

LEARNING INDICATORS UP TO CLASS III

Curricular Expectations:

During the learning of mathematics from class I to III child is expected to:

- Count and understand numeration system
- Learn conventions needed for mastery of mathematical techniques such as the use of a base ten system to represent numbers
- Perform simple computations in her/his own ways up to three digit numbers and apply these to their day to life activities in different contexts
- Understand and use standard algorithms to perform operations of addition, subtraction, multiplication and division on numbers up to three digits
- Learn vocabulary of relational words to extend her/his understanding of space and spatial objects
- Identify and extend simple patterns starting from repeating shapes to patterns in numbers
- Collect, represent and interpret simple data/information in her/his daily life activities

CLASS I

Conceptual Area	Pedagogical Processes	Learning Indicators
<p>SHAPES AND SPATIAL UNDERSTANDING</p> <p>Familiarity with spatial relationships like top- bottom; on-under; inside- outside; etc.</p>	<ul style="list-style-type: none"> • Interaction is to be done with children on introducing the new vocabulary of spatial terms, for example, telling small stories/poems having the vocabulary related to spatial terms with lot of interaction with the children. Utilizing child's experiences outside the classroom • Games within groups of children to find hidden treasure by providing clues in spatial terms like on the top of the table but below the book, fish inside the jar etc. 	<ul style="list-style-type: none"> • Displays understanding of spatial relationships (top- bottom, inside- outside; above- below; big- small; near- far; thin- thick; before-after; above- below etc.) in given surroundings/situations and uses vocabulary for describing .
<p>NUMBERS AND NUMBER OPERATIONS</p>	<ul style="list-style-type: none"> • Engaging children in activities targeted to manipulation of concrete objects (locally 	<ul style="list-style-type: none"> • Devises ways of collecting and counting the given number of objects like pebbles, seeds, leaves, etc

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<p>Counts, Recognizes, Reads and writes numerals for numbers up to 99</p> <p>Adds and subtracts single digit numbers</p>	<p>available) to develop pre number concepts like sorting, classification, sequencing and one- to-one correspondence.</p> <ul style="list-style-type: none"> • Involving children in reading numbers written on a number chart and other places in and outside classroom • Activities and games aimed at associating a spoken or written number with appropriate number of objects, drawn from a collection. • Organise group activities to compare number of objects in two collections by one-to-one correspondence. Children should be encouraged to find their own ways of comparing the collections e.g. using the sequential order of numbers. 	<p>from her immediate environment and expresses the number as per her own understanding.</p> <ul style="list-style-type: none"> • Attempts to read and write any given number (up to 99) and associate a given collection with a number and vice-versa. • Demonstrates strategies of comparing two numbers e.g. matching one to one, using sequential order of numbers, using size of a number etc. • Describes ways of combining two collections to find the sum of numbers • Demonstrates her ways of finding difference between two numbers
<p>Solves problems using Addition and Subtraction of single digit numbers</p>	<ul style="list-style-type: none"> • Involve children in reading given problems and discussing what is given, what is to be found. Let children work out their strategies to find the unknown from the known. 	<ul style="list-style-type: none"> • Analyses and describes simple contextual problem in mathematical terms and finds the given and unknown data. • Finds the strategies to reach unknown from the known • Solves problems using addition and/or subtraction
<p>Basic idea of multiplication</p> <p>Understands concept of division</p>	<ul style="list-style-type: none"> • Creating situations and context where a number is to added repeatedly like 2 cookies to be given to each of 4 friends, etc. • Encouraging children to discover some other 	<ul style="list-style-type: none"> • Shows difficulty in expressing repeated addition and appreciates the use of multiplication for repeated addition • Explores the multiplication facts of 2,3,4 and 5 by

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	<p>method of writing repeated addition</p> <ul style="list-style-type: none"> • Providing small hints to reach to the situation where child says $2+2+2+2$ can also be called as 4 times 2. • Activities to develop multiplication facts (times tables) by repeated addition and later on by observing patterns • Creating situations of equal sharing/grouping of objects and exploring ways of describing it in mathematical way. 	<p>different ways like repeated addition, skip counting, identifying and continuing pattern $1 \dots$</p> <ul style="list-style-type: none"> • Explores ways of equal grouping /sharing /distribution
<p>Money</p> <p>Identifies currency notes and coins</p>	<ul style="list-style-type: none"> • Using childø vocabulary and understanding about money from home and out of school experiences. • Involving children in groups and/or individually to make play currency notes of different denominations. A set of such actual notes can be shown to them for the activities. • Creating simple selling and buying situations in classroom and let children play with their play money. 	<ul style="list-style-type: none"> • Demonstrates use of numbers in identifying and making currency notes of different denominations • Attempts to make small amounts of money by using notes of different denominations in different ways
<p>Measurement:</p> <p>Idea of length and distance</p>	<ul style="list-style-type: none"> • Organising discussions among children focusing on need o measure various things including lengths and distances and other quantities 	<ul style="list-style-type: none"> • Describes and justifies length and distances of common objects in her own language

