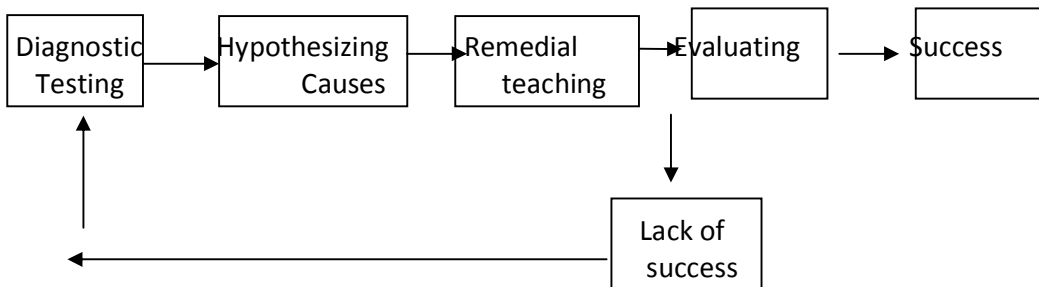
2.3.4 Diagnostic test

Diagnostic test in mathematics may be defined as a testing or evaluation programme carried out by a mathematics teacher for diagnosing the nature and extent

of the learning difficulties and behavioural problems of any particular student or group of students alongwith the inherent causes for chalking out suitable remedial programmes which aim in helping the educator and help student get rid off their difficulties and problems.

So, it can be easily said that diagnostic testing and remedial teaching are inter-related as well as complementary to each other. Each is based upon and results into the other. One resorts to diagnostic testing for searching the appropriate remedial instructions. However, the diagnosis not followed by the remedial treatment is useless. Similarly remedial task not based on the diagnosis of the nature and extent of the weaknesses may prove to be not only the wastage of the resources but can also prove to be dangerous to the well being of the affected persons. It is therefore, essential that diagnostic testing in mathematics should necessarily be followed by the suitable remedial teaching. Diagnostic testing and remedial teaching are complimentary to one another. They should form a part of a cycle known as Diagnostic testing and Remedial teaching cycle which may be considered to involve the following steps for its complete execution.

1. **Diagnostic testing** for finding the child's weaknesses and learning difficulties in mathematics.
2. **Hypothesizing the probable causes** for these weaknesses and difficulties.
3. **Applying remedial teaching** for removing these weaknesses and difficulties.
4. **Evaluating** the outcomes of the remedial teaching.
5. **Continuing** to repeat the above four processes to achieve desired success in removing the diagnosed difficulties and weaknesses.



2.3.5 Identification of hard spots and remedial measures

2.3.5.1 Identification of hard spots: It is a common question why mathematics skills are harder to acquire than literary skills. For one thing maths is more abstract subject to by its very nature will be more difficult to master. Other reason why particular children will have difficulty in learning maths include:

Low cognitive ability any abstract will be hard for whom with low cognitive ability

Specific learning difficulties such as dyscalculia, slow learner etc. Children with any of these conditions often find particular aspects of math hard.

Behaviour difficulties/absence of school through truancy or illness. Mathematical skills are progressive and cumulative. Furthermore, these skills are interrelated. Interruptions in schooling or whatever reasons will impact on subsequent progress.

By including these reasons discussed above, there are some more hard spots in mathematics given below:

1. Lack of memorised facts
2. An insecure concept of place value
3. Difficulty carrying out multi-step procedures
4. Difficulty solving word problems
5. Area of Circle
6. Surface area of Sphere
7. Volume of Cone and Prism
8. Profit and loss
9. Mensuration
10. Height and distances in trigonometry etc.

2.3.5.2 Remedial measures: Remedial measure helps the learners and teachers in getting rid of common or specific difficulties faced by them in the regular class room environment. Some of the remedial measure that can be used in the mathematics classroom are:

1. Category-wise remedial teaching (not more than 5 to 8 students in each class)
2. Personal and individual attention by teacher.
3. No humiliation
4. Special and carefully devised tasks for under achievers.
5. Read-Re-read-Write-Re-Write-Reproduce-Drill.
6. Group studies; group learning
7. Micro-notes
8. Extra classes
9. Use of different methods and techniques

2.3.6 Error Analysis: The term Error analysis as the name represents stands for the analysis of the error committed by the learner in a particular diagnostic test. It helps to diagnose the weakness and difficulties of learners. Teacher can help to remove them by making different strategies. The procedure for the task of error analysis and diagnosis of the weaknesses and learning difficulties may now be understood with the help of the following Tables given below:

Error Analysis of the Diagnostic test in Four Fundamental Rules

S. No.	The error committed	Diagnosed weakness (as a result of the error analysis)
1.	$\begin{array}{r} 54 \\ +23 \\ \hline 67 \end{array}$	The students lack the mastery of basic addition combination
2.	$\begin{array}{r} 69 \\ -37 \\ \hline 31 \end{array}$	The students lack the mastery of basic subtraction combinations.
3.	$\begin{array}{r} 34 \\ \times 2 \\ \hline 66 \end{array}$	The students lack the mastery of basic multiplication combination
4.	(i) $48 \div 6 = 7$ (ii) $\begin{array}{r} 8 \\ 9 \overline{)81} \\ \underline{-81} \\ 0 \end{array}$	The students lack the mastery of basic division combination.
5.	(i) $\begin{array}{r} 73 \\ +35 \\ \hline 98 \end{array}$ (ii) $\begin{array}{r} 42 \\ \times 3 \\ \hline 46 \end{array}$	The student is in the habit of rewriting numerals without computing.
6.	$\begin{array}{r} 562 \\ \times 13 \\ \hline 1686 \end{array}$	The student multiplies by only one digit out of the two present in the given number.

