

# COMMON SYLLABUS – 2009 MATHEMATICS

## CLASSES I to X

### Introduction

Mathematics is a coherent, consistent, and growing body of science which makes use of a specific language and skills to model, analyze, and interpret the world. Mathematics provides a means of communication which is concise, and powerful.

As a human endeavour, mathematics involves creativity and imagination in the discovery of patterns of shape and number, the perceiving of relationships, the making of models, the interpretation of data, and the communication of emerging ideas and concepts.

This Curriculum Framework looks at mathematics as one of the essential areas of learning. Mathematical understanding and skills contribute to people's sense of self-worth and ability to control aspects of their lives. Everyone needs to develop mathematical concepts and skills to help them understand and play a responsible role in our democratic society. Mathematics education aims to provide students with those skills and understandings.

This Curriculum Framework also asserts the importance of eight essential sets of skills: communication skills; numeracy skills; information skills; problem-solving skills; self-study skills; social and co-operative skills; physical skills; work and study skills.

In an increasingly technological age, the need for innovation, and problem-solving and decision-making skills, has been stressed in many reports on the necessary outcomes for education in India. Mathematics education provides the opportunity for students to develop these skills, and encourages them to become innovative and flexible problem solvers.

The ability to communicate findings and explanations, and the ability to work satisfactorily in team projects, have also been highlighted as important outcomes for education. Mathematics education provides many opportunities for students to develop communication skills and to participate in collaborative problem-solving situations, thereby contributing to the development of many social and co-operative skills.

Increasingly, information is communicated through the use of data graphics. The communication of information through graphics is particularly common in the mass media. It is important that people can draw sensible conclusions from charts, tables, and graphs of various kinds. At the same time, increasing numbers of occupations demand the ability to collect data, to understand and use information technology for the organization and interpretation of data, and to present reports and summaries. Mathematics education gives young people the opportunity to develop information skills through learning and practicing data handling and data interpretation.

### General Aims of Mathematics Education

- To help students to develop a belief in the value of mathematics and its usefulness to them, to nurture confidence in their own mathematical ability, to foster a sense of personal achievement, and to encourage a continuing and creative interest in mathematics;
- To develop in students the skills, concepts, understandings, and attitudes which will enable them to cope confidently with the mathematics of everyday life;
- To help students to develop a variety of approaches to solving problems involving mathematics, and to develop the ability to think and reason logically;
- To help students to achieve the mathematical and statistical literacy needed in a society which is technologically oriented and information rich;
- To provide students mathematical tools, skills, understandings, and attitudes they will require in the world of work;
- To provide a foundation for those students who may continue studies in mathematics or other learning areas where mathematical concepts are central;
- To help to foster and develop mathematical talent.

### Achievement areas of the Mathematics Curriculum

- Mathematical Processes
- Numbers
- Measurements
- Geometry
- Algebra
- Statistics
- Development of essential skills through mathematics

### Mathematical Processes

The mathematics curriculum intended by this statement will provide opportunities for students to:

- develop flexibility and creativity in applying mathematical ideas and techniques to unfamiliar problems arising in everyday life, and develop the ability to reflect critically on the methods they have chosen;
- become effective participants in problem-solving teams, learning to express ideas, and to listen and respond to the ideas of others;
- develop the skills of presentation and critical appraisal of a mathematical argument or calculation, use mathematics to explore and conjecture, and learn from mistakes as well as successes;
- develop the characteristics of logical and systematic thinking, and apply these in mathematical and other contexts, including other subjects of the curriculum;
- become confident and competent users of information technology in mathematical contexts;
- develop the skills and confidence to use their own language, and the language of mathematics, to express mathematical ideas;
- develop the knowledge and skills to interpret written presentations of mathematics.

### Numbers

The mathematics curriculum intended by this statement will provide opportunities for students to:

- develop an understanding of numbers, ways they are represented, and the quantities for which they stand;

- develop accuracy, efficiency, and confidence in calculating-mentally, on paper, and with a calculator;
- develop the ability to estimate and to make approximations, and to be alert on the reasonableness of results and measurements.

### **Measurements**

The mathematics curriculum intended by this statement will provide opportunities for students to:

- develop knowledge and understanding of systems of measurement and their use and interpretation;
- develop confidence and competence in using instruments and measuring devices;
- predict and calculate the effects of changes in variables and rate of change of variables on systems representable by simple mathematical models.

### **Geometry**

The mathematics curriculum intended by this statement will provide opportunities for students to:

- gain a knowledge of geometrical objects and relations in two and three dimensions, and recognize and appreciate their occurrence in the environment;
- develop spatial awareness and the ability to recognize and make use of the geometrical properties and symmetries of objects in everyday use;
- develop the ability to use geometrical models as aids to solving practical problems in time and space.

### **Algebra**

The mathematics curriculum intended by this statement will provide opportunities for students to:

- recognize patterns and relationships in mathematics and the real world, and be able to generalize from these;
- develop the ability to think abstractly and to use symbols, notation, and graphs and diagrams to represent and communicate mathematical relationships, concepts, and generalizations;
- use algebraic expressions confidently to solve practical problems.

### **Statistics**

The mathematics curriculum intended by this statement will provide opportunities for students to:

- recognize appropriate statistical data for collection, and develop the skills of collecting, organizing, and analyzing data, and presenting reports and summaries;
- interpret data presented in charts, tables, and graphs of various kinds;
- develop the ability to estimate probabilities and to use probabilities for prediction.

## Approaches to teaching and learning in mathematics

- Problem-solving approach
- Catering for individual needs
- Use of resources

### Problem-solving approach

A balanced mathematical programme includes concept learning, developing and maintaining skills, and learning to tackle applications. These should be taught in such a way that students develop the ability to think mathematically.

Students learn mathematical thinking most effectively through applying concepts and skills in interesting and realistic contexts which are personally meaningful to them. Thus, mathematics is best taught by helping students to solve problems drawn from their own experience.

Real-life problems are not always closed, nor do they necessarily have only one solution. Determining the best approximation to a solution, and finding the optimum way of solving a problem when several approaches are possible, are skills frequently required in the workplace. Students need frequent opportunities to work with open-ended problems. The solutions to problems which are worth solving seldom involve only one item of mathematical understanding or only one skill. Rather than remembering a single correct method, problem solving requires students to search the information for clues and to make connections to the various pieces of mathematics and other knowledge and skills which they have learned. Such problems encourage thinking rather than mere recall.

Closed problems, which follow a well-known pattern of solution, develop only a limited range of skills. They encourage memorization of routine methods rather than consideration and experimentation. While fluency with basic techniques is very important, such routines only become useful tools when students can apply them to realistic problems.

The characteristics of good problem-solving techniques include both convergent and divergent approaches. These include the systematic collection of data or evidence, experimentation (trial and error followed by improvement), flexibility and creativity, and reflection – that is, thinking about the process that has been followed and evaluating it critically.

Teachers can create opportunities for students to develop these characteristics by encouraging them to practice and learn such simple strategies as guessing and checking, drawing a diagram, making lists, looking for patterns, classifying, substituting, re-arranging, putting observations into words, making predictions, and developing proofs.

Learning to communicate about and through mathematics is part of learning to become a mathematical problem solver and learning to think mathematically. Critical thinking may be developed by encouraging students to share ideas, to use their own words to explain their ideas, and to record their thinking in a variety of ways, for example, through words, symbols, diagrams, and models.

The chance to formulate problems as well as to solve them, to create and to produce rather than reproduce what already exists, is important for all students. Creativity in problem solving is recognized as one of the basic traits that must be developed if outstanding achievement is to result, and it plays a major role in innovation, invention, and scientific discovery.

### Catering for individual needs

It is a principle of this proposed Curriculum Framework that all students should be enabled to achieve personal standards of excellence and that all students have a right to the opportunity to achieve to the maximum of their potential. It is axiomatic in this curriculum statement that mathematics is for all students, regardless of ability, background, gender, or ethnicity.

Students of lower ability need to have the opportunity to experience a range of mathematics which is appropriate to their age level, interests, and capabilities. Equally, students with exceptional ability in mathematics must be extended and not simply expected to repeat different permutations of work they have clearly mastered.

As new experiences cause students to refine their existing knowledge and ideas, so they construct new knowledge. The extent to which teachers are able to facilitate this process significantly affects how well students learn. It is important that students are given explicit opportunities to relate their new learning to knowledge and skills which they have developed in the past. Factors such as out-of-school experience and language have profound effects on the way students learn mathematics.

In many cases in the past, students have failed to reach their potential because they have not seen the applicability of mathematics to their lives and because they were not encouraged to connect new mathematical concepts and skills to experiences, knowledge, and skills which they already had. This has been particularly true for many girls, and for many Tamil or other non-English medium students, for whom the contexts in which mathematics was presented were irrelevant and inappropriate. These students have developed deeply entrenched negative attitudes towards mathematics as a result.

An awareness of these issues has led to improved access for girls to mathematics, but the participation rate of female students in mathematics continues to be lower than that of male students at senior school level and beyond. This limits later opportunities for girls and women.

The suggested learning experiences in this document include strategies that utilize the strengths and interests that girls bring to mathematics. Techniques that help to involve girls actively in the subject include setting mathematics in relevant social contexts, assigning co-operative learning tasks, and providing opportunities for extended investigations.

The suggestions also describe experiences which will help girls develop greater confidence in their mathematical ability. Girls' early success in routine mathematical operations needs to be accompanied by experiences which will help them develop confidence in the skills that are essential in other areas of mathematics. Girls need to be encouraged to participate in mathematical activities involving, for example, estimation, construction, and problem solving where there are any number of methods and where there is no obvious "right answer".

It is particularly important that mathematical learning experiences for Tamil and first generation students acknowledge the background experiences which have led to the formation of ideas and skills which those students already have. Tamil, non-English medium students, and first generation learners will be helped to achieve if teachers acknowledge and value those ideas and experiences.

Traditional time-constrained pencil and paper tests have proved unreliable indicators of achievement in the past. Among the sample assessment activities, there are procedures suggested which may be more appropriate for assessing a large spectrum of students. In selecting assessment procedures,

teachers should endeavour to ensure that all of the desired objectives are evaluated and that the procedures which are selected are culturally appropriate.

The development of more positive attitudes towards mathematics and a greater appreciation of its usefulness is the key to improving participation rates for all students.

### **Use of Resources**

Teachers are the prime resource. Much of what is recommended in these guidelines is existing widespread practice and will be familiar to them. They may, however, have staff development needs arising from:

- textbooks or resource-based learning packages;
- reference books for students and teachers;
- measuring equipment, structured apparatus, for example, to explore and illustrate concepts in number and shape;
- instruments and other equipment for drawing shapes and making models;
- games and puzzles;
- constructional toys and play equipment.;
- the use of attainment outcomes and targets in planning and assessment;
- the increased emphasis on problem-solving and enquiry;
- calculators wherever possible in number work and as a teaching aid;
- computers wherever possible in information handling and in shape, position and movement as a tool and as a teaching aid;
- the use of a variety of contexts.

Other people who can be a resource, for example as a source of data for information handling, include the students, their relations and friends, adults in the school, visitors. The school premises and local environment can be a resource - buying lunch, considering routes to school, looking for symmetrical shapes, measuring, counting.....

### **A variety of material resources will be required**

Many everyday materials such as newspapers, magazines, advertising literature, brochures, packaging, maps, plans and timetables can be used to good effect and increase relevance, as can discarded household items.

Many schools already possess and use a wide range of resources, but others will require additions with consequent expenditure. The scope for using those resources which are freely available should not, however, be overlooked, and students can help by bringing useful items to school.

### **Apparatus**

The importance of the use of apparatus to help students form mathematical concepts is well established. Using apparatus provides a foundation of practical experience on which students can build abstract ideas. It encourages them to be inventive, helps to develop their confidence, and encourages independence.

Primary school teachers are used to, from the experience of Activity Based Learning Cards and Self Learning Mathematics Kits, choosing an appropriate range of apparatus to focus students' thinking on the concept to be developed and modifying the apparatus as the learner's understanding grows. Teachers

know that students are capable of solving quite difficult problems when they are free to use concrete apparatus to help them think the problems through. Such an approach is equally valid with older students and should be used wherever possible.

At all levels, students should be introduced to new ideas by having their attention drawn to examples occurring in their natural environment, and then by modeling them with apparatus. For example, a child's concept of "four" could be enriched by discussing the number of wheels on a car, legs on a table, or edges on a piece of paper. The child could then be encouraged to explore the idea further, using materials with which to make their own models of "four". Similarly, secondary students could be focused on the concept of "rate of change" by discussing, for example, that younger people grow faster than older people, or by discussing the slope changes on nearby hills. Students could then model uniform and non-uniform rate situations, using apparatus such as sand running through an egg-timer or a ball rolling down a smooth slope.

### **Textbooks**

Many textbooks in the library will be useful for the students to practice and get enrichment. Increasing numbers of popular books contain excellent ideas for problem-solving situations which develop mathematical skills and understandings. In any event, teachers should continually re-evaluate the texts they are using in the light of the particular needs of their students.

### **Technology**

This curriculum statement assumes that both calculators and computers may be available and used in teaching and learning of mathematics at appropriate levels. Instruction in the correct and appropriate use of calculators is particularly important.