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	<ul style="list-style-type: none"> • Providing hints during discussions so that children can appreciate that a unit is required for measuring anything. • Creating situations when children get opportunities to measure in their own ways and resolve conflicts, if any, aroused due to use of non uniform units. • Involving children in devising various units that can remove the confusion and be used by all in a particular context. • Encouraging children to make out their meaning about the standard units of measurement they have in their vocabulary like a liter of water, kilogram, meter, kilometer etc. 	<ul style="list-style-type: none"> • Attempts to resolve conflicts on lengths/distances by using body parts like hand span etc.(non standard units). • Devises ways of making uniform units for measuring length/distances. • Uses her vocabulary to appreciate meter as a standard (uniform) unit of length. • Demonstrates ways of measuring smaller distances using a meter scale • Appreciates the division of one meter into centimeters to measure relatively smaller lengths
<p>Mass</p> <p>Weighs objects using non-standard units</p> <p>Appreciates need for standard unit of measuring marks</p>		<ul style="list-style-type: none"> • Describes ways of comparing and quantifying mass(es) of common objects • Uses simple balance to compare weights of common objects • Uses non-standard units like small stones and other such objects available in child's vicinity • Understands that objects with different shapes and sizes may have same weights.

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<p>Volume</p> <p>Idea of more/less capacity of different containers</p>		<ul style="list-style-type: none"> • Estimates capacities of different containers and tries to order them as per their capacities • Shows the ability to compare the capacities of different containers in terms of non-standard units (like mugs, spoons etc.)
<p>Time</p> <p>Gets familiar with the days of the week and months of the year</p>	<ul style="list-style-type: none"> • Organising discussions and short stories on the vocabulary children have about time and calendar • Creating situations where children are encouraged to describe their experiences in terms of daily routine activities like from waking up in morning till sleeping in the night. 	<ul style="list-style-type: none"> • Attempts to narrate the activities of a day in sequence, distinguishing time of events using her own vocabulary for earlier and later • Shows the understanding of shorter and longer duration of different activities performed or to be performed • Describes he names of days of a week and months in a year
<p>Data Handling</p> <p>Collects, represents and interprets simple data</p>	<ul style="list-style-type: none"> • Organising activities and providing opportunities to record information in numbers and to draw inferences or make decisions out of it. For example, in organizing a New Year party, how many pieces of different types would be required for class de coration. 	<ul style="list-style-type: none"> • Attempts to record information in her own ways. • Participates in discussions with others to draw inferences from the recorded information

CLASS II

Conceptual Area	Pedagogical Processes	Learning Indicators
<p>SHAPES AND SPATIAL UNDERSTANDING</p> <p>Classifies shapes on the basis of their properties .</p>	<ul style="list-style-type: none"> • Conduct plays and games with children on identification and classification of shapes around them like round that role, slide that are sliding etc. 	<ul style="list-style-type: none"> • Displays understanding of 3-D shapes around her in terms of their physical properties
<p>Sorts, classifies and describes 2-D and 3-D shapes</p>	<ul style="list-style-type: none"> • Discussing various shapes (2-D and 3-D) available in the surroundings of the child and their characteristics by involving children in identification of the specific characteristics of every shape. • Conducting individual and group activities on sorting things from a given collection of objects (from NCERT mathematics kit, if available in the school or taking things from the child's vicinity). The sorting can be done on the basis of observable properties like color, shapes or size, taking one at a time. • Drawing child's attention towards various similarities and differences in two and three dimensional shapes while they are sorting and classifying them. This will help them in associating various shapes with names like squares, rectangles, triangles, cube, cuboids, cone, cylinder, sphere etc. 	<ul style="list-style-type: none"> • Shows understanding by naming 2-D shapes like square, rectangle, triangle and circle and also discovers their observable properties. • Indicates understanding of 2-D shapes on the basis of number of sides, corners and diagonals, straight and curved edges etc. • Demonstrates shapes like book, glass, bottle, chalk box, ball as 3-D shapes and gradually attempts to associate them with standard names like cuboids, sphere, cone, cylinder • Explores observable properties of 3-D shapes like flat and curved surface, edges, corners etc. • Groups objects on the basis of shapes (cones, cylinder, cubes, balls etc.) and other observable properties. • Demonstrates her ability to differentiate between 2-D shapes (like square, rectangle etc.) and 3-D shapes (cone, cylinder, sphere etc.)
<p>Understands the concept of straight and curved lines</p>	<ul style="list-style-type: none"> • Child sees lot of straight lines in their surrounding. Conduct group activities to classify lines as sleeping (horizontal) , slanting (oblique) and standing 	<ul style="list-style-type: none"> • Classifies lines as slanting, sleeping and standing • Cites different examples to show the understanding of