In this way, through careful study and analysis of the error committed by the students in responding to the various items of a diagnostic test one can reach to some or the other most convincing reasons (in terms of the learner's difficulty and weakness) for the errors committed.

Such type of error analysis and interpretation of the responses of the students in terms of their weaknesses and learning difficulties then may lead a mathematics teacher to devise some possible remedial measures with the sole objective of helping the students to get rid of their weaknesses and learning difficulties.

2.3.7 Formative assessment: This type of assessment is conducted well during the teaching-learning process. When a teacher has taught some content or some unit or provided some learning experiences, he has a need to determine the outcome. Similarly, students also need to know about their progress in the path of learning. The formative assessment helps in this task by providing useful information to both teacher and students about the strengths and weaknesses of their teaching and learning. In the light of this information, they may plan and engage for the mid course corrections in pace of content and methodology of instruction. The formative assessment may be carried out both in formal (like checklists, quizzes, question-answers, assignments and tests) as well as informal (like observations, listening to students comments and conversation) way.

2.3.8 Summative Assessment: Such type of assessment is carried out at the end of a piece of instruction lesson or unit. Actually it represents a final test or measure of the student's progress in learning during a particular course. Both formal as well as informal techniques may be used for conducting such assessment. The formal techniques may include tests-standardized as well as teacher made, questionnaires, interviews, rating scale, work assignments, projects etc. In the informal techniques, we may include observations, discussions, comments and feedback given by the students etc.

2.3.9 Tools and techniques for formative and summative assessment

There are various tools and techniques of assessment. Techniques of assessment represent those ways and means which help to measure and assess the teaching-learning outcomes i.e. to know the extent to which desired behavioural changes have taken place in the learner. The teacher in mathematics may make use of so many formal as well as informal techniques for the measurement and assessment of the teaching-learning outcomes like below:

- A. Oral tests and examinations.
- B. Practical tests and examinations.
- C. Written tests and examinations consisting of variety of questions like essay, objective and short answer type questions.
- D. Techniques and tools like observation, discussion, questionnaire inventory, interview, checklist, attitude scale, rating scale, case study, projective techniques, assignment, project work, creative and production work of the students etc.

Description of a few important assessment tools and techniques

1. **Viva-voce or oral tests:** Such tests are based on oral communication between the examiner and examinees. Here in general oral questions are put to the students for being responded by them in oral form.
2. **Practical tests:** In such tests students are required to demonstrate their learning performance by engaging themselves in experimental and work activities.
3. **Written tests:** Written tests are the most commonly and popularly used assessment techniques. Such tests require the use of writing material like paper

and pencil from the examiner and examinees. Students receive test question through written media known as question paper and are required to give their responses on the supplied answer sheet or the question paper itself in the written form. The questions framed in the written tests are usually of the following three types:

(i) Essay type (ii) Short answer type and (iii) Objective type

- (i) **Essay type questions** in a written test (whether teacher made or standardized) are characterized with their demand from the students to respond by providing quite lengthy, descriptive, detailed and elaborate answers.
- (ii) **Short answer type questions** set in a written paper represent those questions which need a short and pinpointed reply either limited to fixed number of words say 80 or 200 words or restricted in its scope by delimitation and specification like list, define, give three examples, provide a most suitable reason, etc.
- (iii) **Objective type questions** set in a written paper represent these type of questions which can be responded by just writing one or two words or numerals, filling up the blank or choosing one out of the multiple give responses etc.

4. Rating scales: The abilities, behavioural characteristics and performances of the students can also be judged and evaluated through suitable rating scales. These are in general, two types of rating scales, one qualitative scales and the other frequency scales. In qualitative scales, the quality or characteristic of the behaviour or performance is rated by using the terms 'Excellent and very poor' like below:

The trait or characteristic to be rated: Drawing skill/ drawing the figures of various geometrical shapes representing mathematics problems through figures.

5	4	3	2	<u>1</u>
Excellent	Good	Average	Poor	Very poor

In Frequency Scales, the frequency of a behaviour is to be rated by using the terms ranging from always to never, like below.

The skill or behaviour to be rated: Solves mathematical problems with proper steps and relevant diagrams.

5	4	3	2	<u>1</u> Always
Frequently	Sometimes	Rarely	Never	

5. Questionnaire is the most simple accurate and common assessment technique consists of sufficient number of questions related to the evaluation of a particular performance or behaviour. The question may take the form of a simple check list (multiple alternatives) or responded as yes or no (two alternatives) or yes, ?, or no (three alternatives). These may also be open ended providing greater scope and freedom for the student responses. As illustration, we may have the following types of items.

-The drawing work in Geometry makes me to feel (i) bored (ii) confident (iii) anxious

(iv) interested.

- I like to draw various geometrical Yes /?/No

- After asking for drawing geometrical figures by my teacher I feel.....

6. Interview: Interview is a more personal assessment technique consists of a face-to-face dialogue and interaction between the examiner and examinee. The student facing interview is required to answer or demonstrate his performance as asked by the interviewer or panel of interview board. Here little time or almost no time is given for responding to the enquiry questions asked by the interviewers. Interviewers may put a set of pre- developed questions or ask spontaneous questions depending upon the reactions and responses of the person being interviewed for evaluating their behavioural changes and performances related to a particular field.

7. Observation: Observation as an assessment technique consists of observing and taking note of the observed behaviour by the examiner or group of examiners. The manner and degree of the expected behaviour changes have occurred in the learning behaviour of the children, can be safely assessed by employing the observation technique.