Calculators, graphing calculators, and computers are learning tools which students can use to discover and reinforce new ideas. Calculators are powerful tools for helping students to discover numerical facts and patterns, and helping them to make generalizations about, for example, repeated operations. Graphing calculators, and computer software such as graphing packages and spreadsheets, are tools which enable students to concentrate on mathematical ideas rather than on routine mechanical manipulation, which often intrudes on the real point of particular learning situations.

### **Assessment and Evaluation in Mathematics**

The ways in which primary and secondary schools assess their students' progress in mathematics should be consistent with the priorities they set for the learning outcomes of students monitoring and evaluation are necessary to assess students' readiness for new learning, to give teachers feedback on the success of their methods and approaches, and to assist planning for new learning.

Evaluation includes diagnostic assessment procedures which enable teachers to discover difficulties that individual students may be having. Appropriate diagnostic assessment may reveal that the reason for a particular student's lack of progress is a lack of understanding achieved at some earlier time, and the difficulty may be relatively easily addressed. Diagnosis may also reveal that the student is very talented and is simply bored by lack of stimulation. Diagnostic assessments enable teachers to plan further learning activities specifically designed to meet the learning needs of individual students. Worthwhile diagnosis is very often carried out by simple question and answer interaction in the classroom.

Assessment should focus both on what students know and can do, and on how they think about mathematics. It should involve a broad range of mathematical tasks and problems and require the

application of a number of mathematical ideas. Skills assessed should include the ability to communicate findings, to present an argument, and to exploit an intuitive approach to a problem.

Assessment should, as far as possible, be an integral part of normal teaching and learning programme. Continuing assessment as part of the teaching and learning programme increases the range and quality of assessment which can be carried out for good diagnosis, and avoids the artificial intrusion on learning and teaching time which is associated with separate assessment sessions. Assessment should involve multiple techniques including written, oral, and demonstration formats. Group and team activities should also be assessed.

Teachers should avoid carrying out only tests which focus on a narrow range of skills such as the correct application of standard algorithms. While such skills are important, a consequence of a narrow assessment regime which isolates discrete skills or knowledge is that students tend to learn in that way. Mathematics becomes for them a set of separate skills and concepts with little obvious connection to other aspects of learning or to their world.

Assessment should also be undertaken to provide students and their parents with an indication of a student's progress. Assessment in mathematics, as in other aspects of the curriculum, involves obtaining evidence about the extent and quality of students' attainments. Its prime purpose is to improve students' learning. It does this by providing students, parents and teachers with feedback which can be used in reviewing programmes of study and planning further learning. In summarizing the results of evaluations of students' achievement, teachers should report what students have been working on, what they have achieved, and how well they have achieved it. A grade, level, or mark alone is insufficient.

### **Format and presentation of this document**

- Themes
- Achievement objectives by levels
- Suggested learning experiences
- Sample assessment activities
- Development band activities

### **Themes**

There are some main achievement aims of the mathematics curriculum. Accordingly, the curriculum statement is presented in six "themes" each of which reflects a particular aim of the curriculum. The themes are headed:

- **Mathematical Processes**
- **Numbers**
- **Measurements**
- **Geometry**
- **Algebra**
- **Statistics**

This division is a convenient way of categorizing the outcomes for mathematics education in schools. It emphasizes that there are a number of aspects which are all equally important. The division does not mean that mathematics is expected to be learned in discrete "packages". On the contrary, the

mathematical processes strand is deliberately intended to encourage teachers and students to make connections between the other themes wherever possible.

### **Achievement objectives by levels**

A number of achievement objectives are described in each theme, and at each level. The objectives define what students should be able to achieve after appropriate learning experiences in mathematics. They define the progression of learning outcomes which is the core of this curriculum statement in mathematics.

At each level the objectives are quite broad. The division of the school mathematics curriculum into different levels does not mean that there are well-identified stages, which learners pass through in the development of mathematical understanding. However, it is accepted that some concepts are better introduced to older students, and that the effective learning of some ideas depends on a prior understanding of other ideas. The judgment of experienced teachers as to what students can do at various ages has been combined with recent research into mathematical learning to place material into levels.

This scheme explicitly recognizes that each learner is an individual whose learning development and rate of progress is different from others. Different students will be ready for particular mathematical content and experiences at different times. It is not expected that all students of the same age will be achieving at the same level at the same time, nor that an individual student will necessarily be achieving at the same level in all strands of the mathematics curriculum.

The levels are not meant to be interpreted as the rungs of a ladder which is to be climbed as quickly as possible. Nor are they meant to be interpreted as hurdles over which each student must pass before moving to any new work. Rather, they are meant to focus the mathematics programmes of schools in a consistent way. They provide a basis for reporting students' achievements to parents in a way that is clear and demonstrates progression in learning.

### **Suggested learning experiences**

In each strand, and at each level, a range of suggested learning experiences is suggested. The activities and experiences which are included are drawn from the best of contemporary teaching practice, and are intended to help students meet the aims and achievement objectives of the mathematics curriculum.

There is not necessarily an exact match between the suggested learning experiences and the achievement objectives at each level. In some cases, this is because the learning experiences described contribute to concepts and skills which will take considerable time to develop, and appropriate achievement objectives are not described until later levels. At the same time, all of the suggested learning experiences contribute to the development of the broader aims of the curriculum and thus, for some, there may not be specifically associated achievement objectives.

The suggested learning experiences are, nevertheless, pointers only. It is not intended that the activities described in this document should limit the way teachers choose to teach mathematics. Indeed, teachers are encouraged to use their own judgment in designing courses to provide their students with mathematical experiences which will enable the students to achieve the broader aims and achievement objectives of the curriculum. Teachers in, for example, bilingual schools may choose to offer mathematics in contexts which provide quite different activities and experiences.

The suggested learning experiences are carefully worded in active terms. This is to emphasize that mathematics is most effectively learned through students' active participation in mathematical situations, rather than through passive acceptance and repetition of knowledge.

### **Sample Assessment Activities**

Traditionally, assessment in mathematics has been focused on a quite narrow range of procedures. Procedures such as pencil and paper tests of algorithmic skills do not always reveal students' difficulties, nor do they allow assessment of the full range of students' achievements.

This curriculum statement provides, at each level in each strand, examples of activities in which teachers might engage students to assess their current level of achievement. An assessment programme modeled on these examples will help teachers to plan the next stages of learning for their students.

The models illustrate tasks that can be used to assess a full range of accomplishments, including, for example, the ability to collect and summarize data, the ability to communicate findings, the ability to present an argument, and the ability to exploit an intuitive approach to a problem. The suggestions include multiple assessment techniques including written, oral, and demonstration formats, which should be used in addition to more traditional tests and assignments. Suggestions for group and team assessments are included.

The activities illustrate assessment techniques which are not disruptive to normal classroom activities they could be carried out as an integral part of the teaching programme rather than at times specifically set aside for "tests". Assessment and evaluation strategies of this kind require teachers to make systematic observations of students at work, and to record their observations carefully.

As each achievement objective in this statement is capable of being achieved at a range of standards, teachers should choose assessment and reporting methods which reveal a student's degree of attainment of the objectives.

The few assessment activities suggested in the statement are exemplars which teachers could imitate in developing their own assessment programme. They provide for teachers a selection of activities which allow for observations of various manifestations of students' achievement. While it is suggested that teachers will use the tasks described as models for developing their own assessment tasks and procedures, they are free to use different assessment methods if they wish, and are encouraged to do so.

The examples do not cover all of the objectives of the curriculum. A comprehensive assessment programme remains the responsibility of the teacher.\*

### **Sample Group Activities**

Some students develop faster in all aspects of mathematics than most of their peer group. Other students reach a particular achievement level in one strand or topic sooner or faster than most of their peer group without necessarily being equally competent in all other strands at the same level. A levels structure may be thought to imply that faster students should automatically be accelerated to the next level. This is not necessarily so, nor is it the aim of this curriculum. Teachers should carefully appraise the experience and needs of students before deciding to move them to the next level.

It is very important, however, that students do not have their mathematical development inhibited by, for example, repeating work which they have clearly mastered.

The mathematics contained in the suggested learning experiences at any level is only a subset of the mathematics which students could possibly learn. Faster students can be extended in their mathematical experience without necessarily accelerating them to a higher level, which for many students may itself limit the extent of their learning.

The intention of the group activities is to encourage teachers to offer broader, richer, and more challenging mathematical experiences to faster students. Work from the group activity should allow better students to investigate whole new topics which would not otherwise be studied and to work at a higher conceptual level. Talented students should have their interest in mathematical ideas further stimulated and their understanding of the nature of mathematics deepened.

The development band must not be considered as an optional extra or simply a reward for good work. Students have a right to the opportunity to extend their mathematical knowledge and power. Accordingly, teachers have a responsibility to provide enrichment opportunities to students, and a responsibility to report to parents in a way that acknowledges the students' accomplishments.

A valid group activity is a significant new piece of work, not merely an extra "extension example" or set of examples.

Group activities should include a measure of self-assessment. Students should be encouraged to set their own goals in this work and to be self-critical. They should keep a portfolio of their development activities, including the goals they had set, their assessments, and their teachers' assessments, as a record of their extended progress.

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## Classes - I to V

## Class – I

Topic	Content	Expected Learning Outcomes	Mode of Transaction	Duration of periods
I. Shapes and Figures	<ul style="list-style-type: none"> <li>• Introduction to spatial orientation</li> <li>• Introduction to shapes in real objects and its attributes</li> <li>• Introduction to elementary shapes</li> <li>• Sorting object groups into shapes</li> </ul>	<ul style="list-style-type: none"> <li>• To build a sense of spatial orientation.</li> <li>• To understand spatial relationship.</li> <li>• Understand the meaning of and use appropriate spatial vocabulary</li> <li>• Ex. Top, Bottom, On, Under, Inside, Outside, Above, Below, Near, Far, Before, After</li> <li>• To correlate concrete things to their shapes</li> <li>• To Learn vocabulary related to nature of shapes</li> <li>• Ex. Shapes, flat, round, corner, edge, surface, plain, long &amp; short.</li> <li>• To know elementary names of shapes like square, circle, oval, rectangle, triangle</li> <li>• To observe and describe objects from the surroundings having different sizes and shapes like pebbles, boxes, balls, pipes, bottle caps, pencil, eraser.</li> <li>• To collect objects from the surrounding sort and classify on the basis of shapes, and other observable properties.</li> </ul>	<ul style="list-style-type: none"> <li>• Observing things</li> <li>• Sorting objects</li> <li>• Telling stories</li> <li>• Simulation exercises</li> <li>• Drawing activities</li> <li>• Tracing activities</li> <li>• Colouring</li> <li>• Sensory activities</li> </ul>	40 periods

Topic	Content	Expected Learning Outcomes	Mode of Transaction	Duration of periods
<b>II. Numbers</b>	<ul style="list-style-type: none"> <li>• Numbers from 1 to 9</li> <li>• Concept of “Zero”</li> <li>• Numbers from 10 to 20</li> <li>• Addition (of single digit numbers whose sum is less than 20)</li> <li>• Subtraction of numbers without conversion</li> <li>• Numbers from 20 to 99</li> <li>• Place value as “Tens” and “Ones”</li> </ul>	<ul style="list-style-type: none"> <li>• To count the number of objects in a collection.</li> <li>• In two similar collection of objects</li> <li>• To match object through one to one correspondence</li> <li>• To recognize and speaks numbers from 1 to 9.</li> <li>• To make the group of objects according to a given number.</li> <li>• To use numbers from 1 to 9 in counting and comparison.</li> <li>• To understand the concept of “nothing” give the symbol zero to represent it.</li> <li>• To read and write numerals from 1 to 9.</li> <li>• To learn addition using real objects up to a sum of 18</li> <li>• To use the symbol ‘+’ to represent addition.</li> <li>• To learn vocabularies like total, together, altogether etc., to denote addition.</li> <li>• To understand subtraction as “taking away” using real objects.</li> <li>• To understand subtracting as canceling using pictures.</li> <li>• To use vocabularies like difference, take away, less etc., to denote subtraction.</li> <li>• To approach zero through the subtraction pattern (such as <math>5 - 1 = 4</math>, <math>5 - 2 = 3</math>, <math>5 - 5 = 0</math>).</li> <li>• To approach zero through real life situation (such as there are 5 chocolates all of them were eaten up, how many remaining?).</li> </ul>	<ul style="list-style-type: none"> <li>• Singing songs</li> <li>• Counting, grouping, taking away</li> <li>• Comparing</li> <li>• writing</li> <li>• Drawing</li> <li>• Playing games</li> <li>• Relating to life situation</li> <li>• Visualizing</li> </ul>	115 periods

Topic	Content	Expected Learning Outcomes	Mode of Transaction	Duration of periods
		<ul style="list-style-type: none"> <li>• To learn sense of numbers up to 20.</li> <li>• To read and write numbers from 10 to 20.</li> <li>• To make the group of objects according to a given number.</li> <li>• To group objects into a group of 'tens' and 'ones'</li> <li>• To learn intuitively build a notion of place value.</li> <li>• To count the number of tens and ones in a given number.</li> <li>• To represent numbers tens and ones through pictures.</li> <li>• To learn numbers by rote from 21 to 99.</li> <li>• To read and writes numerals for Twenty-one to Ninety nine.</li> <li>• To read numbers represented as groups of tens and ones 21 to 99.</li> <li>• To identify the predecessor and successor up to 99.</li> <li>• To identify numbers" in between" Ex: 24, __ , 26.</li> <li>• To skip count by twos forward to backward up to Ninety-nine.</li> <li>• To skip count by threes forward to backward up to Ninety-nine.</li> <li>• To add two single digit numbers up to sum of 10 mentally.</li> </ul>		