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	<p>(vertical) lines. Child actually draws such lines in their drawings</p> <ul style="list-style-type: none"> • Giving idea of straightness and curvedness from the objects like edge of a tumbler, edge of a book/notebook, table etc. • Conducting activities involving children in drawing straight and non straight lines by tracing the edge on paper. • Engaging children in making sceneries, pictures and drawings, focusing on shapes made up of straight and curved lines 	<p>difference between straight and curved lines</p> <ul style="list-style-type: none"> • Make free hand drawing of horizontal, vertical and slant lines.
<p>NUMBERS AND NUMBER OPERATIONS</p> <p>Counts, Recognizes, Reads and writes numerals for numbers up to 99</p>	<ul style="list-style-type: none"> • Involving children in reading numbers written on a number chart and other places in and outside classroom • Activities and games aimed at associating a spoken or written number with appropriate number of objects, drawn from a collection may be organized in groups of tens and ones • Organise group activities to compare number of objects in two collections by one-to-one correspondence. Children should be encouraged to find their own ways of comparing two numbers e.g. using the sequential order of numbers, number of tens and ones in them etc. 	<ul style="list-style-type: none"> • Attempts to read and write any given number (up to 99) and associate a given collection (arranged in tens and ones) with a number and vice-versa. • Demonstrates strategies of comparing two numbers e.g. matching one to one, using sequential order of numbers, using size of a number etc.

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<p>Understands place and face value of digits in a number.</p> <p>Understands zero as a place holder and as a number</p> <p>Recognizes patterns in numbers and shapes</p>	<ul style="list-style-type: none"> • Engaging child in activities of counting large number of objects from her surroundings. Encourage them to make equal groups while counting. After building an adequate understanding of grouping objects in tens and ones, involve them in writing the number. • Conducting group activities in the class so that children are involved in breaking a number in tens and ones like in 17 the digit 1 shows 10 so $17=10+7$; 20 has two tens and the no units. 	<ul style="list-style-type: none"> • Appreciates the place value system as a system of grouping objects while counting • Describes her understanding about value of digits in a given number. • Devises ways of writing a number when a group (tens or ones) is missing. • Answers question like what happens when a number is subtracted from itself? When some items are consumed one after the other, how many are left when last is also consumed? • Child attempts to show that zero is the number representing absence of some item in a group. • Writes a number in expanded form in her own ways like 53 can be $50+3$ or $3+50$ or $40+10+3$ etc.
<p>Adds and subtracts two digit numbers (with and without regrouping)</p>	<ul style="list-style-type: none"> • Engaging child in exploring the situations where addition and subtraction of numbers is required like, combining two groups, enlarging a given group by adding some more items etc. • There are a lot of situations in child's daily life 	<ul style="list-style-type: none"> • Devises her own ways to add two 2-digit numbers. Later on uses algorithms for addition of numbers • Develops her strategies to add and/or subtract a numbers from a two digit number. • Uses different algorithms to add and subtract numbers