Short in Text Questions

1. What do you mean by remedial measure

.....
.....

2. Define rating scale

.....
.....

2.3.10 Summary: This unit discusses assessment and evaluation, error analysis, diagnostic tests, identification of hard spots and remedial measures, tool and techniques for formative and summative assessments. Assessment is an ongoing process aimed at improving students learning. Evaluation is the process of making overall judgment about one’s work or a whole school’s work. Evaluation is the broader concept than assessment. Error analysis stands for the analysis of the error committed by the students in providing responses to the items. Diagnostic test help you measure strength and weakness of learners. Lack of memorised facts, an insecure concept of place value, difficulty carrying out muti-step procedures, difficulty solving world problems etc. are some specific hard spots generally find in Mathematics. These hard spots can be overcomes by remedial measures. Formative assessment is conducted during the teaching learning process. Summative assessment is final test to measure student progress in particular session. Viva-voce, practical tests, written tests, rating scales, questionnaires, interview,

observations etc. are some tools and techniques for formative and summative assessment.

2.3.11 Key Concept

Assessment: It is a measure of what students are learning.

Formative assessment: It is a short or time to time feedback of the student learning.

Summative Assessment: It is a long or at the end of program/course feedback of the student's learning.

2.3.12 Self Check Exercise: Fill in the blanks

- i. The formative assessment may be carried out both as.....and.....
- ii. Essay type questions are used for.....Assessment

Ans: i. Formal, informal ii. summative

2.3.13 Suggested questions

1. What do you understand by assessment and evaluation? Discuss in detail.
2. What is diagnostic test?
3. Differentiate between error analysis and hard spots in mathematics.
4. Discuss about tools and techniques of formative and summative assessment.

2.3.14 Suggested readings

1. Dowker, A. (2008). Mathematics difficulties: Psychology and intervention Elsevier
2. Sidhu, K. S. (2006). The teaching of mathematics. New Delhi: Sterling Publishers private ltd.
3. Singh, M. (2006). Modern teaching of mathematics. New Delhi: Anmol Publications Pvt. Ltd.
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7. Ediger Marlow (2004). Teaching Math Successfully, Discovery Publication.
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10. Goel, Amit. (2006). Learn and teach mathematics. Delhi: Authors Press

Preparation of diagnostic and achievement test and Mathematics club formation and organization of its activities- Wall magazine, Quiz, Preparation of charts and models in Mathematics

Structure of the lesson

2.4.1 Objectives

2.4.2 Introduction

2.4.3 Diagnostic Test

2.4.4 Characteristic of Diagnostic Test

2.4.5 Preparation of Diagnostic Test

(i) Planning

(ii) Writing items

(iii) Assembling the test

(iv) Providing Directions preparing the scoring key

(v) Reviewing the test

2.4.6 Administration of Diagnostic Test

2.4.7 Achievement test

2.4.8 Construction of an achievement test

2.4.8.1 Planning of the Test

2.4.8.2 Preparing the Achievement Test

2.4.8.3 Preparation of test items

2.4.8.4 Preparation of Directions Regarding the Achievement Test Items

2.4.8.5 Preparation of Direction for the Administration of the Achievement Test

2.4.9 Introduction Mathematic club

2.4.10 Importance of Mathematical club

2.4.11 Organization of Activities

2.4.11.1 Wall magazine

2.4.11.2 Quiz

2.4.11.3 Preparation of charts and models in Mathematics

2.4.12 Summary

2.4.13 Key Concept

2.4.14 Self Check Exercise

2.4.15 Suggested Questions

2.4.16 Suggested reading and web resources

2.4.1 Objectives

After going through this lesson learners will be able to:

- i. Define diagnostic test
- ii. Explain characteristic of diagnostic test
- iii. Differentiate between diagnostic test and achievement test
- iv. Develop a diagnostic test
- v. Develop an achievement test
- vi. Recall the term mathematics club
- vii. Know about the formation of mathematics club
- viii. Explain the importance of mathematics club
- ix. Explain wall magazine activity
- x. Explain about quiz activity
- xi. Prepare charts and models related to mathematics

2.4.2 Introduction

Diagnosis consists of identifying the nature of an illness or other problem through the examination of relevant symptoms. In mathematics, a diagnostic test helps identify a student's learning difficulties so teachers can provide instruction to remedy those problems and an achievement testing is to measure some aspect of the intellectual competence of students: what a student has learned to know or to do. Teachers use achievement tests to measure the attainments of their students.

2.4.3 Diagnostic Test

Definitions

A diagnostic test is a test used to diagnose or reveal an individual's weakness and strengths in a certain course of study. These are designed to analyze individual's performance and provide information on the causes of difficulty. Diagnostic tests would be helpful in identifying the use of faculty or incorrect procedures; the use of elementary processes where these could have been replaced by advanced processes; and evidence of lack of understanding and lack of precision.

Thorndike and Hagen (1970), suggested that "A diagnostic test should provide a detailed picture of the strengths and weakness of a pupil in a particular area". Diagnostic tests are designed to point out inadequacies in specific skills. The immediate aim is to locate areas in which additional instruction is required or in which teaching methods have to be improved. The purpose of diagnostic testing is to furnish continuous specific information in order that learning activities may be most productive of desirable outcomes. A diagnostic test is a series of achievement tests, each designed to measure behaviour. These tests provide independent measure of the respective skills, and this validity and reliability must be established separately for each scale. All diagnostic tests provide a series of scores, although the number of scales varies considerably among tests. Diagnostic tests can be indicates what a student's deficiencies are and why these deficiencies have occurred. A diagnostic test, however, is used to find a way to resolve the difficulty a

student is having. A diagnostic test might identify important specific skills the students has yet to achieve, but it will not indicate why these skills have not yet been achieved or what action, if any, will help the student to overcome these difficulties. From a measurement perspective diagnostic tests have significant limitation. Consequently their scores must be interpreted conservatively.

