Theme 1: Number System

In this theme the rules developed by children for addition and subtraction of integers will be extended to the formation of rules for their multiplication and division by using patterns and generalization.

Another important type of number called rational number will also be introduced in this class. This exposure will develop children's understanding about various kinds of numbers as a system and a structure. At this stage a relationship will also be established between fractions and rational numbers for which children will extend the rules used for performing operations on fractions to integers. This is also the time when children will be enabled to understand that fractions are not only representing part of a whole but also a number that operates on quantities. Extension of fractions and rational numbers is further done to decimal fractions. Once children understand that decimal notation of numbers is another convenient way of writing fractions with denominator as 10, 100, 1000 etc, they will be able to form rules for operating decimal fractions too. Children's exploration on properties of natural numbers through a play way method will help in learning exponential form of numbers, divisibility rules, LCM and HCF. The learning of Sets and their types and use in daily life is further extended in this class.
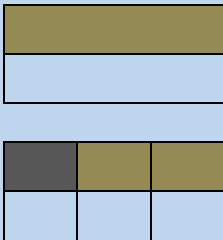
Learning Outcomes:

Children will be able to:

- multiply integers by using patterns and generalize the rules to multiply a positive integer by a negative integer, a negative integer by a positive integer and two negative integers;
- divide integers by using patterns and forms rules to perform division in integers;
- get a feel of necessity of rational numbers (through representation on number line);
- perform operations on rational numbers (addition, subtraction, multiplication and division);
- solve daily life problems involving rational numbers (all operations);
- observe patterns in multiplication tables and forms divisibility rules;
- understand and use fraction as an operator;
- find reciprocal of a fraction;
- multiply fractions by using patterns/paper folding/pictures and form general rules;
- divide fractions by using patterns/visualization/picture and forms rules;
- solve word problems involving mixed fractions and operations on them;
- represent rational number as a decimal and vice-versa;
- multiplication and division of decimal fractions;
- use exponential form and their rules to solve problems related to repeated multiplication;
- revise idea of sets;
- define equal, equivalent, and universal sets;
- find and use cardinality of finite sets.

Number System

Key Concepts	Suggested Transactional Processes	Suggested Learning Resources
- Multiplication and division of integers - Properties of operations on integers: Commutativity, associativity, existence of identity and inverse and distributivity - Problem solving using operations on integers - Solution of word problems involving integers (all operations) - Introduction to rational numbers (with representation on number line) - Word problems on rational numbers (all operations) - Decimal representation of rational numbers - Problem solving using operations on rational numbers and decimal fractions - Fraction as an operator - Reciprocal of a fraction - Multiplication and division of decimal fractions - Exponents only natural numbers. - Laws of exponents (through observing patterns to arrive at generalisation.) - Application of laws of exponents in simple daily life problems - Revision idea of sets - Equal, equivalent, universal sets - Cardinal property of sets	- Revising previous concepts learnt by children. - Building on children's previous learning. - Involving children in discussion to find their own ways of multiplying integers using their understanding about the rules for multiplication and division of whole numbers - Providing enough time to children to use patterns in multiplying a negative integer by another integer as this may be a new idea. Up till now they have learnt that multiplication is repeated addition or an operator in case of fractions. Sufficient time should be given to children to appreciate why the product of two negative integers is positive. - Encouraging children to explore and use the concept of dividing a natural number by another by simply finding the number which when multiplies the divisor gives the dividend as product. So to find -4÷ -2 we have to find the number which on multiplication with -2 gives the result -4. Many children will be able to infer that the required number must be +2. Many such examples will help the child to make their own rule like +ve ÷ -ve = -ve, -ve ÷+ve= -ve and −ve÷-ve=+ve. - Involving children in classification of numbers on the basis of their properties like even, odd, multiples and factors. These numbers can be used to classify numbers in to various categories - Introducing divisibility rules using patterns, and then different division problems could be discussed to show their use. For example, let children form multiplication tables of different numbers like 2, 3, 4, etc. and then from the multiplication facts ask them to identify the pattern like multiple of 3 has sum of its digits divisible by 3,	- Shapes used in daily life (*for demonstrating number system, algebra, geometry mensuration and data handling*) - Geoboard with rubber bands (*for demonstrating various shapes and Charts*) - Brief life history of mathematicians with their contributions at elementary level. - Maths Kit