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	<p>where addition of numbers is happens. Involve them in activities and problem solving on addition and subtraction of numbers</p> <ul style="list-style-type: none"> • Conduct discussion with children so that they explore their own ways of addition and subtraction and should be able to develop their algorithms. Avoid unnecessary emphasis on mechanical application of standard algorithms for these operations. • Creating situations where children can use alternative algorithms to find sum and difference. • 	<ul style="list-style-type: none"> • Adds and subtracts two digit numbers in daily life situations
<p>Solves problems involving Addition and Subtractions of two digit numbers</p>	<ul style="list-style-type: none"> • Involve children in reading given problems and discussing what is given, what is to be found. Let children work out their strategies to find the unknown from the known. • Creating situations where addition and/or subtraction of two digit numbers is involved in solving a problem. • Organising selling buying situation in classroom where lot of addition and subtraction of money is involved. • Encouraging children to use alternative strategies for finding total and balance without using pen and paper. 	<ul style="list-style-type: none"> • Analyses and describes a problem involving addition and/or subtraction in terms of mathematical terms and finds the given and unknown data. • Finds the strategies to reach unknown from the known • Solves problems using addition and/or subtraction with and without regrouping. • Uses estimation in verification of sum and difference of two digit numbers • Poses meaningful problems and solves them.

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	<ul style="list-style-type: none"> Encourage children to develop questions/problems on addition and subtraction of two digit numbers. Game can be played within groups of children where in one group designs questions and the other group solves the questions/ problems. 	
<p>Multiplies two numbers</p> <p>Understands concept of division</p> <p>Applies multiplication and/or division to solve conceptual (daily life) problems</p>	<ul style="list-style-type: none"> Creating situations and context where a number is to be added repeatedly like there are five rows and in each row six children are seating ; 2 cookies to be given to each of 7 friends, etc. Activities to write multiplication facts (times tables) by repeated addition and later on by observing patterns Activities to explore ways of multiplying two digit numbers. Avoid telling the standard algorithm at the first instance. Children may devise their ways of multiplying first the tens and then units or other creative ways. Solving large problems on multiplication to master different algorithms and strategies. Creating situations of equal sharing/grouping of objects and exploring ways of describing it in mathematical way. Involving children in discovering their own ways to solve a problem involving division of two digit 	<ul style="list-style-type: none"> Shows difficulty in expressing repeated addition and appreciates the use of multiplication for repeated addition Explores the multiplication facts of 2,3,4 and 5 by different ways like repeated addition, skip counting, identifying, and continuing pattern í . Develops different algorithms to multiply two digit numbers Explores ways of equal grouping /sharing/ distribution Understands division as another way of equal grouping /sharing /distribution

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	numbers	<ul style="list-style-type: none"> • Performs division of a single digit/ double digit number by one digit number by grouping / using multiplication tables
<p>Money</p> <p>Identifies currency notes and coins</p> <p>Puts together amounts of money not exceeding Rs. 50</p> <p>Adds and subtract small amount of money mentally</p> <p>Transacts an amount using 3-4 notes</p>	<ul style="list-style-type: none"> • Using childø's vocabulary and understanding about money from home and out of school experiences initiate discussion on they transact money to purchase things • Involving children in groups and/or individually to make play currency notes of different denominations. A set of such actual notes can be shown to them for the activities. • Creating simple selling and buying situations in classroom and let children play with their play money. • Providing small hints to solve situations of transacting money and finding balances • Encouraging children to make estimates of how much money required, what will left etc. and then to actually verify their estimates. Discussions may be held within and across the groups to find out the ways to refine their estimates. • Encouraging children to be critical observers of money transactions while they accompany parents and others for shopping. 	<ul style="list-style-type: none"> • Demonstrates use of numbers in identifying and making currency notes of different denominations • Appreciates the use of money in day-to-day buying and selling situations • Attempts to make small amounts of money by using 3-4 notes of different denominations in different ways • Describe ways to find balance amount out of a given amount after the purchase of about 50 rupees • Estimates/approximates the money required and money obtained in balance in simple buying situations.