2.4.4 Characteristic of diagnostic test

Cook (1958) has stated the following characteristics of an effective diagnostic test

- (i) It should be an integral part of the curriculum, emphasizing and clarifying the important objectives.
- (ii) It's test items should require response to be made to situation approximating as close as possible to be functional.
- (iii) It must be based on experimental evidence of learning difficulties.
- (iv) It should reveal the mental processes of the learner sufficiently to detect point of error.
- (v) It should suggest or provide specific remedial procedures for each error detected.
- (vi) It should be designed to cover a long sequence of learning systematically.
- (vii) It should be designed to check forgetting by constant review of difficult elements as well as to detect faulty learning.
- (viii) It should reveal pupil's progress in objectives terms.

2.4.5 Preparation of Diagnostic Test

Diagnostic test can either be Standardized or teacher- made. Teacher-made tests, besides being more economical, are also more effective, as each teacher can frame it according to the specific needs of students.

The Stages of Preparation of a Diagnostic Test

- (i) Planning
- (ii) Writing items
- (iii) Assembling the test
- (iv) Providing Directions preparing the scoring key
- (v) Reviewing the test

The details regarding the stages of preparation of diagnostic test are given below

(i) Planning

The unit, on which a diagnostic test is based, requires a detailed exhaustive content analysis. It is broken into learning points without omitting any point.

The diagnostic procedure is based on the premise that mastery of the total process cannot be stronger than that of the weakest link in the claim of related concepts and skills. Accordingly each concept, skill of learning point come into play is identified at the time of constructing the test. As far as a diagnostic test is concerned, it is not very necessary to know the relative importance of the learning points. All the learning points have to be covered in an unbroken sequence. Each learning point should have an adequate number of questions to help in identifying the areas of weakness.

(ii) Writing items

All the forms of questions (short answer & objective type) can be used for testing different learning points. However, it appears for diagnostic purposes, objective type questions are used widely. Whatever be the form of questions, they should in general be easy, suitable for average students of that age or grade. The questions have to be specifically related to the learning points and should be such as to throw light on the weakness of the students. The questions should be written in simple language. The scope of the expected answer should be clear to the students. The questions are clubbed around the learning points, even when they are of the different forms; the learning points are arranged sequentially from simple to complex which ensures that students do not have to change their mental sets very frequently.

(iii) Assembling the test

Preparation of blue print may altogether be avoided. No rigid time limit need to be specified, though for administrative the test a time limit may be set.

(iv) Providing directions and preparing scoring key

A set of instructions clear and precise, was drafted along with a scoring key and marking scheme.

(v) Reviewing the test

Before printing the test, it should be carefully edited and reviewed. This ensures that any inadvertent errors are eliminated.

Example of diagnostic test:

Diagnostic Test

Name of the student.....

Roll Number

Class

School

Unit-1 (Rational Number)

- $(\frac{-8}{15} + \frac{-4}{3}) = ?$
 (i) $\frac{28}{15}$ (ii) $\frac{-28}{15}$ (iii) $\frac{-4}{5}$ (iv) $\frac{-4}{15}$
- What should be added to $\frac{7}{12}$ to get $\frac{-4}{15}$?
 (i) $\frac{17}{20}$ (ii) $\frac{-17}{20}$ (iii) $\frac{7}{20}$ (iv) $\frac{-7}{20}$
- What should be subtracted from $\frac{-b}{3}$ to get $\frac{b}{6}$?
 (i) $\frac{5}{2}$ (ii) $\frac{3}{2}$ (iii) $\frac{5}{4}$ (iv) $\frac{-5}{2}$
- $(\frac{-9}{16}) \times (\frac{8}{15}) = ?$
 (i) $\frac{-3}{10}$ (ii) $\frac{-4}{15}$ (iii) $\frac{-9}{25}$ (iv) $\frac{-2}{5}$
- $(\frac{-5}{9}) \div (\frac{2}{3}) = ?$
 (i) $\frac{-5}{2}$ (ii) $\frac{-5}{6}$ (iii) $\frac{-10}{27}$ (iv) $\frac{-6}{5}$
- Additive inverse of $\frac{-8}{9}$ is
 (i) $\frac{-9}{5}$ (ii) 0 (iii) $\frac{5}{9}$ (iv) $\frac{9}{5}$
- Reciprocal of $\frac{-3}{4}$ is
 (i) $\frac{4}{3}$ (ii) $\frac{3}{4}$ (iii) $\frac{-4}{3}$ (iv) 0

Unit-2 (Square and square root)

- What will be the unit digit of the square of the number 799?
 (i) 9 (ii) 1 (iii) 7 (iv) 2
- Which will be the following numbers is not a perfect square?
 (i) 7056 (ii) 3969 (iii) 5478 (iv) 4624
- Write a phitagorean triplet whose one number is 6
 (i) 6, 8, 8 (ii) 5, 6, 7 (iii) 4, 6, 8 (iv) None of these
- What is the square root of 196?
 (i) 11 (ii) 16 (iii) 14 (iv) 12
- The square root of 12.25 is
 (i) 3.5 (ii) 4.5 (iii) 2.5 (iv) none of these
- Area of a square plot in 2304 m². Find the side of the square plot.
 (i) 40m (ii) 48m (iii) 46m (iv) 42m
- $\sqrt{0.9} \times \sqrt{1.6} = ?$
 (i) 0.12 (ii) 1.2 (iii) 0.75 (iv) 12