Topic	Content	Expected Learning Outcomes	Mode of Transaction	Duration of periods
<b>III. Measurements</b>	<ul style="list-style-type: none"> <li>• Introduction to Length, Mass, Volume</li> <li>• Comparison of Objects Using Length, Mass, Volume through Non Standard Units</li> <li>• Time</li> <li>• Earlier Later, Shorter, Longer</li> <li>• Money</li> </ul>	<ul style="list-style-type: none"> <li>• To build notion of length, mass, and volume.</li> <li>• To build intuitive notion of comparisons of lengths/masses/sizes of different objects.</li> <li>• To describe lengths using terms like near, far, thin, thick, longer/taller, shorter, high, and low. : similarly terms like lighter and heavier</li> <li>• To measure lengths of object that use in non- standard units.</li> <li>• To establish an intuitive need for standardization.</li> <li>• To distinguish between events occurring in time using terms -earlier and later.</li> <li>• To get the qualitative feel for long &amp; short duration, of school days v/s holidays.</li> <li>• To narrate the sequence of events in a day.</li> <li>• To Able to identify common currency notes and coins. (up to rupees 20)</li> </ul>	<ul style="list-style-type: none"> <li>• Observing</li> <li>• Comparing</li> <li>• Visualizing</li> <li>• Conversation activity</li> <li>• Guessing activity</li> <li>• Play way activity</li> <li>• Sequencing activity</li> </ul>	60periods
<b>IV. Patterns</b>	<ul style="list-style-type: none"> <li>• Patterns in Shapes</li> <li>• Patterns in Numbers</li> </ul>	<ul style="list-style-type: none"> <li>• To identify the patterns in shapes</li> <li>• To make pattern through shapes.</li> <li>• To identify the patterns in numbers. (using elementary examples)</li> </ul>	<ul style="list-style-type: none"> <li>• Observing</li> <li>• Drawing</li> <li>• Following the number sequence</li> <li>• Colouring</li> </ul>	17periods
<b>V. Study of Data</b>	<ul style="list-style-type: none"> <li>• Handling – Simple Data (shapes and numbers)</li> </ul>	<ul style="list-style-type: none"> <li>• To collect, represent and interpret simple data such as Mode of transport to School, Favorite TV program, Numbers of brothers and sisters etc.,</li> </ul>	<ul style="list-style-type: none"> <li>• Observing</li> <li>• Counting</li> <li>• Tabulating</li> <li>• Surveying</li> </ul>	20periods

<b>Topic</b>	<b>Content</b>	<b>Expected Learning Outcomes</b>	<b>Mode of Transaction</b>	<b>Duration of periods</b>
	<ul style="list-style-type: none"><li>Organizing simple data (shape and numbers)</li></ul>			

## Class - II

Topic	Content	Expected Learning Outcomes	Mode of Transaction	Duration of periods
<b>I. Shapes and Figures</b>	Identifying the Dimension of shapes in everyday object <ul style="list-style-type: none"> <li>• Introduction to spatial orientation</li> <li>• Introduction to shapes of objects in real life and its attributes</li> <li>• Introduction to elementary shapes</li> <li>• Sorting object groups into shapes.</li> </ul>	<b>2-D and 3-D Shapes</b> <ul style="list-style-type: none"> <li>• To identify 2-D shapes viz., rectangle, square, triangle, circle by their names.</li> <li>• To describe intuitively the properties of these 2-D shapes.</li> <li>• To describe qualitatively the properties of these 2-D shapes.</li> <li>• To observe objects in the environment and gets an intuitive feel for their geometrical attributes.</li> <li>• To sort similar shapes of different sizes.</li> <li>• To draw straight line shapes by paper folding and other such simple aids.</li> <li>• To make patterns and shapes with straight and curved lines.</li> <li>• To learn names such as cuboid, cylinder, cone, sphere and recognize objects.</li> <li>• To draw the 2-D outlines of 3-D objects.</li> <li>• To describe intuitively the properties of these 2-D shapes.</li> <li>• To recognize objects by observing their outlines.</li> </ul>	<ul style="list-style-type: none"> <li>• Day – to day life situation examples.</li> <li>• Review exercises.</li> <li>• Practical examples.</li> <li>• Practical examples.</li> </ul>	<b>38 periods</b>

Topic	Content	Expected Learning Outcomes	Mode of Transaction	Duration of periods
<b>II. Numbers</b>	<ul style="list-style-type: none"> <li>• Writing numbers up to 99</li> <li>• Place value and comparing the numbers</li> <li>• Addition &amp; Subtractions up to 99</li> <li>• Multiplication</li> </ul>	<ul style="list-style-type: none"> <li>• To read and write numerals for numbers up to ninety-nine.</li> <li>• To count and regroup objects into tens and ones.</li> <li>• To understand place values.</li> <li>• To apply the concept of place value to compare numbers.</li> <li>• To arrange numbers up to hundred in ascending and descending order.</li> <li>• To introduce odd and even numbers.</li> <li>• To skip count numbers backwards and forwards in twos, threes and fives.</li> <li>• To be able to form the greatest and the smallest two digit numbers with and without repetition of given digits.</li> <li>• To learn ordinal and cardinal numbers.</li> <li>• To learn addition and subtraction</li> <li>• To add and subtract two digit numbers beginning from concrete representations to abstract</li> <li>• To add and subtract numbers by drawing representations of tens and ones without and with regrouping.</li> <li>• To add zero to a number and subtract zero from a number.</li> <li>• To understand properties of addition through patterns.</li> <li>• To be able to write stories to describe situations that correspond to the given addition and subtraction facts.</li> </ul>	<ul style="list-style-type: none"> <li>• Using self learning kit.</li> <li>• Review exercise.</li> <li>• Using self learning kit and real life situations.</li> <li>• Using repeated additive property with life oriented situations.</li> </ul>	114 periods

Topic	Content	Expected Learning Outcomes	Mode of Transaction	Duration of periods
		<ul style="list-style-type: none"> <li>• To estimate and check the reasonableness of answers to addition and subtraction problems.</li> </ul> <p><b>Multiplication</b></p> <ul style="list-style-type: none"> <li>• To learn the concept of multiplication as repeated addition.</li> <li>• To learn examples involving repeated addition.</li> <li>• To learn activities of making equal groups in concrete and abstract contexts.</li> </ul> <p><b>Mental Arithmetic</b></p> <ul style="list-style-type: none"> <li>• To add and subtract single digit numbers mentally.</li> <li>• To add and subtract multiples of ten mentally.</li> </ul>		
<b>III. Measurements</b>	<ul style="list-style-type: none"> <li>• Weight , Volume (capacity)</li> <li>• Length (using Standard units)</li> <li>• Time (days, months, years)</li> <li>• Money( up to Rs.100)</li> </ul>	<p><b>Measures</b></p> <ul style="list-style-type: none"> <li>• To measure lengths of objects in the environment using non-standard units (like hand span); short distances in their environment using foot, rope, etc.</li> <li>• To get an intuitive feel for weights of objects by feeling them.</li> <li>• To sort objects from lightest to heaviest by feeling.</li> <li>• To understand the need for standard units and a simple balance.</li> <li>• To compare weights of given objects using simple balance.</li> <li>• To compare and sequences containers in terms of capacity by</li> </ul>	<ul style="list-style-type: none"> <li>• Real life situations.</li> <li>• Real life situations.</li> <li>• Application of practical knowledge.</li> <li>• Story problems in real life situations.</li> </ul>	<b>50 periods</b>

Topic	Content	Expected Learning Outcomes	Mode of Transaction	Duration of periods
		<p>pouring things like water, sand, etc.</p> <ul style="list-style-type: none"> <li>• To do elementary activities in measurements using their water bottles, tumblers, bowls, etc. and compare volumes.</li> <li>• To get familiar with the days of the week and months of the year.</li> <li>• To get an idea of different annual calendars based on culture.</li> <li>• To get a feel for sequence of seasons that are context specific.</li> <li>• To sequence the events of their school day, school week, school year.</li> <li>• To identify currency - notes and coins up to Rs. 100.</li> <li>• To put together amounts of money up to Rs. 50 in only whole number of rupees.</li> <li>• To add and subtract small amounts of money mentally, with no paise involved.</li> <li>• To transact an amount using 3-4 notes.</li> </ul>		
<b>IV. Patterns</b>	<ul style="list-style-type: none"> <li>• Patterns in shapes</li> <li>• Patterns in numbers</li> <li>• Block patterns</li> </ul>	<ul style="list-style-type: none"> <li>• To observe, draw, and extend patterns in sequence of shapes and numbers.</li> <li>• To explore patterns in different ways of splitting a number.</li> <li>• To create block patterns by using motifs from common objects and to create patterns of regular shapes.</li> </ul>	<ul style="list-style-type: none"> <li>• Review activities.</li> <li>• Review exercise.</li> <li>• Project.</li> </ul>	25 periods

<b>Topic</b>	<b>Content</b>	<b>Expected Learning Outcomes</b>	<b>Mode of Transaction</b>	<b>Duration of periods</b>
<b>V. Study of Data</b>	<ul style="list-style-type: none"><li>• Simple data (Shapes and numbers)</li><li>• Organizing simple data (Shapes and numbers)</li></ul>	<ul style="list-style-type: none"><li>• To collect simple data (like foot wear sizes) through survey and measurement.</li><li>• To represent the data using appropriate pictorial form</li><li>• To interpret pictures and draw inferences from the data at the appropriate level.</li></ul>	<ul style="list-style-type: none"><li>• Classroom activities.</li><li>• Life oriented situations.</li></ul>	25 periods

## Class - III

Topic	Content	Expected Learning Outcomes	Mode of Transaction	Duration of periods
<b>I. Shapes and Figures</b>	<ul style="list-style-type: none"> <li>• Creating 2 – D shapes</li> <li>• Tangram</li> <li>• Introduction to map</li> <li>• Drawing 3 – D objects</li> </ul>	<ul style="list-style-type: none"> <li>• To make shapes involving straight and curved lines through paper folding, paper cutting, stencils, etc.</li> <li>• To identify and groups together similar 2-D shapes.</li> <li>• To learn terms like sides, corners and diagonals.</li> <li>• To describe various 2-D shapes using their attributes.</li> <li>• To make shapes on the dot-grid using straight lines and curves.</li> <li>• To solve tangram puzzles and to create shapes using other such pieces.</li> <li>• To fill a given region using patterns of a tile of a given shape.</li> <li>• To distinguish between shapes that can be tessellated and that cannot be.</li> <li>• To get an understanding of a map; able to read and draw simple maps of their classroom, school, Chennai, etc (not necessarily scaled) just to understand spatial relationships.</li> <li>• To be able to draw 3-D objects.</li> </ul>	<ul style="list-style-type: none"> <li>• Through paper folding.</li> <li>• Through Activity &amp; puzzles.</li> <li>• Through simple maps of village.</li> <li>• Project.</li> </ul>	14 periods
<b>II. Numbers</b>	<ul style="list-style-type: none"> <li>• Numbers sequence up to 1000</li> <li>• Addition and Subtraction with in 1000</li> <li>• Multiplication tables (2,3,4,5</li> </ul>	<ul style="list-style-type: none"> <li>• To read and write 3-digit numbers.</li> <li>• To understand place values up to a thousand.</li> <li>• To be able to identify examples that require order of magnitude of tens, hundreds and thousands.</li> <li>• To identify odd and even with respect to ones place upto three digit</li> </ul>	<ul style="list-style-type: none"> <li>• Use beads, spike abacus, pictures, &amp; real objects.</li> <li>• Teach numbers. through activity.</li> <li>• Through exercise.</li> <li>• Project.</li> <li>• Using 'I'- learning</li> </ul>	136 periods

Topic	Content	Expected Learning Outcomes	Mode of Transaction	Duration of periods
	<p>and 10)</p> <ul style="list-style-type: none"> <li>• Multiplication of 2-digit number by a single digit number</li> <li>• Introduction to division by grouping and sharing</li> </ul>	<p>numbers.</p> <ul style="list-style-type: none"> <li>• To be able to skip counts in different ways starting from any number.</li> <li>• To be able to sort an array of arbitrary numbers not necessarily in sequence into ascending and descending order .</li> <li>• To be able to forms greatest and smallest numbers using given digits.</li> </ul> <p><b>Addition and Subtraction</b></p> <ul style="list-style-type: none"> <li>• Able to add and subtract (3 digit) numbers by writing them vertically in the following two cases: (Sum should not exceed 1000) <ul style="list-style-type: none"> <li>- Without regrouping.</li> <li>- With regrouping.</li> </ul> </li> <li>• Able to use the place value in standard algorithm of addition and subtraction.</li> <li>• Able to solve addition and subtraction problems in different situations presented through pictures and stories.</li> <li>• To write stories for addition and subtraction facts.</li> <li>• To estimate the sum and difference of two given two digit numbers less than 50.</li> </ul> <p><b>Multiplication</b></p> <ul style="list-style-type: none"> <li>• To understand the concept of multiplication as repeated addition by working many patterns.</li> <li>• Able to understand and use the sign</li> </ul>	<p>mathematical kit teach Addition, subtraction, multiplication and division through activity.</p> <ul style="list-style-type: none"> <li>• Using real objects to construct the multiplication tables 2, 3,4, 5 &amp; 10.</li> <li>• Learning Division through activity using real objects</li> <li>• Through Exercise.</li> <li>• Through project.</li> </ul>	