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<p>Measurement: Length</p> <p>Measures lengths and distances</p> <p>Relates centimeters and meters</p>	<ul style="list-style-type: none"> • Organising discussions among children to showcase their understanding about measuring various things including lengths and distances and other quantities • Providing hints during discussions so that children can appreciate that a unit is required for measuring anything. • Creating situations when children get opportunities to measure in their own ways and resolve conflicts, if any, aroused due to use of non uniform units. • Involving children in devising various units that can remove the confusion and be used by all in a particular context. • Encouraging children to make out their meaning about the standard units of measurement they have in their vocabulary like a liter of water, kilogram, meter, kilometer etc. 	<ul style="list-style-type: none"> • Describes and justifies length and distances of common objects in her own language • Attempts to resolve conflicts on lengths/distances by using body parts like hand span etc.(non standard units). • Devises ways of making uniform units for measuring length/distances. • Uses her vocabulary to appreciate meter as a standard (uniform) unit of length. • Demonstrates ways of measuring smaller distances using a meter scale • Appreciates the division of one meter into centimeters to measure relatively smaller lengths
<p>Mass</p> <p>Weighs objects using non-standard units</p> <p>Appreciates need for standard unit of measuring marks</p>	<ul style="list-style-type: none"> • Conducting activities within classroom so that children get opportunity to compare the amount of liquid two or more containers have and then arranges these containers in ascending or descending orders of their capacities. 	<ul style="list-style-type: none"> • Describes ways of comparing and quantifying mass(es) of common objects • Designs and uses simple balance to compare weights of common objects • Uses non-standard units like small stones and other such objects available in child's vicinity to measure mass/weight of small objects. • Understands that objects with different shapes and

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<p>Volume</p> <p>Measures and compares the capacity of different containers using non-standard units</p>		<p>sizes may have same weights.</p> <ul style="list-style-type: none"> • Estimates capacities of different containers and tries to order them as per their capacities • Shows the ability to compare the capacities of different containers in terms of non-standard units (like mugs, spoons etc.)
<p>Time</p> <p>Gets familiar with the days of the week and months of the year</p> <p>Gets a feel for sequence of seasons varying locally.</p> <p>Sequences the events occurring over longer periods in terms of dates/days</p>	<ul style="list-style-type: none"> • Organising discussions and short stories on the vocabulary children have about days in a week and names of months • Creating situations where children are encouraged to describe their experiences in terms of daily routine activities like from waking up in morning till sleeping in the night. • Encourage children to tell the time elapsed, time required to complete a task etc. in terms of their own units like number of claps, 	<ul style="list-style-type: none"> • Attempts to narrate the activities of a day in sequence, distinguishing time of events using her own vocabulary for earlier and later • Shows the understanding of shorter and longer duration of different activities performed or to be performed • Uses her experiences and talk of the people around him to express sequence of seasons in her own situation/environment

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<p>Data Handling</p> <p>Collects, represents and interprets simple data</p>	<ul style="list-style-type: none"> • Organising activities and providing opportunities to record information in numbers and to draw inferences or make decisions out of it. For example, in organizing a New Year party, how many pieces of different types would be required for class decoration? • Involving children in discussion to highlight the importance of recording of information • Creating situations such that child uses her ways to record and present the information in a meaningful manner. • Giving opportunities to children for exploring ways of recording and presenting data and draw inferences from the data. 	<ul style="list-style-type: none"> • Attempts to record information in her own ways like number of different types of fruits required the picnic day • Participates in discussions with others to draw inferences from the recorded information • Devises ways to present the recorded information in such a way that its interpretation can be made simpler
<p>Patterns</p> <p>Observes and extends patterns in sequence of shapes and numbers</p> <p>Identifies patterns</p> <p>Creates simple patterns by stamping, thumbprints, leaf prints etc.</p>	<ul style="list-style-type: none"> • In all learning of mathematics recognition and extension of patterns is essentially required and used. However, children come across with many interesting patterns in daily life experiences. These are required to be recorded and interpreted. 	<ul style="list-style-type: none"> • Identifies simple patterns right from school activities to home like pattern in coming to school to going back, patterns in numbers and shapes, patters in tiles and designs, etc.