2.4.6 Administration of Diagnostic Test

The following points need to keep in view while administering the diagnostic test:

- (i) The first task of the teacher is to win the confidence of the students and reassure them that test is to help them in the improvement of their learning rather than for declaring pass or fail.
- (ii) It should be administered in a relaxed environment.
- (iii) Students should be seated comfortably.
- (iv) Students should be asked not to consult each other while taking the test.
- (v) If any student is not able to follow something, he/she should be allowed to seek clarification from the teacher.
- (vi) The teacher may ensure that the students taking the test attempt all questions.
- (vii) Time schedule should not be enforced strictly. If any student takes a little more time, he should be allowed to do so.

All the aforesaid points/conditions were taken care of by the teacher while administering the diagnostic test.

2.4.7 Achievement test



Believing we can improve schooling with more tests is like believing you can make yourself grow taller by measuring your height.” **Robert Schaeffer**

Achievement is the accomplishment or proficiency of performance in a given skill or body of knowledge. Therefore, it can be said that achievement implies the overall mastery of a pupil on a particular context. Any measuring instrument that measures the attainments or accomplishments of a pupil's achievement must be valid and reliable. This way an achievement test is an examination to reveal the relative standing of an individual in the group with respect to achievement.

As achievement is the competence of a person in relation to a domain of knowledge An Achievement Test is a test of knowledge or proficiency based on something learned or taught. The purpose of an achievement test is to determine student's knowledge in a particular subject area.

2.4.8 Construction of an achievement test

The development of test items is an important stage in the construction of a test as the reliability, validity and objectivity of the test depends upon the test items.

i. Planning of the Test

This is a very important preliminary stage, when teacher needs to consider in detail what exactly he/she wishes to measure, what are its manifestations and which circumstantial factors could influence the results of the measurement. It is especially important to define clearly the purpose of the test because that increases the possibility for achieving high validity. The teacher is also supposed to make a decision about the test format, which would be most appropriate for the desired purposes. Achievement Test consisted of true false, fill in the blanks and multiple choice questions etc.

For the preparation of Achievement Test the following points are also of crucial importance

- ✓ Objectives of the Test
- ✓ Content of the Test
- ✓ Preparation of the Blue-print

a) Objectives of the Test

For the purpose of constructing Achievement Test, objectives were defined in behavioral terms from the selected units of Mathematics Since the major concern here was to test the academic achievement, it was accordingly, decided to test the three major areas of cognitive domain, i.e., Knowledge, Understanding and Application. After determining objectives, the learning outcomes were stated as observable terminal performance. In order to make sure that Achievement Test measures a desirable behavior, test specifications were developed covering the objectives and subject matter selected for the teaching during the experiment.

b) Content of the Test

At this stage, the teacher has to determine what content is to be tested.

c) Preparation of the Blue-print

Preparation of the blue print helped the teacher to have an objective based Achievement Test giving due weightage to objectives, content area and forms of questions. To decide the weightage to be given to different content areas, objectives and different forms of questions, experts' opinions of the other teachers were taken into consideration.

ii. Preparing the Achievement Test

(a) Preparation of test items

After preparation of blue print, the teacher started preparing test items for Achievement Test. The test items include true/false, fill in the blanks, multiple choice questions. To give an adequate coverage to the most likely situations involved in the test items, information based on Experts' opinion, discussion with teachers and Literature already available was obtained. This enabled the teacher to prepare items covering the entire unit. These items were examined by school teachers & experts whose comments about the content, structure and language of the items were taken into account and changes were made accordingly.

(b) Preparation of Directions Regarding the Achievement Test Items

The test was divided into three sections viz. True/False, Fill in the blanks and multiple choice questions. For the first section, the students were asked to write T for true or F for false. For the second section, the students were asked to respond /write in the blank. For the third section, the students were asked to tick(✓) the right answer from the given options.

(c) Preparation of Direction for the Administration of the Achievement Test

Scoring key was prepared for the achievement test. Clear and precise directions were prepared for administration of test.

Reliability of the test

A test is useful only when it is reliable and measures the trait or characteristic for which it has been constructed originally. According to Garrett (1981) "The reliability of a test or any measuring instrument depends upon the consistency with which it gauges the ability to which it is applied." There are different methods for measuring reliability of a test. The test retest method was found to be the most suitable method to calculate reliability. In this method, same test is administered to same subjects twice with some interval of time. Two sets of score are obtained for each individual. The coefficient of correlation usually the Pearson Product Moment Correlation is the reliability estimate.

Validity of the test

Validity means the extent to which a test measures what it purports to measure, meaning thereby, that a test should measure exactly only that for what it has been constructed keeping in view its sole objective or purpose. According to Garrett (1981) "The validity of a test or of any measuring instrument depends upon the fidelity with which it measures what it purports to measure." According to Freeman (1962) "Each test item should be a sampling of knowledge or performance, which the test purports to measure i.e the items, should constitute a representative sample of the variable to be tested".

Example of an achievement test

Name Roll Number
 Class School

Instructions for the students/Respondents

Do not start the test until you have been asked. Read the following instructions carefully:

1. All questions are compulsory.
2. In this test three types of questions are given. In Section 'A' questions of True/False type are given which have to be responded either in 'T' which stands for True, if the statement is true or in 'F' which stands for False, if the statement is false/wrong. The responses 'T' or 'F', whatever seems to be appropriate to you are to be indicated in bracket () given against each statement. In section 'B' fill in the blanks type questions are given. You are required to fill in the correct answer /response in these questions (in the blank space given for that purpose). In section 'C' Multiple Types of questions are given. You are required to mark \surd on the correct answer/option.
3. Each correct answer has 1 mark score. There is no negative marking.