Number System

Key Concepts	Suggested Transactional Processes	Suggested Learning Resources
	multiple of 5 has either 5 or zero in its one's place etc. ▶ Utilising children's knowledge about describing multiplication of fractions as operator 'of" and explain by paper folding, shading parts of whole etc. for example $\frac{1}{3} \times \frac{1}{2}$ is one-third of one-half which can be shown as: The double shaded region is one-sixth of the whole which shows that $\frac{1}{3} \times \frac{1}{2} = \frac{1}{6}$. ▶ Solving of sums by children and observing the pattern that in all cases the product of fractions can be obtained by multiplying their numerators and their denominators ▶ Providing opportunities to children to observe and find through pictures that $\frac{1}{2} \div \frac{1}{4}$ means the number of one-fourths in one-half. Simple visualization is required to find that one-half contains two one-fourths. Let children observe the patterns and find their own ways of dividing a fraction by another fraction ▶ Conducting discussion with children to observe and generalise that to divide a fraction by another fraction (non-zero) can be done by multiplying the dividend by reciprocal of the divisor. ▶ Involving children in exploring their own ways of writing repeated multiplication in a short form as repeated addition is represented by multiplication. With discussion let the children reach the conclusion of writing repeated multiplication in exponent form.	

Life Skills: Solving daily life problems

Theme 2: Ratio and Proportion

This theme will focus on developing children's ability to solve higher problems on the use of ratio and proportion in daily life in this class. Children are enabled to use ratio, proportion and their properties appropriately in problem solving. The idea of percentage, unitary method, simple interest, time, work and speed are also introduced through simple daily life problems. Children will appreciate that this is the part of mathematics that they can use the most in their daily lives.

Learning Outcomes:

Children will be able to:

- recall ratio and proportion done in early classes;
- solve problems using unitary method (getting feel of how formulae for calculation of simple interest and understand percentage as a fraction with denominator 100;
- re write fractions and decimals into percentage and vice-versa;
- solve problems related to profit and loss (single transaction only);
- apply simple interest (time period in complete years) in daily life situations;
- solve problems related to speed, distance and time.

Ratio and Proportion

Key Concepts	Suggested Transactional Processes	Suggested Learning Resources
‣ Ratio and proportion (revision) ‣ Unitary method continued, consolidation, general expression for unitary method ‣ Percentage- an introduction. ‣ Understanding percentage as a fraction with denominator 100 ‣ Converting fractions and decimals into percentage and vice-versa. ‣ Application to profit and loss (single transaction only) ‣ Application to simple interest (time period in complete years). ‣ Speed, distance, time	‣ Revising previous concepts learnt by children. ‣ Building on children's previous learning. ‣ Children know about many ways of comparing quantity. Utilise their experiences to conclude that ratio is another way of comparing quantities. Percentages and their applications are also in child's daily life experiences which can be used to form various formulae and solving problems using them.	‣ Maths Kit

Life Skills: Solving daily life problems

Theme 3: Algebra

Children in class VI were exposed to and were enabled to understand that algebra is an extension and generalization of arithmetic. Letters for numbers are to be seen as a compact language to express situations in expressions. The basic idea of various terminologies that form the language to learn algebra is also to be communicated to children in a gradual manner. Children should get a feel that algebra is just extension of numbers and quantities. They should also gain fluency in mathematical language through operations on algebraic expressions and solving linear equations.

