

MATHEMATICS

Theme 1: Numbers

The basis of understanding multi digit numbers lies in the understanding of the place value system. Thus, it is important to start with the concept of place value through manipulatives like place value cards, spike abacus, unifix cubes and expanded and short form of numbers in class. International system of numeration is different than the one used in India. Children will understand that the difference lies in the process of grouping the digits called periods. They should be able to relate to various types of numbers learnt earlier i.e. counting numbers, common fractions and decimal fractions. A clear understanding about the relationship among these numbers will help them in further using these for problem solving strategies. Providing opportunities of using these in different contexts (familiar and unfamiliar) are important to develop strategies to deal with them.

Learning Outcomes:

Children will be able to:

- ✎ acquire understanding of 6 digit numbers and their use in daily life;
 - ☛ read and write numbers up to 6 digits (lac) using Indian system of writing large numbers;
 - ☛ use place value to write a number in expanded form and vice versa;
 - ☛ compare numbers using place value and arranges them in ascending and descending order
 - ☛ use the given 6 digits to form the greatest and smallest number;
 - ☛ represent numbers (up to 39) by Roman Numerals:
- ✎ work with fractions:
 - ☛ identify half, one-fourth, three-fourths in a given picture (by paper folding) and also in a collection of objects.
 - ☛ represent fractions as half, one-fourth and three-fourths by using symbols $\frac{1}{2}$, $\frac{1}{3}$, $\frac{3}{4}$ respectively.
 - ☛ show the equivalence of $\frac{1}{2}$ and $\frac{2}{4}$ and other fractions.

Numbers		
Key Concepts	Suggested Transactional Processes	Suggested Learning Resources
<ul style="list-style-type: none"> ➤ 6 digits numbers (up to lac) using the Indian system of numeration. ➤ Place value and face values. ➤ Ascending and descending order of numbers. ➤ Greatest and smallest numbers from given digits. ➤ Roman Numerals using symbols I, V and X. ➤ Fractions as part of a whole and their representation as 	<ul style="list-style-type: none"> ➤ Providing opportunities to children to collect and discuss real-life context in which numbers up to a lac are used e.g. making large payments, huge crowd. etc. ➤ Building on previous learning by providing opportunities for application of place value learnt in previous classes by expanding it based on patterns. 	<ul style="list-style-type: none"> ➤ 5-6 sets of number cards from 0-9 to make 6 digit numbers. ➤ Cuttings from newspaper/ magazines about large numbers.

Numbers

Key Concepts	Suggested Transactional Processes	Suggested Learning Resources
<p>number.</p> <ul style="list-style-type: none"> ➤ Types of fractions: Like, unlike, unit, equivalent. ➤ Visual idea of equivalent fractions like $\frac{1}{2}, \frac{2}{4}, \frac{3}{6}, \dots$ ➤ Addition of subtraction of like fractions. 	<ul style="list-style-type: none"> ➤ Conducting activities so that children compare numbers using place value based and creating number sequence in ascending and descending order. ➤ Creating games/activities using number cards (0-9) to form 6 digit numbers (e.g. A number which has 8 at thousandth place & so on). ➤ Forming questions on the greatest and smallest numbers should be discussed with the strategy to do so. ➤ Introducing numerals from other Indian languages along with Roman numerals. 	

Theme 2: Number Operations

This theme aims at children gaining a broader and deeper understanding of the standard algorithms by having many and varied opportunities to use concrete materials such as place-value charts, unifix cubes and base ten blocks in problem-solving situations. The use of these tools will greatly enhance children's exploration of addition, subtraction, and multiplication involving regrouping, and multi digit division. Teaching the standard algorithms through problem solving using manipulatives will help children develop their conceptual understanding of the standard algorithms. Once children have a thorough understanding of the standard algorithms, it will enable them to work flexibly with algorithms and determine when their use is appropriate.