SECTION-A

True/False

1. The diagonals of a parallelogram are equal. ()
2. The diagonals of a rectangle are perpendicular to each other. ()
3. The diagonals of a rhombus are equal. ()
4. Every rhombus is a kite. ()
5. Every square is a parallelogram. ()
6. Every square is a rhombus. ()

7. Every rectangle is a parallelogram. ()
8. Every parallelogram is a rectangle. ()
9. The base angles of an isosceles trapezium are equal. ()
10. The area of a rhombus whose diagonals are 8 cm and 12 cm is 120 cm^2 . ()
11. The larger cube occupies less space. ()
12. The space occupied by a solid body is called its surface. ()
13. Area of four walls of a room = Perimeter of floors \times height of a wall. ()
14. A cubical water tank is 4 cm long. Its capacity in liters is 6400 L. ()
15. A cuboid has six faces which are all rectangle. ()

SECTION-B**Fill in the blanks:**

16. A simple closed plane figure formed by line segments is called a -----
-----.
17. Each end point of a side is called a -----of the polygon.
18. -----polygon is a polygon with all its sides and all its angle equal.
19. The diagonals of a rhombus bisect each other at -----
angles.
20. A rhombus is a parallelogram with all side -----.
21. A solid has -----dimensions.
22. Bodies that have definite shape are called-----
23. The space occupied by a solid body is called its -----
24. The corners of a solid shape are called its
25. A cuboid is a solid having-----rectangular faces.
26. A cuboid has-----edges.
27. A cuboid has -----vertices.
28. A cuboid in which length, breadth and height are all equal is called-----

29. Lateral surface area of the cuboids is -----
30. The edge of a cube is $\sqrt{49}$ cm. Its surface area is-----

SECTION-C**Multiple Choice Questions:**

31. Volume has
(i) 4 dimensions (ii) 2 dimensions (iii) 3 dimensions (iv) None
32. The parallel side of a trapezium measure 14 cm and 18 cm and the distance between them is 9 cm. The area of the trapezium is
(i) 96 cm^2 (ii) 144 cm^2 (iii) 189 cm^2 (iv) 207 cm^2
33. What is the area of Trapezium with base 12 cm and height 6 cm, if the side parallel to the given base is 7 cm long.

- (i) 57 cm^2 (ii) 65 cm^2 (iii) 75 cm^2 (iv) 56 cm^2
34. What is the area of rhombus ?
 (i) $\frac{1}{2}$ (Product of diagonals) (ii) Product of diagonals
 (iii) $\frac{1}{2}$ (Product of sides) (iv) Product of sides
35. Area of rhombus whose diagonals are 18 cm and 6.4 cm is
 (i) 47.5 cm^2 (ii) 35.6 cm^2 (iii) 55.4 cm^2 (iv) 57.6 cm^2
36. Lateral Surface area of a cube whose edge is 8 cm. is
 (i) 726 cm^2 (ii) 400 cm^2 (iii) 837 cm^2 (iv) 576 cm^2
37. The total surface area of a cube is 54 cm^2 ,-----length of its side.
 (i) 5 cm (ii) 3 cm (iii) 4 cm (iv) 6 cm
38. Volume of cube with the given side 6 cm is
 (i) 36 cm^3 (ii) 216 cm^3 (iii) 72 cm^3 (iv) 1269 cm^3
39. The total surface area of a cube is 150 cm^2 its volume is
 (i) 216 cm^3 (ii) 125 cm^3 (iii) 64 cm^3 (iv) 80 cm^3
40. If each side of a cube is doubled then its volume becomes
 (i) doubled (ii) 4 times (iii) 6 times (iv) 8 times
41. The area of a trapezium is 180 cm^2 and its height is 9 cm. If one of the parallel sides is longer than the other by 6 cm , the length of the longer of the parallel sides is
 (i) 24cm (ii) 18cm (iii) 23 cm (iv) 17 cm
42. The height of a cylinder is 80 cm and the diameter of its base is 7 cm . The whole surface area of the cylinder is :
 (i) 3080 cm^2 (ii) 1942 cm^2 (iii) 1760 cm^2 (iv) 1837 cm^2
43. If each edge of a cuboid is doubled then its surface area increase.
 (i) 2 times (ii) 4 times (iii) 8 times (iv) None of these
44. If each edge of a cuboid is doubled then its volume increase.
 (i) 2 times (ii) 4 times (iii) 8 times (iv) None of these
45. The height of a cuboid whose volume is 275 cm^3 and base area is 25 cm^2 is
 (i) 8 cm (ii) 11 cm (iii) 12 cm (iv) 13 cm

2.4.9 Introduction Mathematics club

In this lesson we will discuss about mathematics club, its importance and various activities related to mathematics club like wall magazine, quiz and preparation of charts and model. Mathematics club is an integrated part of any school or any institute. Mathematics club is

an organization of students interested in promoting mathematics in the campus. It is an academic group supported by students and teachers to serve the needs and interest of all students in mathematics.