Topic	Content	Expected Learning Outcomes	Mode of Transaction	Duration of periods
		<p>of multiplication.</p> <ul style="list-style-type: none"> <li>• Able to construct the multiplication tables of 2, 3, 4, 5 and 10</li> <li>• To use multiplication table in situations.</li> <li>• To understand graded sequence of multiplication beginning from multiplication of: single digit by single digit, two digit numbers by single digit using standard algorithm.</li> </ul> <p><b>Division</b></p> <ul style="list-style-type: none"> <li>• To understand the concept of division from the context of equal grouping and sharing.</li> <li>• To understand division as repeated subtraction</li> <li>• Able to relate division with inverse of multiplication.</li> <li>• Able to solve simple division problems involving multiplication and division <ul style="list-style-type: none"> <li>- by grouping</li> <li>- by using multiplication tables.</li> </ul> </li> </ul> <p><b>Mental Arithmetic</b></p> <ul style="list-style-type: none"> <li>• Able to add and subtract single digit numbers and two digit numbers up to a sum of 50 mentally.</li> <li>• Able to double two digit numbers mentally (result not exceeding two digits).</li> </ul>		

Topic	Content	Expected Learning Outcomes	Mode of Transaction	Duration of periods
III. Measurements	<ul style="list-style-type: none"> <li>• Length (using standard units - cm., m.,)</li> <li>• Weight (using non-standard)</li> <li>• Volume (capacity) - (using non-standard)</li> <li>• Time (calendar, hours, min, AM, PM)</li> <li>• Money (addition, subtraction)</li> </ul>	<p><b>Length</b></p> <ul style="list-style-type: none"> <li>• Able to appreciate the need for a standard unit.</li> <li>• To measure length of objects in their environment using simple aids.</li> <li>• To express appropriate standard units of length by choosing between centimeters and meters.</li> <li>• To understand order of magnitude between cm. , m., and km. as units.</li> <li>• To estimate the length of given object in standard units and verifies by measuring.</li> <li>• To use a ruler.</li> <li>• Able to understand numerical relationship between centimeter and meter.</li> </ul> <p><b>Weight</b></p> <ul style="list-style-type: none"> <li>• Able to weigh objects using non-standard Units.</li> <li>• To understand the concept of conservation of weight that applies in a simple balance.</li> </ul> <p><b>Volume</b></p> <ul style="list-style-type: none"> <li>• Able to measure and compare the capacity of different containers in terms of non-standard units.</li> </ul> <p><b>Time</b></p> <ul style="list-style-type: none"> <li>• To read the time from a digital and analogue clock correct to the hour.</li> <li>• To read a calendar to find a particular day and date.</li> </ul>	<ul style="list-style-type: none"> <li>• Through activity based learning using non – standard and standard units measure) the length, weight and volume of real objects.</li> <li>• Using the original clock to read the time through exercise.</li> <li>• Using pictures of Indian Money.</li> </ul>	28 periods

Topic	Content	Expected Learning Outcomes	Mode of Transaction	Duration of periods
		<ul style="list-style-type: none"> <li>• To sequence simple events in their lives chronologically.</li> </ul> <p><b>Money</b></p> <ul style="list-style-type: none"> <li>• To understand the relationship between rupee and paise</li> <li>• To add and subtract amounts involving rupees and paise amounts of multiples of 10 without carry over.</li> <li>• To make rate charts and bills.</li> </ul>		
<b>IV. Fractional Numbers</b>	<ul style="list-style-type: none"> <li>• Introduction of fraction</li> </ul>	<ul style="list-style-type: none"> <li>• To identify half, one fourth and three fourths of a whole.</li> <li>• To identify the symbols <math>\frac{1}{2}</math>, <math>\frac{1}{4}</math>, <math>\frac{3}{4}</math>.</li> <li>• Able to explain the meanings of <math>\frac{1}{2}</math>, <math>\frac{1}{4}</math> and <math>\frac{3}{4}</math> through illustrations or grouping objects.</li> <li>• Able to understand equivalence of <math>\frac{2}{4}</math> and <math>\frac{1}{2}</math> and of <math>\frac{2}{2}</math>, <math>\frac{3}{3}</math>, <math>\frac{4}{4}</math> and 1.</li> </ul>	<ul style="list-style-type: none"> <li>• Through paper folding.</li> <li>• Through activity by using pictures and real objects.</li> <li>• Through Exercise.</li> </ul>	<b>14 periods</b>
<b>V. Patterns</b>	<ul style="list-style-type: none"> <li>• Pattern in geometrical shapes</li> <li>• Pattern in numbers</li> </ul>	<ul style="list-style-type: none"> <li>• To recognize simple symmetries in shapes and patterns.</li> <li>• To create patterns and designs from straight lines and other geometrical shapes.</li> <li>• Able to identify patterns in the numerals for odd and even numbers and in adding odd and even numbers.</li> <li>• Able to identify patterns in multiplication with, and dividing by 10s.</li> </ul>	<ul style="list-style-type: none"> <li>• Through observation of real objects.</li> <li>• Through Activity using geometrical shapes and figures.</li> <li>• Project.</li> </ul>	<b>28 periods</b>

<b>Topic</b>	<b>Content</b>	<b>Expected Learning Outcomes</b>	<b>Mode of Transaction</b>	<b>Duration of periods</b>
<b>VI. Study of Data</b>	<ul style="list-style-type: none"><li>• Tally marks for simple data</li><li>• Pictographs for simple data</li></ul>	<ul style="list-style-type: none"><li>• To undertake simple surveys and gathers data</li><li>• To record data using tally marks.</li><li>• To collect data and represent it in terms of pictograph choosing appropriate scale and unit for display through pictographs.</li><li>• To interpret and draw inferences from the data.</li></ul>	<ul style="list-style-type: none"><li>• Through Activity, Through Exercise and project work.</li></ul>	32 periods

## Class - IV

Topic	Content	Expected Learning Outcomes	Mode of Transaction	Duration of periods
<b>I. Shapes and Figures</b>	<ul style="list-style-type: none"> <li>• Circle</li> <li>• Introduction to perimeter and Area</li> <li>• Reflection and Symmetry</li> </ul>	<ul style="list-style-type: none"> <li>• To learn names of shapes like triangle, square, rectangle, pentagon, circle etc.,</li> <li>• To recognize these shapes in the objects around them.</li> <li>• Able to draw circles using objects like bangles , tin caps etc.,</li> <li>• Able to draw a circle free hand and with compass.</li> <li>• To learn terms like centre, radius and diameter of a circle.</li> <li>• Uses Tangram to create different shapes.</li> <li>• Able to fill space using tiles of geometrical shapes chooses a tile among a given number of tiles that can tile a given region both intuitively and experimentally.</li> <li>• To learn the concept of perimeter and area.</li> <li>• Able to explore intuitively the area and perimeter of simple shapes using graph paper and measuring.</li> <li>• To learn the concept of reflection and symmetry in simple shapes.</li> <li>• Able to explore qualitatively reflections through mirror, inkblots, paper folding etc.,</li> <li>• To visualize and draw 3-D objects.</li> </ul>	<ul style="list-style-type: none"> <li>• Observing the pictures.</li> <li>• Colouring the shapes.</li> <li>• Using match sticks to form shapes.</li> <li>• Joining the dots.</li> <li>• Drawing circle using string and compass.</li> <li>• Paper folding activity to find centre and radius.</li> <li>• Group activity to arrange tangram.</li> <li>• Paper folding activity to learn about symmetry.</li> <li>• Drawing the pictures.</li> <li>• Visualizing the picture cards.</li> <li>• Picture cards and square papers to find area and perimeter.</li> <li>• Solving puzzles on area.</li> </ul>	39 Periods

<b>II. Numbers</b>	<ul style="list-style-type: none"> <li>• Number Sequence up to 10000</li> <li>• Comparing numbers</li> <li>• Addition and subtraction within 10,000</li> <li>• Multiplication (up to 2 digit number by 2 digit number and 3 digit number by single digit number)</li> <li>• Division: up to 4 digit number by single digit number.</li> </ul>	<ul style="list-style-type: none"> <li>• To read and write 4 – digit numbers (including odd and even numbers)</li> <li>• To write numbers with respect to place value expansion.</li> <li>• Able to sequence an arbitrary array of numbers in ascending and descending order.</li> <li>• Able to form greatest and smallest numbers using given digits</li> <li>• Adds and subtracts up to four digit numbers by writing them vertically in the following two cases: without grouping, with grouping(sum should not exceed 10,000).</li> <li>• Able to do elementary multiplication of 2-digit by 2-digit and 3- digit by single digit numbers.</li> <li>• Able to write tables up to <math>10 \times 10</math>.</li> <li>• To divide a given number by another number in various ways.</li> <li>• To apply the four operations to life situations.</li> <li>• To frame word problems.</li> <li>• To estimate sums, differences and products of simple two digit numbers to nearest tens or hundreds.</li> </ul> <p><b>Mental Arithmetic</b></p> <ul style="list-style-type: none"> <li>• Able to add and subtract multiple of 10 and 100, mentally.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowing place value using abacus.</li> <li>• Comparison of numbers by group activity.</li> <li>• Solving Riddle.</li> <li>• Brainstorming for introduction of addition.</li> <li>• Word problems are solved by using life situation pictures</li> <li>• Using number cards to find addition and subtraction</li> <li>• Framing problems for the given pictures.</li> <li>• Framing tables using pictures.</li> <li>• Day – to - day life situation examples learning through multiplication division.</li> </ul>	72 Periods
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<b>III. Measurements</b>	<ul style="list-style-type: none"> <li>• Length (m., cm., addition, subtraction, conversion and estimation of distance)</li> <li>• Weight (Using standard units Kg., gm., addition subtraction)</li> <li>• Volume (Using standard units Lt., mlt., addition subtraction)</li> <li>• Time (calendar, clock)</li> <li>• Money – conversion of rupees to paise, addition, subtraction and multiplication.</li> </ul>	<ul style="list-style-type: none"> <li>• To understand relationship between metre and centimetre;</li> <li>• Able to Convert metre into centimetres and vice versa.</li> <li>• To solve problems involving length and distances.</li> <li>• Able to estimate length of an objects in their surrounding up to 1 meter and distance between two given locations in their environment up to 100 meters.</li> <li>• To learn to weigh objects using a balance and standard units.</li> <li>• Able to estimate the weight of an object and verifies using a balance.</li> <li>• Able to measure volumes of given liquid using containers marked with standard units.</li> <li>• Able to estimate the volume of a liquid contained in a vessel and verifies by measuring.</li> <li>• Able to compute the number of weeks in a year.</li> <li>• Able to correlate the number of days in a year with the number of days in each month.</li> <li>• To read clock time to the nearest hours and minutes.</li> <li>• Able to express time, using the terms, ‘a.m.’ and ‘p.m.’</li> <li>• Able to estimate the duration of familiar events.</li> <li>• Able to compute the number of days between two given dates.</li> <li>• Able to convert rupees to paise.</li> <li>• To add and subtract simple</li> </ul>	<ul style="list-style-type: none"> <li>• Introduction of measurements by conversation technique.</li> <li>• Using real objects to find measurements.</li> <li>• Activities involving hands on experiences.</li> <li>• Lab activity to enhance the measurements.</li> <li>• Using brainstorming strategy purchase of materials for particular amount given.</li> <li>• Using picture cards.</li> <li>• Activities are involving scientific facts.</li> <li>• To identify the measure for consumerable product – the project is given.</li> <li>• Estimating capacity through Lab activity.</li> <li>• Lab activity is given as individual activity o regulate daily habits.</li> <li>• picture cards are used to identify a.m.and p.m.</li> <li>• By reading calendar learning the relation between days and weeks, days and year</li> <li>• play way method is used to write the denominations for the given amount.</li> <li>• For addition and subtraction problems are solved.</li> </ul>	80 Periods
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		<p>amounts of money in denominations of rupees and paise which are multiples of ten using column addition and subtraction with regrouping.</p> <ul style="list-style-type: none"> <li>• To learn to use operations to find totals, change, multiple costs and unit cost.</li> <li>• Able to estimate roughly the totals</li> </ul>		
<b>IV. Fractional Numbers</b>	<ul style="list-style-type: none"> <li>• Compare fractions</li> <li>• Equivalent fraction</li> <li>• Addition and subtraction of like fraction.</li> </ul>	<ul style="list-style-type: none"> <li>• Able to find the fractional part of a whole</li> <li>• Able to find the fractional part of a collection.</li> <li>• To compare fractions and identifies greater and smaller</li> <li>• Able to identify equivalent fractions</li> <li>• Able to do addition and subtraction of like fractions with same denominators up to 9</li> </ul>	<ul style="list-style-type: none"> <li>• Using picture cards to learn the concept of fraction.</li> <li>• Colouring activity to learn fractions.</li> <li>• Lab activity is framed for equivalent fractions.</li> <li>• Addition and Subtraction of fractions are explaining through life situations.</li> </ul>	24 Periods
<b>V. Patterns</b>	<ul style="list-style-type: none"> <li>• Pattern in numbers (multiplication and division)</li> <li>• Pattern in geometry (symmetry)</li> </ul>	<ul style="list-style-type: none"> <li>• Able to identify patterns in multiplication and division:</li> <li>• Able to identify patterns in multiples of 9.</li> <li>• To cast out nines from a given number to check if it is a multiple of nine.</li> <li>• Able to identify patterns in multiplication and division by 10s, 100s.</li> <li>• Able to identify symmetry in geometrical patterns.</li> </ul>	<ul style="list-style-type: none"> <li>• Observation of picture cards.</li> <li>• Completion of patterns.</li> <li>• Using puzzles.</li> <li>• Fun with numbers.</li> <li>• Special activities are framed for the number '9'.</li> <li>• Play way method for number patterns.</li> <li>• Brainstorming strategy for number patterns.</li> </ul>	22 Periods