Learning Outcomes:

Children will be able to:

- identify terms related to algebra like constants, variable, terms, coefficient of terms, like and unlike terms etc.;
- generate algebraic expressions involving one or two variables/unknowns;
- add and subtract algebraic expressions;
- express situations in simple linear equations and find solution of related problems;
- find solution to simple inequalities (< or >) in one variable.

Algebra

Key Concepts	Suggested Transactional Processes	Suggested Learning Resources
‣ Terms related to algebra like constants, variable, terms, coefficient of terms, like and unlike terms, etc. ‣ Generate algebraic expressions ‣ Performs operations (addition and subtraction) on algebraic expressions with integral coefficients only ‣ Simple linear equations in one variable (in contextual problems) with two operations. ‣ Inequalities and solution of simple inequalities in one variable	‣ Revising previous concepts learnt by children. ‣ Building on children's previous learning. ‣ Use child's context and encourage them to generate algebraic expressions by proper choice of variable/unknown and operations. ‣ Child's daily life experiences like adding/subtracting a group of 2 notebooks and 5 pencils to/from another group of 3 notebooks and 8 pencils etc. Let children form their own rule that like terms can only be added or subtracted. ‣ Involve children in groups of three or four to explore situations which can be expressed by simple equations and solve them. Textbooks have many such examples.	‣ Notebooks, pencils, pens, etc. ‣ Textbooks

Skills: pursuing assumptions to logical conclusions

Theme 4: Geometry

Children in this class will be enabled to perceive relationships between properties of figures. The children will develop the ability to give the minimum number of properties, eliminating redundancies and formulate meaningful definitions and understand inclusion relationships such as every square is a special type of rectangle, but not every rectangle is a square. Note that if a student is requiring to "know a definition" before attaining this level, it will be a memorized definition with little meaning to the student. Their concept definition is likely not to match their concept image.

Learning Outcomes:

Children will be able to:

- identify pairs of angles like linear, supplementary, complementary, adjacent and vertically opposite and find one when the other is given;
- hypothesize the relationship between pairs of angles out of eight angles formed by a transversal with two parallel lines;
- verify angle sum and other properties of triangles and use these properties to find unknown elements of a triangle;
- appreciate the rotational symmetry of various shapes and figures;
- read simple maps and construct own maps like home to school, map of her village, house etc.;
- establish congruence criterion for triangles and circles;
- construct simple triangles when three out of six elements are given (like three sides, two sides and included angle, a side and two angles etc.).

Geometry

Key Concepts	Suggested Transactional Processes	Suggested Learning Resources
Understanding shapes: ☛ Pairs of angles (linear, supplementary, complementary, adjacent, vertically opposite) ☛ Properties of parallel lines with transversal (alternate, corresponding, interior, exterior angles) **Properties of triangles:** ☛ Angle sum property ☛ Exterior angle property ☛ Pythagoras Theorem (Verification only)	▷ Revising previous concepts learnt by children. ▷ Building on children's previous learning ▷ Using diagrams to help children in visualizing the relationship between various pairs of angles when a transversal cuts two lines (parallel and non-parallel), angles of triangle and relationship among its sides. ▷ Involve children in experimentation with measurement of sides of right angled triangles and recognition of pattern to hypothesize the Pythagorean relation. ▷ Conducting activities with children that are given in textbooks (paper folding and observing diagrams) and encouraging them to visualize symmetry and criterion for rotational symmetry of various shapes.	▷ Maths Kit ▷ Geoboard with rubber band ▷ Geometry box

| Geometry		
Key Concepts	**Suggested Transactional Processes**	**Suggested Learning Resources**