2.4.10 Importance of mathematics club

Mathematics club play a pivotal role in any school or institution. Some importance of mathematics club are as follows:

- (i) Mathematics club helps to develop positive attitude towards mathematics.
- (ii) It helps to develop and maintain interest of the students in mathematics.
- (iii) It promotes a holistic development of students through different activities like games, wall magazine, Quiz, puzzles etc.
- (iv) It helps in the proper utilisation of leisure- time.
- (v) It is helpful in developing values like moral, social and intellectual as it gives opportunities to students to work together.
- (vi) It helps to increase the habit of self study.
- (vii) It stimulates active participation of students.
- (viii) It provides the students an opportunity to free discussion and they are benefited from one another's view.

2.4.11 Organization of Mathematics club

If a mathematics club organized properly, then it will be a great help in stimulating the teaching of mathematics. Such a club should run by the students under the guidance and supervision of their teacher.

Formal organization of Mathematics club as follows:

1. Principal or Head of the institution
2. One of the senior maths teachers
3. Students office bearers
 - (I) President
 - (II) Vice President
 - (III) Secretary
 - (IV) Treasurer

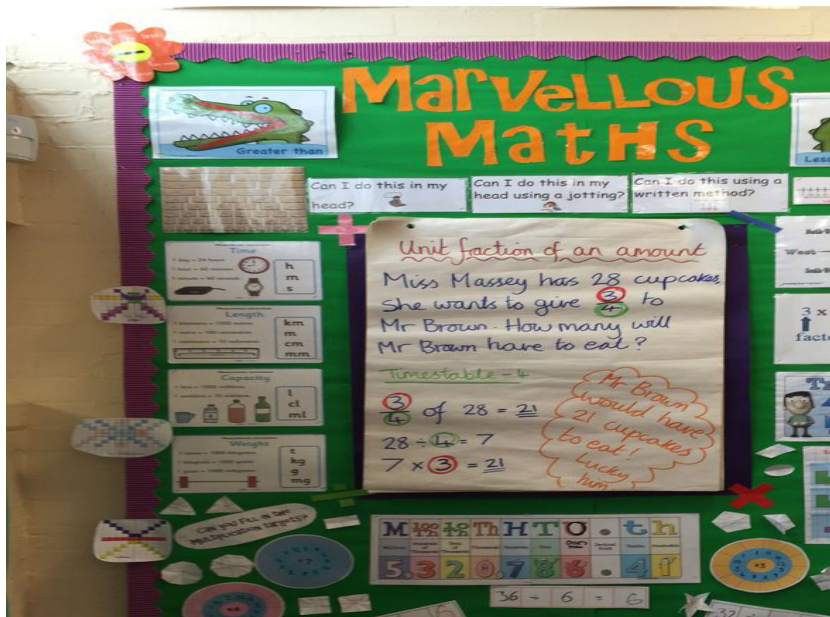
The advisor should properly acquaint all the students' office bearer with their function and responsibility.

2.4.11.1 Organization of Activities

Mathematics is considered as an exceptionally difficult subject by majority of the students. Therefore, it is one of the prime responsibilities of the mathematics club towards the organisation of some interesting and useful activities. Some of the activities like wall magazine quiz and preparation of charts and models in Mathematics may organise.

2.4.11.2 Wall magazine

A wall magazine is a periodical run on a notice board, especially in an educational institute where the students and other members of the institute can post their articles, poems, drawing and other such composition to share with each other. The main objective of mobilizing wall magazine is to initiate writing tendency in students and attract their attention on current incidents. It is a medium within the educational institutions for the students to express their creativity. It is an important means to enable the students to express their inner feelings. It also helps them in developing the positive and desirable qualities.



2.4.11.3 Quiz

A quiz is a game which can also be called a mind sport wherein the players or participant, either as individuals or in teams attempt to answer questions posed to them correctly, in order to win a prize.

Importance of mathematics quizzes

- a) Quizzes improve or expanding one's knowledge of things, either general or in specific area
- b) Quizzes are designed to promote, a fun way to study and in the process help improve one's general knowledge
- c) Quiz competitions enables students to think from different angles
- d) It promotes a healthy debate amongst participants in order to learn from each other
- e) Use it is used as a brief assessment or tool to measure the growth in the knowledge, abilities and / or skills of students either on a general level or restricted to specific fields for instance, science, maths etc
- f) Aiding in language development with the questions based in the language alone
- g) Helpful in the team building process
- h) Help to relieve the tension of the daily work routine
- i) Promoting group harmony, whether in organisations, schools or just a group of friends
- j) Making new friends, from different cultures at times
- k) Quiz competitions even help build the student's soft skills

For example:

Understanding Quadrilaterals

1. How many diagonals are there is a Hexagon?
(i) 6 (ii) 8 (iii) 9 (iv) 10
2. The measure of each exterior angle of a regular polygon is 40° . How many sides does it have?
(i) 8 (ii) 9 (iii) 6 (iv) 10
3. Each interior angle of a polygon is 135° . How many sides does it have?
(i) 8 (ii) 7 (iii) 6 (iv) 10
4. The two diagonals are not necessary equal in a
(i) Rectangle (ii) Square (iii) Rhombus (iv) Isosceles trapezium
5. The diagonals do not necessarily intersect at rt. Angle in a
(i) Parallelogram (ii) Rectangle (iii) Rhombus (iv) Kite
6. Two adjacent angles of a parallelogram are $(2x+25)^\circ$ and $(3x-5)^\circ$. The value of x is
(i) 28 (ii) 32 (iii) 36 (iv) 42
7. In a square ABCD, $AB = (2x+3)\text{cm}$. and $BC = (3x-5)\text{cm}$. then, the value of x is