<b>VI. Study of Data</b>	<ul style="list-style-type: none"><li>• Pictograph</li></ul>	<ul style="list-style-type: none"><li>• To learn to do survey and collect simple data.</li><li>• To represent data in the form of pictures like pictograms, etc.,</li><li>• To read and interpret pictures and draws Inferences.</li></ul>	<ul style="list-style-type: none"><li>• Data collection through project method.</li><li>• Representation of data through pictograph and circle chart.</li><li>• Survey method is used to learn data.</li></ul>	15 Periods
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## Class - V

Topic	Content	Expected Learning Outcomes	Mode of Transaction	Duration of periods
<b>I. Shapes and Figures</b>	<ul style="list-style-type: none"> <li>• Drawing 3-D shapes from 2-D</li> </ul> Shapes <ul style="list-style-type: none"> <li>• Types of angle</li> </ul>	<ul style="list-style-type: none"> <li>• To get the perspective while observing drawings of 3-D objects in 2-D.</li> <li>• Able to explore intuitively rotations and reflections of familiar 2-D shapes.</li> <li>• Able to explore intuitively symmetry in familiar 3-D shapes.</li> <li>• Able to make the shapes of cubes, cylinders and cones using nets especially designed for this purpose.</li> <li>• To get the feel of an angle through observation of objects in their environment and paper folding.               <ul style="list-style-type: none"> <li>• To learn the names of angles like acute, obtuse and right angle.</li> <li>• Able to identify right angles in the environment.</li> <li>• Able to classify angles into right, acute and obtuse angles.</li> <li>• To represent right angle, acute angle and obtuse angle by drawing through tracing.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Simple way of drawing 3D from 2D(cube &amp; cuboids ).</li> <li>• Drawing perspective view of 3D from 2D (cuboids).</li> <li>• Forming different types of nets through thick sheets of paper specially designed for the purpose.</li> <li>• Paper folding activity rotation, lines of symmetry.</li> <li>• Drawing line of symmetry.</li> <li>• Rotation of 2D shapes for understanding rotation.</li> <li>• Drawing 2D shapes through reflection.</li> <li>• Tracing the path activity .</li> <li>• Making angle tester and test it to measure angles.</li> <li>• Group activity for making difference shapes using clocks alphabets posture and life situation.</li> </ul>	45 Periods
<b>II. Numbers</b>	<ul style="list-style-type: none"> <li>• Numbers up to 10,00,000</li> <li>• Place value and comparing</li> </ul>	<ul style="list-style-type: none"> <li>• To know numbers up to 1,00,00,000</li> <li>• To determine place value in numbers up to 1,00,00,000.</li> </ul>	<ul style="list-style-type: none"> <li>• Completing number sequence through patterns up to 1crore.</li> <li>• Using abacus to understand place value up to 1 crore .</li> </ul>	63 Periods

	<p>numbers</p> <ul style="list-style-type: none"> <li>• Four operations</li> <li>• Factors and multiples.</li> <li>• Mental Arithmetic</li> </ul>	<ul style="list-style-type: none"> <li>• Able to sequence an arbitrary array of numbers up to five digits in ascending and descending orders.</li> <li>• To form greatest and smallest numbers using five digits.</li> <li>• To understand the role of place value in addition, subtraction and multiplication algorithms.</li> <li>• To learn to use standard division algorithm.</li> <li>• To understand the meaning of factors and multiples.</li> <li>• Able to estimate sums, differences, products and quotients up to two digits numbers and verifies using approximation.</li> </ul>	<ul style="list-style-type: none"> <li>• Comparison of numbers by observing the numbers of digits and using place value activity.</li> <li>• Importance of place value in addition, subtraction multiplication and division.</li> <li>• Using self learning materials for division.</li> <li>• Activity for using estimation in day to day life.</li> </ul>	
<b>III. Measurements</b>	<ul style="list-style-type: none"> <li>• Conversion of units (mm., cm, m., km., mg., g., kg., ml., lt.,)</li> <li>• Four fundamental operation on length, weight and capacity</li> <li>• Time (addition, subtraction) Money: four fundamental operations.</li> </ul>	<ul style="list-style-type: none"> <li>• Able to solve word problems involving length, weight and volume.</li> <li>• Able to relate commonly used larger and smaller units of length, weight and capacity and converts one to the other.</li> <li>• To understand the volume of a solid body: qualitatively and also by informal measurement.</li> <li>• To learn to use addition and subtraction in finding time intervals in simple cases.</li> <li>• To apply four operations in solving problems involving money.</li> </ul>	<ul style="list-style-type: none"> <li>• Importance of standard units and conversion of units day to day life activity.</li> <li>• Procedure of to do sums on four operations.</li> <li>• Statement sums from day to day life on four fundamental operations.</li> </ul>	63 Periods

<b>IV. Fractional Numbers</b>	<ul style="list-style-type: none"> <li>Types of fractions</li> <li>Comparing of fraction.</li> <li>Addition and subtraction of unlike fraction.</li> <li>Introduction of decimals.</li> </ul>	<ul style="list-style-type: none"> <li>Revision of definition of fraction as part of the whole and part of a collection.</li> <li>To learn terminologies like numerator and denominator.</li> <li>type of fractions : Proper , Improper, mixed , like, unlike, equivalent</li> <li>Able to compare like fractions with denominators up to 20.</li> <li>Able to do addition and subtraction of like fraction with denominator up to 20.</li> <li>Able to do multiplication of fractions by single digit numbers and other fractions.</li> </ul>	<ul style="list-style-type: none"> <li>Introducing fractions, addition ,subtraction, of fractions from life situations.</li> <li>Using number line life situations paper folding and drawing for different types of fractions.</li> <li>Drawing paper folding and patterns in drawing for addition, subtraction, multiplication.</li> </ul>	43 Periods
<b>V. Patterns</b>	<ul style="list-style-type: none"> <li>Pattern in square numbers.</li> <li>Pattern in tiles</li> </ul>	<ul style="list-style-type: none"> <li>Able to identify patterns in square numbers.</li> <li>Able to make border strip and tiling patterns.</li> </ul>	<ul style="list-style-type: none"> <li>Using multiplication table adding odd numbers and patterns to introduce square numbers.</li> <li>Observing tile patterns and border strips from the surroundings.</li> <li>Project work for making tile patterns and border strips.</li> </ul>	25 Periods
<b>VI. Study of Data</b>	<ul style="list-style-type: none"> <li>Table the data.</li> <li>Pictograph.</li> </ul>	<ul style="list-style-type: none"> <li>To collect two-dimensional quantitative data and to represent the data in the form of a table.</li> <li>To draw a pictograph to represent a data.</li> </ul>	<ul style="list-style-type: none"> <li>Introducing collection of data and from life situations.</li> <li>Project work for collecting data and representing it in the of table and pictograph.</li> </ul>	13 Periods

## Class - VI

Topic	Content	Expected Learning Outcomes	Mode of Transaction	No. of Periods
<b>I. Number System</b>	<ul style="list-style-type: none"> <li>• Numbers up to 8- digits</li> <li>• Place value and comparison</li> <li>• Whole numbers</li> <li>• Test of divisibility for 2,3,4,5,6,8,9,10,11</li> <li>• Factorization</li> <li>• Prime number</li> <li>• LCM &amp; HCF</li> <li>• Integers</li> <li>• Revision : Fraction and Decimal numbers</li> <li>• Conversion : Decimal to Fraction</li> <li>• Addition &amp; Subtraction of decimal numbers</li> </ul>	<ul style="list-style-type: none"> <li>• To understand the concepts of numbers (up to 8 digits), number names and numerals;</li> <li>• Able to identify place value in eight digit numbers</li> <li>• To expand numbers with respect to place value.</li> <li>• Able to identify smaller/ larger numbers.</li> <li>• To compare numbers using <math>&lt;</math>, <math>&gt;</math> or <math>=</math> symbols and also arranges numbers in ascending / descending order.</li> <li>• To understand the number line and locate numbers on it (smaller number only)</li> <li>• Able to perform the four fundamental operations (answers not to exceed six digits) and applies the right operation in word problems.</li> <li>• To understand natural numbers and the necessity to extend natural numbers to whole numbers.</li> <li>• To represent whole numbers on number line.</li> <li>• To understand the four properties of numbers as patterns without emphasis on terminology (closure, commutative, associative, distributive properties over addition and multiplication) additive identity, multiplicative identity of numbers.</li> <li>• Able to identify and appreciate</li> </ul>	<ul style="list-style-type: none"> <li>• Place Value through pattern</li> <li>• Observation Method</li> <li>• Estimation through real life Examples</li> <li>• Induction method</li> <li>• Divisors through patens</li> <li>• Multiples through observations</li> <li>• Divisibility conditions through patens</li> <li>• G.C.D. and L.C.D. through examples</li> <li>• Equivalent fractions through multiple cards</li> <li>• Addition Subtraction and Comparison of fractions through pictorial representation</li> <li>• fractions on number line through activities</li> <li>• decimals through pictorial representation</li> <li>• representation of decimals on number line</li> <li>• understanding of integers through realized situation</li> <li>• representing integers on number line</li> <li>• Addition and</li> </ul>	60 Periods

Topic	Content	Expected Learning Outcomes	Mode of Transaction	No. of Periods
		<p>number patterns-triangular numbers and square numbers.</p> <ul style="list-style-type: none"> <li>• To recall the concepts of factors and multiples with the aid of multiplication tables of factors up to 10</li> <li>• To understand the rules of the divisibility test and apply it to numbers (divisibility tests for 2, 3, 4, 5, 6, 8, 9, 10, 11)</li> <li>• To recall the classification of even and odd numbers.</li> <li>• To understand the classification of prime, composite and co – prime numbers.</li> <li>• To learn prime factorization of a given number and express it as a product of prime numbers.</li> <li>• To factorize two digit numbers.</li> <li>• To understand the method of finding HCF and LCM (by prime factorization method and division method).</li> <li>• To learn to deduce the relationship between HCF, LCM and the two numbers.</li> <li>• To understand the necessity for extension of whole numbers to negative integers.</li> <li>• To understand that the collection of positive integers, negative integers and zero forms integers.</li> <li>• To represent integers on number line and understand the difference between the number rays of <math>\mathbf{N}</math> and</li> </ul>	<p>subtraction of integers through play way method.</p>	

Topic	Content	Expected Learning Outcomes	Mode of Transaction	No. of Periods
		<p><b>W</b></p> <ul style="list-style-type: none"> <li>• To compare integers and arrange them in ascending / descending order.</li> <li>• To add and subtract integers using number line and real life situation.</li> <li>• To recall that a fraction is a part of a whole.</li> <li>• To represent fractions pictorially on number line, understanding the difference from the integer number line</li> <li>• To be able to identify different kinds of fractions – proper, improper and mixed fractions</li> <li>• Able to convert a fraction into an equivalent fraction; and reduces fraction to the lowest term.</li> <li>• To compare fractions with unlike denominators up to 10.</li> <li>• To add and subtract fractions of unlike denominators up to 10.</li> <li>• To learn the concept of decimals using place value notation.</li> <li>• To learn the concept of decimals as fractions with denominators of tens and its multiples.</li> <li>• To be able to convert fractional numbers into decimals and vice – versa.</li> <li>• To add and subtract decimal fractions.</li> <li>• Able to apply the appropriate operation in word problems- addition and subtraction of decimals.</li> </ul>		

Topic	Content	Expected Learning Outcomes	Mode of Transaction	No. of Periods
<b>II. Measurements</b>	<ul style="list-style-type: none"> <li>• Metric Measures</li> <li>• Revision of Length, weight, volume.</li> <li>• Measure of Time from seconds to minutes, hours, week, year &amp; leap year</li> <li>• Perimeter and Area of rectangle, right angle triangle.</li> </ul>	<ul style="list-style-type: none"> <li>• To recall the conversion of units of length, weight and volume restricting to the units mentioned below. (km, m, cm, mm and similarly units that are in common use in weight and volume)</li> <li>• Able to find the duration between two time instances.</li> <li>• Able to identify leap years.</li> <li>• Able to convert from one unit of time to the other – seconds to minutes and hours and vice – versa, days to weeks, years, leap year and vice – versa.</li> <li>• To understand the concept of area and perimeter of plane figures.</li> <li>• To calculate the perimeter and area of square, rectangle, right triangle, area of four walls of the room.</li> </ul>	<ul style="list-style-type: none"> <li>• Understanding the concept of metric measures through experiments</li> <li>• Observation method</li> <li>• Finding perimeter and area by using dot paper and grid papers</li> </ul>	45 Periods
<b>III. Algebra</b>	<ul style="list-style-type: none"> <li>• Introduction to Algebra</li> </ul>	<ul style="list-style-type: none"> <li>• Introduction to variable through patterns and through appropriate word problems and generalizations.</li> <li>• To generate such patterns with more examples.</li> <li>• To solve unknowns through examples with simple contexts (single operations).</li> </ul>	<ul style="list-style-type: none"> <li>• Introducing variable and constants through patens</li> <li>• Solving simple equation through trial and error method</li> <li>Forming puzzles through group activities</li> </ul>	18 Periods
<b>IV. Life Mathematics</b>	<ul style="list-style-type: none"> <li>• Ratio and Proportion</li> <li>• Shopping</li> </ul>	<ul style="list-style-type: none"> <li>• To understand the concept of Ratio</li> <li>• To understand that Proportion is same as the ratio of two.</li> <li>• Able to calculate the needed quantity using Unitary method (with only direct variation implied).</li> <li>• Able to prepare a bill.</li> </ul>	<ul style="list-style-type: none"> <li>• Understating the concept of ratios through real life situation</li> <li>• Solving direct variation problem through life oriented examples</li> </ul>	15 Periods