➤ **Symmetry**
  ☛ Recalling reflection symmetry
  ☛ Idea of rotational symmetry, observations of rotational symmetry of 2-D objects. (90^0, 120^0, 180^0)
➤ **Representing 3-D in 2-D***:*
  ☛ Identification and counting of vertices, edges, faces, nets (for cubes cuboids, and cylinders, cones).
  ☛ Mapping the space around approximately through visual estimation.
➤ **Congruence**
  ☛ Congruence through superimposition
  ☛ Extend congruence to simple geometrical shapes e.g. triangles, circles.
  ☛ Criteria of congruence
➤ **Construction**
  ☛ Construction of a line parallel to a given line from a point outside it
  ☛ Construction of simple triangles.
	➤ Assigning group work to children with traced copies of various shapes and superimposing one above the other help them in establishing congruence criterion.
	➤ Adopting exploration, problem-solving and hands-on experiences with children, to engage in discussions and activities with them that address many of the dimensions of geometry (spatial relationships, properties of geometric figures, constructions, geometric modelling, geometric transformations, coordinate geometry, the geometry of measurement, informal geometric reasoning, and geometric connections to the physical world).
	➤ Teachers will explore two- and three-dimensional shapes, paper folding and origami, tessellations and geometric designs, and the use of other manipulatives to develop geometric understanding.
	Through these activities, it is anticipated that teachers will develop new techniques that are sure to enhance student achievement in their classroom.	

Skill: Identify, visualise and quantify measures of shapes and objects

Theme 5: Mensuration

This theme will focus on developing children's understanding and ability on measurement of area, volume and capacity. This begins with children finding rules/ forming formulae for standard figures like cube, cuboid, cylinder etc. The major focus will be on finding the area of 2-D shapes and surface area of 3-D shapes. It is also expected that children will be able to learn to write measurement in smaller and larger units with conversion.

Learning Outcomes:

Children will be able to:

- measure approximate area of simple regular and irregular closed shapes by using unit square grid sheet;
- form formulae to find area of the region enclosed in a rectangle and a square as a better way of counting the number of unit squares that fill them completely.

Mensuration

Key Concepts	Suggested Transactional Processes	Suggested Learning Resources
▶ Revision of perimeter and Idea of Circumference of Circle ▶ Area ☛ Concept of measurement using a basic unit area of a square, rectangle, triangle, parallelogram and circle, rings and combined figures.	▶ Revising previous concepts learnt by children. ▶ Building on children's previous learning ▶ Involving children in activities targeted to measurement of region enclosed by closed figures on a plan surface and encouraging them to come to the conclusion that a unit is required. ▶ Conducting activities related to measuring units squares within a figure drawn on a square grid and to compare the various regions.	▶ Maths Kit

Theme 6: Data Handling

Finding a representative value for a given set of observations called data is a necessary requirement in most of the daily life situations, like one number for heights of the children in a class, number of children in a class when numbers of total children in all classes of the school is known etc. This theme aims at developing children's understanding about the meaning and use of averages like mean, median and mode of simple data not having more than 15 observations. They will also be able to represent data as bar graphs and interpret them.

Learning Outcomes:

Children will be able to:

- find various representative values (Mean, Median and mode) for simple data from her daily life;
- represent data by simple bar graphs and interpret them.

Data Handling

Key Concepts	Suggested Transactional Processes	Suggested Learning Resources
- Collection and organisation of data – choosing the data to collect for a hypothesis testing - Mean, median and mode of ungrouped data – understanding what they represent - Constructing and interpreting bar graphs - Feel of probability using data through experiments. Notion of chance in events like tossing coins, dice etc. Tabulating and counting occurrences of 1 through 6 in a number of throws. Comparing the observation with that for a coin. Observing strings of throws, notion of randomness.	- Revising previous concepts learnt by children. - Building on children's previous learning - Utilizing children's daily life experiences and contextual problems to test hypothesis by collection and organization of data. Situations like finding a representative value to data help in understanding the idea of finding mean, median and mode of ungrouped data. Staring with small sets of numbers will be easier to visualize and represent it by bar graphs. - Involving children in drawing inferences for future events from the existing data	- Maths Kit

Integration: Arts Education

Life Skills: Understanding and interpreting data, drawing inferences