- (i) 4 (ii) 5 (iii) 6 (iv) 8

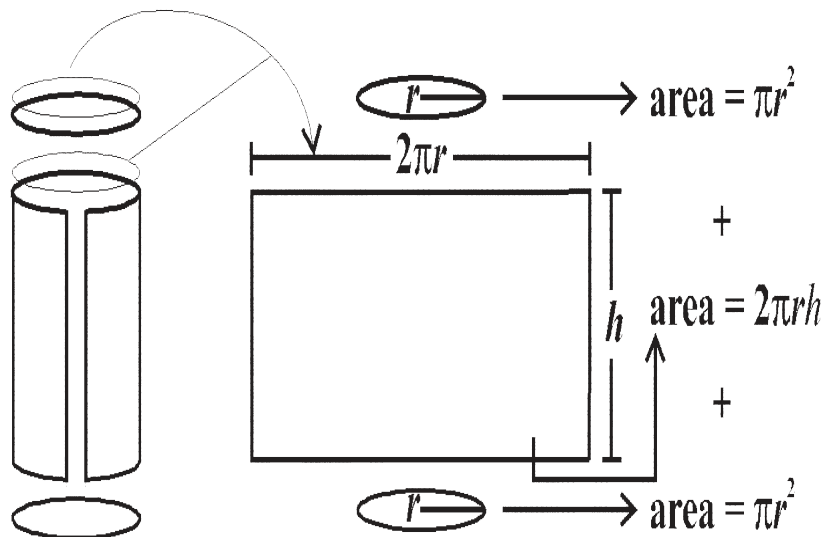
8. The length and breadth of a rectangle are in the ratio 4:3. If the diagonal measures 25cm. Then the perimeter of the rectangle is

- (i) 56cm. (ii) 60cm. (iii) 70cm. (iv) 80cm.

2.4.11.4 Preparation of charts and models in Mathematics

Models are the factual copies of real objects. Models can be successfully used to acquaint the students with the shape and forms of different numerals and geometrical figures. For this purpose even the square, round and rectangular pieces of cardboard or thick paper may serve as model. Models may also serve the best purpose in teaching various concepts and facts related to geometrical theorems and exercises.

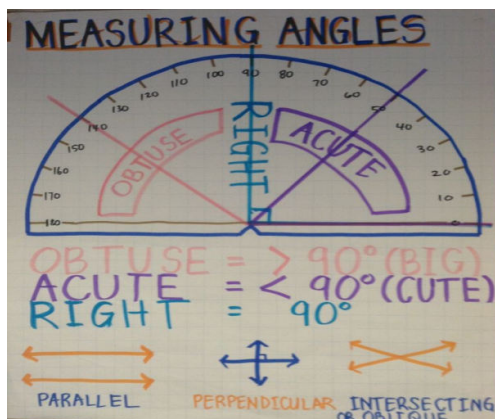
For example: Derivation of curved surface area/ total surface area of cylinder



Charts

In case where it is not possible to have an appropriate model or real objects, charts prove very useful aid in teaching Mathematics. For this purpose the following the following types of charts may be use:

For example



The following points should be kept in mind for the effective use of the pictures and charts:

- (i) Charts should focus on a single definite purpose.
- (ii) It should be neat and clean.
- (iii) It should be coloured and attractive.
- (iv) It should have a proper size.

Only relevant thing should be demonstrated through a chart.

Short in Text Questions

1. What do you mean by mathematic club?
.....
.....
2. Explain any one activities of mathematic club.
.....
.....

2.4.12 Summary

Diagnosis in education means a case study of the condition of learning to determine its nature and to find out the causation, with the main purpose of correcting and remedying the difficulty involved in active remembering. The major function of diagnosis is to facilitate the optimum development of every student. It is the determination of the nature of learning difficulties and deficiencies. In this lesson we discuss about diagnostic test and achievement test. By following the steps of construction of diagnostic and achievement test teachers can prepare these tests for the students in the classroom situation. Mathematics club play a pivotal role in our schools. If we really want some positive outcome we will have to search for some other platform to supplement and

enrich the classroom teaching. So establishment of mathematics club will prove help the students of mathematics.

2.4.13 Key Concept:

Diagnostic test: It is a test used to determine student's weakness, strength and knowledge

Achievement test: It is a test used to evaluate the level of memory of students.

Mathematics club: It develop student's level of math skill and knowledge with the help of activities and game.

2.4.14 Self Check Exercise: Fill in the blanks

- i. The first stage of preparch of diagnostic test is.....
- ii. Diagnostic test may be.....or
- iii. A.....is a periodical run on a notice board
- iv. A test is useful only when it is.....

Ans: i. Planning ii. Standardised, teaches made. iii. Wall magazine
iv. Reliable.

2.4.15 Suggested Questions

Q1. Explain in details the meaning and purpose of diagnostic testing in mathematics.

Q2. What are the characteristic of diagnostic tests?

Q3. What do you mean by diagnostic test? How do they differ from achievement test?

Q4. What are the steps of preparation of diagnostic test?

Q5. What is the difference between diagnostic test and achievement test?

Q6. Prepare a diagnostic test for the topic "linear equation".

Q7. Prepare an achievement test for class VII students.

Q8 Discuss the importance of mathematics club in the teaching of mathematics at the secondary school stage.

Q9. How will you organise a Mathematics Club in your school?

Q10. What type of recreational activities may be organised by a Mathematics Club?

Q11. Write short note on the following:

- (i) Mathematics Quiz
- (ii) Wall magazine
- (iii) Preparation of charts and models in Mathematics

2.4.16 Suggested reading and web resources

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Mandatory Student Feedback Form

<https://forms.gle/KS5CLhvpwrpgjwN98>

Note: Students, kindly click this google form link, and fill this feedback form once.