Topic	Content	Expected Learning Outcomes	Mode of Transaction	No. of Periods
		<ul style="list-style-type: none"> <li>To verify the bill amount.</li> </ul>		
<b>V. Geometry</b>	<ul style="list-style-type: none"> <li>Introduction to point , line, ray , segment and planes</li> <li>Properties of collinear , concurrency , parallel, perpendicular lines</li> <li>Kinds of angles</li> <li>Types of Triangle</li> </ul>	<ul style="list-style-type: none"> <li>To understand certain Fundamental geometrical terms -points, lines, rays, segments and planes.</li> <li>Able to recognize collinear points, intersecting lines, concurrent lines, point of intersection, point of concurrency, parallel lines and perpendicular lines.</li> <li>To understand the concept of angles.</li> <li>Able to identify angles, vertex, arms.</li> <li>Able to measure angles and identify kinds of angles – right angle, acute angle obtuse angle.</li> <li>To understand complementary &amp; supplementary angles and find complementary and supplementary angles for the given angles.</li> <li>Able to recognize different kinds of triangles based on (a) length of sides (b) measures of angles.</li> </ul>	<ul style="list-style-type: none"> <li>Demonstration method</li> <li>Learning by doing method</li> </ul>	30 Periods
<b>VI. Data handling</b>	<ul style="list-style-type: none"> <li>Pictograph</li> <li>Bar graph</li> </ul>	<ul style="list-style-type: none"> <li>To understand the necessity to collect data.</li> <li>To organize the collected discrete data using tally marks and a table.</li> <li>To recall to construct and interpret a pictograph stressing on the importance of the need for scaling.</li> <li>Able to interpret data from bar graphs.</li> <li>Able to construct bar graphs from</li> </ul>	<ul style="list-style-type: none"> <li>Use available data in the class room</li> <li>Project method</li> </ul>	20 Periods

Topic	Content	Expected Learning Outcomes	Mode of Transaction	No. of Periods
		the given data.		
<b>VII. Practical Geometry</b>	<ul style="list-style-type: none"> <li>• Introduction to Geometrical instruments</li> <li>• Drawing and measuring line segments.</li> </ul>	<ul style="list-style-type: none"> <li>• To identify Geometrical instruments.</li> <li>• Able to measure and draw line segments.</li> <li>• Able to measure angles and draw angles using protractor - <math>0^\circ</math> - <math>180^\circ</math>.</li> <li>• Able to construct parallel and perpendicular lines using set square.</li> <li>• Able to identify different kinds of angles and lines from the given figures.</li> </ul>	<ul style="list-style-type: none"> <li>• Learning by doing method</li> </ul>	20 Periods

## Class - VII

Topic	Content	Expected Learning Outcomes	Mode of Transaction	No. of Periods
I. Real Number System	<ul style="list-style-type: none"> <li>• Revision : Integers. Addition and subtraction on integers.</li> <li>• Introduction of multiplication and division on integers.</li> <li>• Properties of Integers</li> <li>• Introduction to rational numbers</li> <li>• Representation of rational numbers on number line.</li> <li>• Four basic operations on rational numbers</li> <li>• Fractions and Decimal Fractions</li> <li>• Powers</li> </ul>	<ul style="list-style-type: none"> <li>• To recall the concepts of addition and subtraction of integers.</li> <li>• Able to multiply and divide integers</li> <li>• To understand that division by zero is meaningless.</li> <li>• To understand the four properties of integers (<b>closure, commutative, associative, distributive</b> properties over addition and multiplication), additive identity of integers, multiplicative identity of integers.</li> <li>• To understand that the above mentioned properties do not hold for subtraction and division of integers.</li> <li>• Able to perform the four fundamental operations on integers and applies appropriate operations in word problems.</li> <li>• To recall addition and subtraction of fractions.</li> <li>• Able to multiply fractions.</li> <li>• To understand fraction as an operator</li> <li>• To find the reciprocal of a fraction.</li> <li>• To learn to divide a fraction by another fraction.</li> <li>• Able to solve word problems that involve fractions (including mixed fractions).</li> <li>• To understand the necessity for extending fractions to rational numbers.</li> <li>• To represent rational number on number line.</li> <li>• To learn to perform all four operations on rational numbers.</li> </ul>	<ul style="list-style-type: none"> <li>• To introduce the operations through number line</li> <li>• Tell how inadequacy of whole numbers leads to integers and factions.</li> <li>• Mark the factions on the number line.</li> <li>• To find a rational number in between two rational numbers</li> <li>• To understand the laws of exponents</li> </ul>	35 Periods

Topic	Content	Expected Learning Outcomes	Mode of Transaction	No. of Periods
II. Algebra	<ul style="list-style-type: none"> <li>• Algebraic Expressions</li> <li>• Addition and Subtraction on expressions</li> <li>• Formation of simple expressions with two variables</li> <li>• Solving simple linear equations in one variable</li> </ul>	<ul style="list-style-type: none"> <li>• Able to identify constants and variables in a given term of an algebraic expression and coefficients of the terms.</li> <li>• Able to identify into like and unlike terms.</li> <li>• To learn to write the degree of expressions like <math>x^2y</math> etc. (exponent &lt; 3, number of variables is 2)</li> <li>• Able to form simple expressions with two variables.</li> <li>• Able to add and subtract algebraic expressions (coefficients should be integers).</li> <li>• To solve simple linear equations in one variable (in contextual problems) with two operations (avoid complicated coefficients).</li> <li>• Able to solve word problems involving rational numbers (all operations).</li> <li>• To represent rational number as a decimal.</li> <li>• To recall addition and subtraction of decimals.</li> <li>• To multiply and divide decimal fractions.</li> <li>• Able to solve word problems based on decimal fractions (all operations).</li> <li>• Able to express a given number in exponential form (exponents – only natural numbers)</li> <li>• To understand the laws of Exponents (through observing patterns and arrives at generalization.)</li> <li>• <math>a^m a^n = a^{m+n}</math> where <math>m, n \in N</math></li> <li>• <math>(a^m)^n = a^{mn}</math> where <math>m, n \in N</math></li> <li>• <math>\frac{a^m}{a^n} = a^{m-n}</math> where <math>m, n \in N, m &gt; n</math>.</li> </ul>	<ul style="list-style-type: none"> <li>• Introduce expressions in I degree and II degree</li> <li>• Starting from the models <math>x+a = b</math>, <math>ax = b</math>, proceed <math>ax + b = c</math> and <math>ax + b = cx + d</math></li> </ul>	40 Periods

Topic	Content	Expected Learning Outcomes	Mode of Transaction	No. of Periods
III. Life Mathematics	<ul style="list-style-type: none"> <li>• Ratio and Proportion</li> <li>• Indirect and Direct variation</li> <li>• Fraction and decimal into percentage</li> <li>• Solving word problem based on percentage</li> <li>• Profit and Loss</li> <li>• Simple Interest</li> </ul>	<ul style="list-style-type: none"> <li>• To recall the concept of ratio and proportion.</li> <li>• Able to differentiate direct and indirect variation and calculate the needed quantity using direct and indirect variation.</li> <li>• To understand percentage as a fraction with denominator 100.</li> <li>• Able to convert fractions and decimals into percentages and vice-versa.</li> <li>• To solve word problems based on percentage.</li> <li>• To understand the concept of profit and loss (single transaction only).</li> <li>• Able to calculate simple interest.</li> </ul>	<ul style="list-style-type: none"> <li>• Time and work, time and distance sharing problems etc.</li> <li>• Collect details of profit and loss. Explain the difference between profit and loss.</li> </ul>	40 Periods
IV. Measurements	<ul style="list-style-type: none"> <li>• Circumference of the Circle</li> <li>• Area : Triangle, Quadrilateral, Parallelogram, Rhombus, Trapezium and Circle</li> <li>• Area of Pathway</li> </ul>	<ul style="list-style-type: none"> <li>• To recall the concepts of Perimeter and Area of Square, Rectangle and Right triangle.</li> <li>• Able to find the area of plane figures made up of squares, rectangles, and right triangles (any two at a time).</li> <li>• To determine the area of Parallelogram, Rhombus, and Trapezium.</li> <li>• To determine the area and circumference of Circles.</li> <li>• To calculate the area of Pathway inside and outside the given rectangles and circles applying the concept of area of rectangle and circle respectively.</li> </ul>	<ul style="list-style-type: none"> <li>• Through paper cutting methods derive the formula for different shapes.</li> <li>• Through paper cutting introduce methods to find area.</li> <li>• Arrive at an approximate value for tabulating diameter and perimeter of circles of different sizes.</li> </ul>	45 Periods

Topic	Content	Expected Learning Outcomes	Mode of Transaction	No. of Periods
V. Geometry	<ul style="list-style-type: none"> <li>• Symmetry - Mirror and rotational</li> <li>• Line or axis of Symmetry</li> <li>• Triangles</li> </ul>	<ul style="list-style-type: none"> <li>• To understand the concept of Symmetry, Mirror and rotational Symmetry, Line or axis of symmetry.</li> <li>• To understand the properties of angles in intersecting lines, adjacent angles, adjacent angles on a straight line, parallel lines and transversal lines.</li> <li>• Able to apply angle sum property of a triangle.</li> </ul>	<ul style="list-style-type: none"> <li>• Introduce idea of symmetry. Give sufficient opportunities to identify all kinds of symmetry.</li> <li>• Rotate figures like square equilateral triangle etc. which have rotational symmetry.</li> <li>• Identify the angle of rotation.</li> </ul>	40 Periods
VI. Practical Geometry	<ul style="list-style-type: none"> <li>• Construction of Perpendicular bisector and angle bisector</li> <li>• Construction of angle using Scale and Compass.</li> <li>• Construction of triangles</li> </ul>	<ul style="list-style-type: none"> <li>• To recall the concepts of angles, parallel lines and perpendicular lines from the given figures.</li> <li>• To construct angle using scale and compasses- <math>90^\circ</math>, <math>60^\circ</math>, <math>30^\circ</math>, <math>120^\circ</math>.</li> <li>• To construct the perpendicular bisector of the given line segment.</li> <li>• To construct the angle bisector of the given angle.</li> <li>• Construction of triangles: given SSS,SAS,ASA.</li> </ul>	<ul style="list-style-type: none"> <li>• To explain perpendicular bisector and angle bisector by paper folding method.</li> <li>• Identify the different types of triangles</li> </ul>	27 Periods
VII. Data handling	<ul style="list-style-type: none"> <li>• Collection and organization of continuous data</li> <li>• Formation of frequency table</li> <li>• Mean , Median, Mode of ungrouped data</li> </ul>	<ul style="list-style-type: none"> <li>• To collect and organize continuous data.</li> <li>• To interpret bar graphs (recall)</li> <li>• Able to form the frequency table</li> <li>• To calculate Mean, Median, Mode of ungrouped data and understanding what they represent.</li> </ul>	<ul style="list-style-type: none"> <li>• Use available data in the class room.</li> <li>• Identify the differences between mean, median and mode.</li> </ul>	25 Periods

## Class – VIII

Topic	Content	Expected Learning Outcomes	Mode of Transaction	No. of Periods
<b>I. Real Number System</b>	(i) Revision : Representation of Rational Numbers on number line. (ii) Four properties of Rational numbers (iii) Simplify Expression with three brackets (iv) Powers (a) Express the numbers in exponential form with integers as exponent. (b) Laws of exponent with integral powers (c) Squares, Square roots, Cubes, Cube roots. (d) Playing With Numbers (e) Approximation of numbers	<ul style="list-style-type: none"> <li>• To recall the concept of rational numbers, representation of rational numbers on number line</li> <li>• To understand the four properties of rational numbers, additive identity and multiplicative identity.</li> <li>• Able to simplify expressions with utmost three brackets.</li> <li>• To understand that between any two rational numbers there lies another rational number (Making children see that if we take two rational numbers then unlike for whole numbers, in this case you can keep finding more and more numbers that lie between them.)</li> <li>• To express numbers in exponential form with integers as exponents.</li> <li>• To understand the laws of exponents with integral powers.</li> <li>• Able to calculate square and square roots of integers.</li> <li>- Square roots using factor method and division method for numbers containing               <ul style="list-style-type: none"> <li>○ not more than 4 digits</li> <li>○ not more than 2 decimal places (in case of imperfect squares)</li> </ul> </li> </ul>	Mark the rational numbers on the number line  Tell the numbers on the right are bigger  Give examples of rational number which are terminating decimals and repeating decimals.  Showing density of rational numbers in a number line.  Experimental method to find approximate square root by squeezing method.  Puzzles with numbers	40 Periods