Learning Outcomes:

Children will be able to:

- ✍ apply operations of numbers in daily life;
- ✍ add and subtract numbers (up to 4 digits) with or without regrouping;
- ✍ solve problems involving addition and subtraction in different real life contexts presented through visuals and stories;
- ✍ construct and write multiplication table up to 10;
- ✍ multiply two and three digit numbers using standard algorithm and lattice algorithm;
- ✍ divide a given number by another number (single digit) by drawing dots and grouping, using multiplication facts and by repeated subtraction;
- ✍ apply four operations-addition, subtraction, multiplication and division in solving real life situations;
- ✍ frame word problems based on a mathematical statement;
- ✍ estimate sum differences and products of two or more given numbers without using paper/pen;
- ✍ multiply 2 and 3 digit numbers;
- ✍ divide a number by another number using different methods such as:
 - ✍ pictorially (by drawing dots)
 - ✍ equal grouping
 - ✍ repeated subtraction
 - ✍ establishing an inter-relationship between division and multiplication
- ✍ create and solve simple real life situations/ problems related to money, length, mass and capacity by using the four operations.

Number Operations		
Key Concepts	Suggested Transactional Processes	Suggested Learning Resources
<ul style="list-style-type: none"> ➤ Addition and subtraction of numbers (up to 4 digits) with or without regrouping. ➤ Construct of multiplication table up to 10. 	<ul style="list-style-type: none"> ➤ Creating real life contexts involving addition/subtraction of 4 digit numbers Text based stories such may be used to practice solving such problems. ➤ Encouraging and facilitating children to develop multiplication tables 	<ul style="list-style-type: none"> ➤ Wooden sticks to demonstrate multiplication table. ➤ Napier sticks for multiplication. ➤ Geoboard and rubber band. <i>(to demonstrate</i>

Number Operations

Key Concepts	Suggested Transactional Processes	Suggested Learning Resources
<ul style="list-style-type: none"> ➤ Multiplication of two and three digit numbers using standard algorithm and lattice algorithm. ➤ Division in single digit another numbers. ➤ Application of four operations-in solving real life situations. ➤ Word problems based on a mathematical statement. ➤ Estimation of sum, differences and products of two or more given numbers and mental verification. 	<p>rather than learning by rote.</p> <ul style="list-style-type: none"> ➤ Introducing standard algorithm initially with one number in expanded form so that better understanding of standard algorithm is developed e.g. $23 \times 3 = (20+3) \times 3 = 20 \times 3 + 3 \times 3$. ➤ Using repeated subtraction to create intuitive understanding of the division algorithm. ➤ Encouraging children to create real life contextual problems based on mathematical operations (not more than two at a time) and solving them. ➤ Involving children in estimating sum/differences of two numbers to do calculation mentally. ➤ Demonstrating the estimation of sum, difference of two numbers by using the Geoboard and rubber band. 	<p><i>estimation of sum, difference of two numbers.)</i></p>





Life Skills: solving daily life problems

Theme 3: Playing with Numbers

The theme will promote children's exploration with various facts and properties of counting numbers which lead to many important aspects of the use of mathematics in daily life activities. It will encourage children to work with numbers, identify the patterns and make general rules. The concepts like factors, multiples, common factors and multiples lead to classification of numbers into various interesting groups. Children will be encouraged to work in groups to generalize their explorations about number properties and enjoy working with numbers.

Learning Outcomes:

Children will be able to:

-  find out factors, prime factors and multiple of numbers;
-  understand prime and composite numbers;
-  understand divisibility by numbers;
-  calculate HCF & LCM of numbers.

Playing with Numbers		
Key Concepts	Suggested Transactional Processes	Suggested Learning Resources
<ul style="list-style-type: none"> ➤ Factors. ➤ Multiples. ➤ Prime and composite numbers. ➤ Test for divisibility by 2, 3, 4, 5, 9, 10. ➤ Prime factors- By Factor tree method and Prime Factorization Method. ➤ Highest common factor-listing method and Common Division. ➤ Lowest Common Multiples- Listing Method, Common Division. 	<ul style="list-style-type: none"> ➤ Encouraging children to understand factors of given number. ➤ Conducting activities in the class so that children use multiplication table for understanding multiplication facts. ➤ Encouraging children to first calculate common factors and then to find the highest common factor. ➤ Guiding children to calculate common multiples and then naming the smallest of them as lowest common multiples. 	<ul style="list-style-type: none"> ➤ Wooden sticks. ➤ Match sticks. ➤ Broom sticks.

Theme 4: Geometry

In the primary grades, learning of mathematics encourages children to focus on geometric features of two-dimensional shapes and three-dimensional figures. Instructional activities provide opportunities for children to manipulate, compare, sort, classify, compose, and decompose these geometric forms. These types of activities help children to identify and to informally describe some attributes and geometrical properties of two-dimensional shapes and three-dimensional figures. In the teaching learning process children continue to learn about the properties of two-dimensional shapes and three-dimensional figures through hands-on explorations and investigations.