Topic	Content	Expected Learning Outcomes	Mode of Transaction	No. of Periods
		<ul style="list-style-type: none"> <li>To recognize cubes and cube roots (only factor method for numbers containing at most 3 digits).</li> <li>To learn to estimate square roots and cube roots(Learning the process of moving nearer to the required number).</li> <li>Able to calculate using shortcut methods in four operations.</li> <li>Able to approximate numbers up to three digits.</li> </ul>	Factor Method	
II. Algebra	(i) Algebraic Expressions (multiplications and divisions) (ii) Identities (iii) Factorizations (iv) Solving linear equations	<ul style="list-style-type: none"> <li>To recall addition and subtraction of expressions.</li> <li>Able to multiply and divide algebraic expressions. (Coefficient should be integers).</li> <li>Able to understand some common errors (e.g. <math>2xx = x</math>, <math>7xxy = 7xy</math>)</li> <li>To deduce identities with geometrical proofs, numerical examples and applies it in sums  <math>(a + b)^2 = a^2 + 2ab + b^2</math>, <math>(a - b)^2 = a^2 - 2ab + a^2 - b^2 = (a + b)(a - b)</math>.</li> <li>Able to recognize (simple cases only) expressions that are factorizable of the following types  <math>a(x + y)</math>, <math>(x \pm y)^2</math>, <math>a^2 - b^2</math>, <math>(x + a)(x + b)</math>.</li> <li>Able to solve word problems that involves linear equations (avoid complex coefficient in the equations).</li> </ul>	Factor tree  Use card boards and paper cutting methods to show identities geometrically  Factor Tree  Problems through life situations	40 Periods

Topic	Content	Expected Learning Outcomes	Mode of Transaction	No. of Periods
<b>III. Life Mathematics</b>	(i) Revision : Profit, Loss and simple interest. (ii) Application of percentage, profit & loss, overhead expenses, Discount, tax. (iii) Compound Interest (iv) Difference between S.I and C.I (v) Compound variation (vi) Time & work problems – Simple and direct word problems	<ul style="list-style-type: none"> <li>• To solve slightly advanced problems involving applications of Percentages, Profit &amp; Loss, overhead expenses, Discount, tax.</li> <li>• Able to derive a formula to find compound interest through patterns and use it in simple problems. (compounded yearly up to 3 years or half-yearly up to 3 steps only).</li> <li>• Able to differentiate between simple and compound interest ( 2 years ).</li> <li>• To do problems on compound variation</li> <li>• To solve Time and Work problems– Simple and direct word problems.</li> </ul>	<p>To understand the different between profit and loss through life situations.</p> <p>To compare quarterly half yearly, annual interest schemes paid by companies.</p> <p>To collect details of tax, discount sale, etc.</p> <p>Post office RD to understand schemes with different interest rates.</p> <p>To understand factors involved in completing a project like, building construction etc.</p> <p>Problems from life situations for time and work.</p>	42 Periods

Topic	Content	Expected Learning Outcomes	Mode of Transaction	No. of Periods
IV. Measurements	i Area and Perimeter of semi circle and quadrant ii Area and Perimeter of combined Plane Figures	<ul style="list-style-type: none"> <li>• Able to calculate area and perimeter of semi circle and quadrant.</li> <li>• To recall the concepts of area &amp; perimeter - Formula for Square, Rectangle, Parallelogram, Triangle, Right Triangle, Equilateral Triangle, Isosceles Triangle, Scalene Triangle, Trapezium, Quadrilateral, Rhombus, circle.</li> <li>• Able to calculate the area of combined figures (Study of area / perimeter of not more than three figures placed in juxtaposition [only simple combined figures])</li> </ul>	Card board, paper cutting and paper folding techniques to understand juxtaposition.  To see the number of tiles laid in floors various areas etc.	23 Periods
V. Geometry	(i) Properties of Triangles (ii) Congruence of Triangles (iii) Circles	<ul style="list-style-type: none"> <li>• To recall the properties of triangles.</li> <li>• To understand theorems based on properties of triangles and applies them to appropriate problems.</li> <li>• To understand the concept of congruence of triangles (SSS, SAS, ASA, RHS theorems).</li> <li>• To understand the concurrency of medians, altitudes, angle bisectors and perpendicular bisectors in a triangle.</li> <li>• To understand Pythagoras theorem and able to solve problems using it.</li> <li>• Able to draw the parts of a circle and identify and compare the relationship between radius and diameter.</li> </ul>	Paper folding techniques to verify properties.  Geometrical instruments  Paper cutting methods; To draw triangles and measure sides and angles and verify.  To show objects of congruent shape; postal stamps etc.	25 Periods

Topic	Content	Expected Learning Outcomes	Mode of Transaction	No. of Periods
VI. Practical Geometry	i. Construction of Quadrilaterals: trapezium, parallelogram, rhombus, rectangle and square  ii. Construction of Concentric Circles.	<ul style="list-style-type: none"> <li>• Able to construct quadrilaterals: trapezium., parallelogram, rhombus, rectangle and square.</li> <li>• Able to construct concentric circles.</li> </ul>	Geometrical instruments  Paper folding methods.	30 Periods
VII. Graphs	(i) Introduction to Cartesian plane with axes  (ii) Plotting of points for different kinds of situations  (iii) Drawing straight lines parallel to coordinate axes	<ul style="list-style-type: none"> <li>• To understand the concept of Cartesian plane with axes.</li> <li>• Able to plot points for different kinds of situations (perimeter vs. length for squares, area as a function of side of a square, plotting of multiples of different numbers, simple interest vs number of years etc.)</li> <li>• To learn to read graphs.               <ul style="list-style-type: none"> <li>-- Able to read the linear graphs.</li> <li>-- Able to read the distance vs time graph.</li> </ul> </li> </ul>	Graph sheets; To see linear relationship between side and perimeter of square.  To understand linear relationship between time and work.	32 Periods

Topic	Content	Expected Learning Outcomes	Mode of Transaction	No. of Periods
<b>VIII. Data handling</b>	(i) To recall formation of frequency table (ii) Drawing Histogram and frequency polygon for grouped data (iii) Construction of Simple Pie-Chart. (iv) Measures of central tendency	<ul style="list-style-type: none"> <li>• To recall formation of frequency table.</li> <li>• To draw Histogram, frequency polygon for grouped data</li> <li>• To construct simple Pie- charts for the given data.</li> <li>• Able to calculate mean ,median and mode for discrete data</li> </ul>	Mark sheets, heights and weights, data from news paper cutting to construct and interpret frequency table.  To construct histogram, frequency curve, pie charts from these datas	32 Periods

## Class – IX

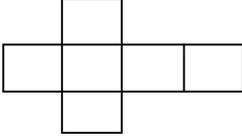
Topic	Content	Expected Learning Outcomes	Mode of Transaction	No. of Periods
I. Theory of Sets	i. Introduction ii. Definition and different ways of writing sets iii. Types of sets and cardinality. iv. Set operations v. Venn diagram vi. Formula for $n(A \cup B)$	<ul style="list-style-type: none"> <li>• Able to describe a set in words, set builder form, roster form.</li> <li>• Able to identify different kinds of sets.</li> <li>• To understand and perform set operations – union, intersection, difference, symmetric difference and complementation</li> <li>• To learn to use Venn diagram to illustrate sets and operations restricted to two sets</li> <li>• Able to use the formula for <math>n(A \cup B)</math> in solving simple word problems.</li> </ul>	Sets from : $N, W, Z$ and $Q$ are to be introduced and then the general form of sets to be given illustrate the concepts  Illustrate set operations using finite sets. Charts giving different forms of sets and examples from life situations. Venn diagrams to be restricted to two sets only. Use Venn diagrams for all real life situations.	25 Periods

Topic	Content	Expected Learning Outcomes	Mode of Transaction	No. of Periods
<b>II. Real Number System</b>	i. Introduction ii. Revision : Natural numbers, Whole numbers, Integers and Rational numbers (definition). iii. Rational numbers iv. Irrational numbers v. Real numbers: Definition and their representation as points on a line vi. Four basic operations on Real numbers. vii. Division algorithm for Real numbers	<ul style="list-style-type: none"> <li>• To recall the representation of natural numbers, whole numbers, integers, and rational numbers on the number line.</li> <li>• Able to classify rational numbers as recurring / terminating decimals.</li> <li>• To represent terminating / non terminating decimals, on the number line through successive magnification.</li> <li>• To understand the existence of non terminating decimals and non-recurring (irrational numbers) and able to represent irrational numbers <math>\sqrt{2}</math>, <math>\sqrt{3}</math> and <math>\sqrt{5}</math> on number line.</li> <li>• To understand and do the four operations in irrational numbers.</li> <li>• Able to rationalize the given irrational numbers of the type <math>1/(a+b\sqrt{x})</math> and <math>1/(\sqrt{x}+\sqrt{y})</math>, where <math>x, y</math> are natural numbers and <math>a, b</math> are integers.</li> <li>• Able to conclude that every real number can be represented by a unique point on the number line and vice – versa.</li> <li>• To understand the Division algorithm for Real numbers.</li> </ul>	<p>Recall natural numbers, whole numbers, integers and rational numbers. Give examples initially.</p> <p>Discriminate terminating and non-terminating decimals through examples.</p> <p>Visual proof of <math>\sqrt{2}</math> shall be explained first and then using it give the visual proof <math>\sqrt{3}</math> and <math>\sqrt{5}</math>.</p> <p>Explain how <math>1 = .9999\dots</math> and <math>\frac{1}{3} = .3333\dots</math> to make sense. Verify the result using calculator.</p> <p>Explain the need for extending real number system through examples.</p> <p>Use numbers to illustrate division algorithm.</p>	25 Periods

Topic	Content	Expected Learning Outcomes	Mode of Transaction	No. of Periods
III. Scientific Notations of Real Numbers. Logarithms	i. Scientific notation ii. Logarithms	<ul style="list-style-type: none"> <li>• To represent the number in Scientific Notation.</li> <li>• To understand the importance and convenience of expressing numbers in scientific notation.</li> <li>• Able to convert larger/smaller numbers to scientific notation and vice – versa.</li> <li>• Able to convert an expression in exponential form to logarithmic form and vice – versa.</li> <li>• To understand the rules of logarithms – product, quotient, power and change of base rule and able to use them in problem solving.</li> <li>• To recall the ways to use logarithmic tables.</li> <li>• Able to apply the rules and logarithmic table to calculate the values of the given expressions.</li> </ul>	<p>To introduce the concept of logarithm, use very large and very small numerical expression in science, Engineering, Astronomy etc.</p> <p>Data from different real life situation from journals and dailies.</p> <p>Use expression of the form <math>b = a^x</math>, where <math>x</math> is an integer first and then for real numbers.</p> <p>Explain characteristic and mantissa, simple problems involving product, quotient, squares and cubes.</p>	15 Periods

Topic	Content	Expected Learning Outcomes	Mode of Transaction	No. of Periods
IV. Algebra	i. Introduction ii. Polynomials iii. Remainder theorem iv. Factor theorem v. Factorization vi. Identities vii. Linear equation viii. Linear inequation in one variable	<ul style="list-style-type: none"> <li>• To learn the definition of a polynomial in one variable.</li> <li>• To determine the coefficients, number of terms, and degree of a polynomial.</li> <li>• Able to classify the expressions based on the number of terms as monomials, binomials, trinomials and polynomials.</li> <li>• Able to classify a polynomial based on the degree of the polynomial as linear, quadratic and cubic.</li> <li>• Able to find zeros / roots of the polynomial/ equation.</li> <li>• To learn the remainder theorem and use it to find the remainder.</li> <li>• To understand the factor theorem and use it to find the factors of the given polynomial.</li> <li>• Able to factor trinomials of the type <math>ax^2 + bx + c</math>, <math>a \neq 0</math> where <math>a, b, c</math> are real numbers, and cubic polynomials</li> <li>• To recall identities for <math>(a + b)^2, (a - b)^2, a^2 - b^2, (x + a)(x + b)</math>.</li> <li>• Able to identify the identities of the type <math>(x + y + z)^2 = x^2 + y^2 + z^2 + 2xy + 2yz + 2zx</math>,  <math>(x + y)^3 = x^3 + y^3 + 3xy(x + y)</math>,</li> <li>• <math>x^3 + y^3 + z^3 - 3xyz = (x + y + z)(x^2 + y^2 + z^2 - xy - yz - zx)</math></li> </ul>	<p>Introduce monomial, binomial, trinomial expression and linear quadratic and cubic polynomials.</p> <p>Distinguish expression and equations, zeros and roots.</p> <p>Illustrate algebraic identities using paper-folding diagrammatic representation.</p> <p>Introduce factorization as the reverse process of multiplication.</p> <p>Differentiating equations and in equation and its solutions through simple examples.</p>	40 Periods

Topic	Content	Expected Learning Outcomes	Mode of Transaction	No. of Periods
		<p>and use them in problem solving.</p> <ul style="list-style-type: none"> <li>To understand to form linear equations in two variables using examples of day – to – day life situations.</li> <li>To solve linear equations in two variables and inequation in one variable.</li> </ul>		
V. Coordinate Geometry	<ol style="list-style-type: none"> <li>Introduction</li> <li>Points on a plane</li> <li>Distance between two points</li> </ol>	<ul style="list-style-type: none"> <li>To understand the concept of Cartesian plane with its axes.</li> <li>Able to plot the points on the plane as well as write the co – ordinates of a given point.</li> <li>Able to measure the distance between two given points and make use of it in problems .</li> </ul>	Locating places in the map. Using latitude and longitude converting latitude and longitude to $x$ and $y$ axis. Find the distance between two places from the map. Finding the distance between two points in graph.	20 Periods
VI. Trigonometry	<ol style="list-style-type: none"> <li>Introduction</li> <li>Trigonometric ratio</li> <li>Complementary angles</li> <li>Trigonometric tables</li> </ol>	<ul style="list-style-type: none"> <li>To understand trigonometric ratios –the relationship between the sides and the angles of the right angled triangle.</li> <li>To recognize the values of sine, cosine, tangent and their reciprocals for specific angles <math>30^\circ, 45^\circ</math> and <math>60^\circ</math> and for <math>0^\circ</math> and <math>90^\circ</math></li> <li>To understand the complementary angles and apply them in simple problems</li> <li>To know how to use trigonometric tables to find the values.</li> </ul>	<p>Recalling the properties of similar triangles. Relating the ratio to angles of a triangle.</p> <p>Show the size of triangle is independent of trigonometric ratios.</p>	16 Periods

Topic	Content	Expected Learning Outcomes	Mode of Transaction	No. of Periods
VII. Geometry	i. Introduction ii. Theorems based on properties of parallelograms (without proof) iii. Theorems based on circles (without proof)	<ul style="list-style-type: none"> <li>To recall the theorems for verification of relation between points, lines and planes, parallel lines and transversal; congruence, points of concurrency in triangle.</li> <li>To recall the theorems on linear pair, vertically opposite angles, angle sum property of a triangle.</li> <li>To learn the properties of parallelograms and able to use them in problem solving.</li> <li>To understand the concept of circles and theorems based on it.</li> </ul>	Paper folding, symmetry transformation technique to recall the properties of parallelograms and circles.  Paper or cardboard cutting to verify theorems on parallelograms and circles	21 Periods
VIII. Measurements	i. Introduction ii. Area and perimeter of sectors iii. Surface Area and volume of Cube and Cuboids.	<ul style="list-style-type: none"> <li>Able to calculate the area and perimeter of sectors.</li> <li>Able to calculate the surface areas and volumes of cube, cuboids.</li> </ul>	Using binding wire to form circle, sector, shading inside to show the area of the circle and sector. Again straighten it to find the circumference of the circle and perimeter of the sector.  Cutting the card board in the form   and show the surface area, volume of cube and cuboid.	25 Periods

<b>Topic</b>	<b>Content</b>	<b>Expected Learning Outcomes</b>	<b>Mode of Transaction</b>	<b>No. of Periods</b>
<b>IX. Practical Geometry</b>	i. Introduction ii. Concurrency in triangles	<ul style="list-style-type: none"> <li>• Able to identify Concurrency in a triangle - centroid, orthocentre, circumcentre and incentre of a triangle geometrically.</li> </ul>	Recalling relevant theorems in theoretical geometry and charts.	21 Periods
<b>X. Graphs</b>	i. Straight lines ii. Intersections of Straight lines	<ul style="list-style-type: none"> <li>• Able to draw straight lines, intersecting and non-intersecting straight lines.</li> <li>• Solving linear equations using their graphs.</li> </ul>	Recalling the method of solving linear simultaneous equations and showing the diagrammatic represents in the graphs	10 Periods
<b>XI. Statistics</b>	i. Introduction ii. To recall Histogram and frequency polygon iii. To draw Histogram with varying base lengths iv. Measures of central tendency for grouped data	<ul style="list-style-type: none"> <li>• To recall collection of data, presentation of data in tabular form - ungrouped and grouped data.</li> <li>• To construct of histograms (with varying base lengths).</li> <li>• To recall Mean, median, mode of ungrouped data.</li> <li>• Able to calculate the Mean, Median and Mode for continuous data.</li> </ul>	Relevant newspaper or magazine cutting to show the statistical diagrams. Real life situation to be introduced.	16 Periods

Topic	Content	Expected Learning Outcomes	Mode of Transaction	No. of Periods
XII. Probability	i. Introduction ii. Probability : an experimental approach	<ul style="list-style-type: none"> <li>• To learn the concept of Probability historically.</li> <li>• To understand probability through repeated experiments and by observed frequency approach</li> <li>• To study probability through empirical approach by considering experiments to be drawn from real-life situations.</li> <li>• Able to tabulate the events like tossing coins and throwing dice.</li> </ul>	Distinguishing deterministic and random experiment in real life situation.  Tossing coins, throwing dice certain number of times and finding the ratio to some favourable cases.	16 Periods

## X Std

Topic	Content	Expected Learning Outcomes	Mode of Transaction	No. of Periods
I. Theory of Sets	i. Introduction ii. Properties of operations on sets iii. De Morgan's laws- verification using example Venn diagram iv. Formula for $n(A \cup B \cup C)$ v. Functions	<ul style="list-style-type: none"> <li>To revise the basic concepts on Set operations</li> <li>To understand the properties of operations of sets - commutative, associative, and distributive restricted to three sets.</li> <li>To understand the laws of complementation of sets.</li> <li>To understand De Morgan's laws and demonstrating them by Venn diagram as well.</li> <li>To solve word problems using the formula as well as Venn diagram.</li> <li>To understand the definition, types and representation of functions.</li> <li>To understand the types of functions with simple examples.</li> </ul>	Use Venn diagrams for all illustrations  Give examples of functions from economics, medicine, science etc.	26 Periods
II. Sequences and Series of Real Numbers	i. Introduction ii. Sequences iii. Arithmetic Progression (A.P) iv. Geometric Progression (G.P) v. Series	<ul style="list-style-type: none"> <li>To understand to identify an Arithmetic Progression and a Geometric Progression.</li> <li>Able to apply to find the nth term of an Arithmetic Progression and a Geometric Progression.</li> <li>To determine the sum of n terms of an Arithmetic Progression and a Geometric Progression.</li> <li>To determine the sum of some finite series such as <math>\sum n, \sum n^2, \sum n^3</math></li> </ul>	Use pattern approach  Use dot pattern as teaching aid  Use patterns to derive formulae  Examples to be give from real life situations	27 Periods

Topic	Content	Expected Learning Outcomes	Mode of Transaction	No. of Periods
III. Algebra	i. Solving linear equations ii. Polynomials iii. Synthetic division iv. Greatest common divisor (GCD) and Least common multiple (LCM) v. Rational expressions vi. Square root vii. Quadratic Equations	<ul style="list-style-type: none"> <li>• To understand the idea about pair of linear equations in two unknowns. Solving a pair of linear equations in two variables by elimination method and cross multiplication method.</li> <li>• To understand the relationship between zeros and coefficients of a polynomial with particular reference to quadratic polynomials.</li> <li>• To determine the remainder and the quotient of the given polynomial using Synthetic Division Method.</li> <li>• To determine the factors of the given polynomial using Synthetic Division Method.</li> <li>• Able to understand the difference between GCD and LCM, of rational expression.</li> <li>• Able to simplify rational expressions (Simple Problems),</li> <li>• To understand square roots.</li> <li>• To understand the standard form of a quadratic equation <math>ax^2 + bx + c = 0</math>, (<math>a \neq 0</math>).</li> <li>• To solve quadratic equations (only real root) - by factorization, by completing the square and by using quadratic formula.</li> <li>• Able to solve word problems based on quadratic equations.</li> <li>• Able to correlate relationship between discriminant and nature of roots.</li> <li>• Able to Form quadratic equation when the roots are given.</li> </ul>	Illustrative examples – Use charts as teaching aids Recall GCD and LCM of numbers initially Compare with operations on fractions Compare with the square root operation on numerals. Help students visualize the nature of roots algebraically and graphically.	40 Periods

Topic	Content	Expected Learning Outcomes	Mode of Transaction	No. of Periods
IV. Matrices	i. Introduction ii. Types of matrices iii. Addition and subtraction iv. Multiplication v. Matrix equation	<ul style="list-style-type: none"> <li>• Able to identify the order and formation of matrices</li> <li>• Able to recognize the types of matrices</li> <li>• Able to add and subtract the given matrices.</li> <li>• To multiply a matrix by a scalar, and the transpose of a matrix.</li> <li>• To multiply the given matrices (2x2; 2x3; 3x2 Matrices).</li> <li>• Using matrix method solve the equations of two variables.</li> </ul>	Using of rectangular array of numbers.  Using real life situations.  Arithmetic operations to be used	16 Periods
V. Coordinate Geometry	i. Introduction ii. Revision :Distance between two points iii. Section formula, Mid point formula, Centroid formula iv. Area of a triangle and quadrilateral v. Straight line	<ul style="list-style-type: none"> <li>• To recall the distance between two points, and locate the mid point of two given points.</li> <li>• To determine the point of division using section formula (internal).</li> <li>• To calculate the area of a triangle.</li> <li>• To determine the slope of a line when two points are given, equation is given.</li> <li>• To find an equation of line with the given information.</li> <li>• Able to find equation of a line in: slope-intercept form, point -slope form, two -point form, intercept form.</li> <li>• To find the equation of a straight line passing through a point which is (i) parallel (ii) perpendicular to a given straight line.</li> </ul>	Simple geometrical result related to triangle and quadrilaterals to be verified as applications.  the form $y = mx + c$ to be taken as the starting point	25 Periods

Topic	Content	Expected Learning Outcomes	Mode of Transaction	No. of Periods
VI. Trigonometry	i. Introduction ii. Identities iii. Heights and distances	<ul style="list-style-type: none"> <li>• Able to identify the Trigonometric identities and apply them in simple problems.</li> <li>• To understand trigonometric ratios and applies them to calculate heights and distances. (not more than two right triangles)</li> </ul>	By using Algebraic formulae  Using trigonometric identities.  The approximate nature of values to be explained	21 Periods
VII. Geometry	i. Basic proportionality theorem (with proof) ii. Converse of Basic proportionality theorem (with proof) iii. Angle bisector theorem (with proof) iv. Converse of Angle bisector theorem (with proof) v. Similar triangles (theorems without proof)	<ul style="list-style-type: none"> <li>• To understand the theorems and apply them to solve numerical problems only.</li> </ul>	Paper folding symmetry and transformation techniques to be adopted.  Formal proof to be given  Drawing of figures  Step by step logical proof with diagrams to be explained and discussed	20 Periods
VIII. Measurements	i. Introduction ii. Surface Area and Volume of Cylinder, Cone, Sphere, Hemisphere, Frustum iii. Surface area and volume of combined figures iv. Invariant volume	<ul style="list-style-type: none"> <li>• To determine volume and surface area of cylinder, cone, sphere, hemisphere, frustum</li> <li>• Volume and surface area of combined figures (only two).</li> <li>• Some problems restricted to constant Volume.</li> </ul>	Use 3D models to create combined shapes  Use models and pictures ad teaching aids.  Choose examples from real life situations.	24 Periods

Topic	Content	Expected Learning Outcomes	Mode of Transaction	No. of Periods
IX. Practical Geometry	i. Introduction ii. Construction of tangents to circles iii. Construction of Triangles iv. Construction of cyclic quadrilateral	<ul style="list-style-type: none"> <li>• Able to construct tangents to circles.</li> <li>• Able to construct triangles, given its base, vertical angle at the opposite vertex and (a) median (b)altitude (c) bisector.</li> <li>• Able to construct a cyclic quadrilateral</li> </ul>	To introduce algebraic verification of length of tangent segments.  Recall related properties of angles in a circle before construction.  Recall relevant theorems in theoretical geometry	15 Periods
X. Graphs	i. Introduction ii. Quadratic graphs iii. Some special graphs	<ul style="list-style-type: none"> <li>• Able to solve quadratic equations through graphs</li> <li>• To solve graphically the equations <math>y \propto x</math>, <math>y \propto \frac{1}{x}</math>, <math>xy = k</math>, <math>\forall x, y &gt; 0</math>.</li> <li>• Able to apply graphs to solve word problems</li> </ul>	Interpreting skills also to be taken care of graphs of quadratics to precede algebraic treatment.  Real life situations to be introduced.	10 Periods
XI. Statistics	i. Recall Measures of central tendency ii. Measures of dispersion iii. Coefficient of variation	<ul style="list-style-type: none"> <li>• To recall Mean for grouped and ungrouped data situation to be avoided).</li> <li>• To understand the concept of Dispersion and able to find Range, Standard Deviation and Variance.</li> <li>• Able to calculate the coefficient of variation.</li> </ul>	Use real life situations like performance in examination, sports, etc.	16 Periods
XII. Probability	i. Introduction ii. Probability-theoretical approach	<ul style="list-style-type: none"> <li>• To understand Random experiments, Sample space and Events – Mutually Exclusive, Complementary, certain and impossible events.</li> <li>• To understand addition Theorem on probability and apply it in solving some simple problems.</li> </ul>	Three diagrams and investigations on coin tossing, die throwing, picking the cards to be used.	15 Periods