Learning Outcomes:

Children will be able to:

- ✎ acquire an understanding about shapes around them;
- ✎ identify the centre, radius and diameter of a circle;
- ✎ find shapes that can be used for tiling;
- ✎ draw cube/ cuboids using the given nets;
- ✎ show through paper folding/ paper cutting, ink blots, etc., the concept of symmetry by reflection;
- ✎ draw top view, front view and side view of simple objects;
- ✎ observe, identify and extend geometrical patterns based on symmetry;
- ✎ represent the collected information in tables and bar graphs and draws inferences from these;
- ✎ use tangrams to create different shapes;
- ✎ tile a given region using one and more than one shape;
- ✎ draw a circle-free hand, using a round object or a compass and identify centre, radius, diameter;
- ✎ explore reflective symmetry through ink blots paper cutting and paper folding;
- ✎ explore the area and perimeter of simple shapes;
- ✎ intuitively draw the plan, elevation and side view of different objects based on observation.

Geometry		
Key Concepts	Suggested Transactional Processes	Suggested Learning Resources
<ul style="list-style-type: none"> ➤ Tangram shapes ➤ Tessellation: Tiling using one and more shapes ➤ Circle: Centre, radius, diameter. ➤ Relation between diameter and radius of a circle ➤ Reflection symmetry ➤ Area and perimeter of simple shapes. 	<ul style="list-style-type: none"> ➤ Using tangrams to create intuitional understanding of physical attributes of different 2D shapes. ➤ Providing concrete shapes (created or procured) to children in groups to cover a surface with no gaps and overlapping using one or two shapes. Discussion on which shapes tile and why or vice versa may be done. ➤ Conducting paper folding activities 	<ul style="list-style-type: none"> ➤ Tangrams of 7 pieces. ➤ Cardboards, tape cutters, glue sticks (for <i>creating tiles of different shapes</i>) ➤ Colour paper, ink markers, scissors. ➤ Circular geoboard and rubber band.

Geometry

Key Concepts	Suggested Transactional Processes	Suggested Learning Resources
<ul style="list-style-type: none"> ➤ Perspectives of shapes: Plan, elevation and side view. ➤ Introduction of terminology: Plane, point, line, line segment, ray, parallel. ➤ Lines, intersecting and perpendicular lines. 	<p>will go a long way to create a deeper understanding of a circle and various vocabulary related to it.</p> <ul style="list-style-type: none"> ➤ Discussing symmetry in daily life context before introducing reflection symmetry. ➤ Conducting individual activities so that child has experiential learning about symmetry and line of symmetry. ➤ Creating activities for drawing the plan, elevation and side view of 3 D objects. ➤ Conducting quizzes to create an understanding of the different views of objects, houses, places etc. For example, showing top view of a chair or table and asking to guess what this object is. 	

Integration: Arts Education

Theme 5: Measurement

In this theme children will not only learn direct measurement but also develop the understanding of indirect measurements of time and temperature. These cannot be measured directly they require instruments that indirectly translate evidence of their presence into a measurable form. Children will be made aware about this. Previous learning had initiated children the learning of direct measurement i.e., by applying a unit directly to the object being measured. For example, to measure length, area or volume a specific unit is required. Selecting a unit is an arbitrary act and the units used are only conventions accepted by all to bring in uniformity for measurement.

Learning Outcomes:

Children will be able to:

- ✘ convert meters into centimeters & vice versa;
- ✘ solve problems involving lengths & distances in daily life contexts;
- ✘ use estimation and verification to find out the distance between two locations;
- ✘ use a balance to weigh different objects using standard weight like grams, kilograms etc. to different objects;
- ✘ estimate and verifies the weights of different objects using a balance;
- ✘ measure volume of different containers using containers marked with standard units of multi-litre and litre;
- ✘ correlate different units of standard measurement like millilitre and litre with different objects;
- ✘ estimate & verifies capacities of different containers by measurement;
- ✘ explore the area and perimeter of simple geometrical shapes (triangle, rectangle, square) in terms of given shape as a unit like the number of books that can completely fill the top of a table;
- ✘ convert metre into centimetre and vice-versa;
- ✘ estimate the length of an object/distance between two locations, weight of various objects, volume of liquid, etc., and verifies them by actual measurement;
- ✘ solve problem involving daily life situations related to length, distance, weight, volume and time involving four basic arithmetic operations;
- ✘ read clock time in hour and minutes and expresses the time in a.m. and p.m.;
- ✘ relate 24 hr clock with respect to 12 hr clock;
- ✘ calculate time intervals/ duration of familiar daily life events by using forward or backward counting/addition and subtraction.

Measurement		
Key Concepts	Suggested Transactional Processes	Suggested Learning Resources
<ul style="list-style-type: none"> ➤ Conversion of units: meters into centimeters grams into kilograms, litre into millilitre & vice versa. ➤ Solve problems involving lengths/distances, weight/ mass, volume/capacity in daily life contexts using four operations. ➤ Estimation and verification of length, weight, volume ➤ Conversion of days, hrs and minutes (Bigger to smaller units and vice versa). ➤ Approximate time elapsed through word problems. 	<ul style="list-style-type: none"> ➤ Organising activities for children to use appropriate units with lengths like smaller lengths using cm and metre/Km for large distances. ➤ Creating real life contexts for solving problems involving various units of lengths. ➤ Emphasizing on estimation skills and its development through activities. ➤ Creating contexts in which children use standard weights to find out the weights of different objects. ➤ Asking children to have collection of containers/pouches so as to discuss different things which are measured in milliliters and liters. Some of these containers may be used in conjunction with standard measures. ➤ Using of toy clocks/ prepared by children or other clocks in the classroom or at home to read time in hours, minutes and seconds. 	<ul style="list-style-type: none"> ➤ Measuring flasks with different markings for measurement. ➤ Shapes of cube, cuboid. ➤ Toy clock prepared by children (<i>to read time in hours, minutes, seconds</i>).

Integration: Science (Measurement)

Life Skills: solving daily life problems

Theme 6: Data Handling

This theme will enable children to discover and learn varied mathematical ways of collecting and using information. In this class, the emphasis is given to more efficient ways of representing data by pictures and graphs. The reading and interpretation of graphs is further enhanced to inculcate the data handling skills. Children will also be encouraged to draw their own graphs and pictures for the data collected by them as they will be in a better position to do so.

Learning Outcomes:

Children will be able to:

- represent collected data in pictographs using stickers, pictures etc.;
- read bar graphs and make observations based on more or less.

Data Handling		
Key Concepts	Suggested Transactional Processes	Suggested Learning Resources
<ul style="list-style-type: none">Pictorial representation of the raw data.Interpretation of bar graph.	<ul style="list-style-type: none">Taking up data handling activities (slightly more complex) for representation in different graphical forms.Asking children to do simple graphical data representation from newspapers/magazines and interpreted in the class along with discussions on it.Organising group projects involving children in focusing on collecting data, interpreting it and then pictorially representing the same in terms of a bar graph.	<ul style="list-style-type: none">Coloured papers, glue sticks, markers, stickers of different objects.Cuttings of pictographs, bar charts, etc. from newspapers, magazines.Videos and PPTs (of simple data, findings that are presented in graphs).

Integration: Arts Education

Life Skills: Interpretation and analysis

Theme 7: Patterns

The aim of this theme will be to make children aware of and practice how to find patterns, extend them and express in various ways thereby enabling them to initiate the process of thinking towards generalizations which is termed as algebra in upper primary classes. The decimal system (base 10 place value system) has its base on patterns and their further extension from one to tens to hundreds to thousands Similarly, characteristics of shapes and figures are generalized on the basis of patterns.

Learning Outcomes:

Children will be able to:

- observe and identify patterns with more than one characteristic, like growing and reducing patterns;
- create a rule based on observations for extending the pattern in shapes and numbers.

Patterns		
Key Concepts	Suggested Transactional Processes	Suggested Learning Resources
<ul style="list-style-type: none">▶ Growing and reducing patterns.▶ Rule to extend a growing/reducing pattern in shapes and numbers.	<ul style="list-style-type: none">▶ Planning activities around patterns in which children are able to formulate a rule and verify it for the extension of pattern.	<ul style="list-style-type: none">▶ Shapes, coloured papers, stamping tools, stamp pads, ink, water colours, vegetables etc.

Integration: Arts Education

Life Skills: Logical thinking