CLASS III

Conceptual Area	Pedagogical Processes	Learning Indicators
<p>SHAPES AND SPATIAL UNDERSTANDING</p> <ul style="list-style-type: none"> • Creates shapes through paper folding, paper cutting • Identifies 2-D shapes • Describing the various 2-D shapes by counting their sides, corners and diagonals • Draw some 3-D objects • Make shapes on the dot-grid using straight and curved lines • Tiles a given region using a tile of a given shape • Distinguishes between shapes that tile and that do not tile 	<ul style="list-style-type: none"> • Conduct activities with individual child and group of 3-4 children for folding paper for more than two types. Let the children discuss and identify the figures that are formed by the crease on opening the paper. • Discussing various shapes (2-D and 3-D) available in the surroundings of the child and their characteristics by involving children in identification of the specific characteristics of every shape. • Drawing child's attention towards various similarities and differences in two and three dimensional shapes while they are sorting and classifying them. This will help them in associating various shapes with names like squares, rectangles, triangles, cube, cuboids, cone, cylinder, sphere etc. • Giving idea of straightness and curvedness from the objects like edge of a tumbler, edge of a book/notebook, table etc. involve children in exploring the other properties of shapes like edges, corners etc. • Conducting activities involving children in drawing straight and non straight lines 	<ul style="list-style-type: none"> • Child identifies rectangles, triangles and other rectilinear shapes formed by the crease of paper on folding it. • Indicates understanding of 2-D shapes on the basis of number of sides, corners and diagonals, straight and curved edges etc. • Demonstrates shapes like book, glass, bottle, chalk box, ball as 3-D shapes and gradually attempts to associate them with standard names like cuboids, sphere, cone, cylinder • Explores observable properties of 3-D shapes like flat and curved surface, edges, corners etc. • Groups objects on the basis of shapes (cone, cylinder, balls etc. as they have curved surface) and other observable properties. • Demonstrates her ability to differentiate between 2-D shapes (like square, rectangle etc.) and 3-D shapes (cone, cylinder, sphere etc.) • Uses different ways of drawing straight line by paper folding, straight edge, straight string with free hand and with free ruler. • Cites different examples to show the understanding of difference between straight and curved lines. • Make free hand drawing of horizontal, vertical and slant lines. • Draws shapes of her liking by using straight and

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	<p>by tracing the edge of a 3-D shape on paper.</p> <ul style="list-style-type: none"> Engaging children in making sceneries, pictures and drawings, focusing on shapes made up of straight and curved lines Conducting activities with children to draw various shapes using a dot grid. 	<p>curved lines on a dot grid</p>
<p>NUMBERS AND NUMBER OPERATIONS</p> <p>Reads and write 3-digit numbers</p> <p>Expands a number using place value</p> <p>Counts in different ways- starting from any number</p> <p>Compares numbers</p> <p>Forms greatest and smallest up to three digit numbers using given digits</p>	<ul style="list-style-type: none"> Involving children in reading numbers written on a number chart and other places in and outside classroom Engaging child in activities of counting large number of objects from her surroundings. Encourage them to make equal groups while counting. After building an adequate understanding of grouping objects in hundreds, tens and ones, involve them in writing the number. Organise group activities to compare number of objects in two collections (having groups of tens and ones) by one-to-one correspondence. Children should be encouraged to find their own ways of comparing the collections e.g. using the sequential order of numbers. 	<ul style="list-style-type: none"> Devises ways of counting the given number of objects by grouping them in groups of 2, 3, 4, .. 10 objects from her immediate environment and expresses the number as per her own understanding. Attempts to read and write any given number (up to 999) and associate a given collection with a number and vice-versa. Demonstrates strategies of comparing two numbers using sequential order of numbers, using size of a number, using the place values of digits etc. Devises ways of writing a number when a group (hundreds, tens or ones) is missing.
<p>Addition and subtraction</p> <p>Adds and subtracts three digit</p>	<ul style="list-style-type: none"> Engaging child in adding and/or 	<ul style="list-style-type: none"> Adds and subtracts 3-digit numbers by using different

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<p>numbers (with and without regrouping) Solves problems using Addition and Subtractions</p>	<p>subtracting two numbers written vertically or horizontally. Let the children devise their own ways of addition by using their understanding of addition on 2-digit numbers</p> <ul style="list-style-type: none"> • There are a lot of situations in child's daily life where addition and subtraction of numbers up to three digits happens. Let the child analyse the given situation and solve it by addition and subtraction. • Involve children in reading given problems and discussing what is given, what is to be found. Let children work out their strategies to find the unknown from the known. • Organising selling buying situation in classroom where lot of addition and subtraction of money is involved using play currency notes up to Rs. 1000 • Encouraging children to use alternative strategies for finding total and balance without using pen and paper. 	<p>strategies like using the concrete objects in bundles of hundreds, tens and ones or by standard algorithms or by her own algorithm but mathematically correct process.</p> <ul style="list-style-type: none"> • Analyses and describes a problem in mathematical terms and finds the given and unknown data. • Finds the strategies to reach unknown from the known • Solves problems using addition and/or subtraction with and without regrouping. • Uses estimation in verification of sum and difference of two/three digit numbers
<p>Multiplication Multiplies two numbers using standard algorithm and lattice multiplication algorithm Understands concept of</p>	<ul style="list-style-type: none"> • Providing small hints to reach to the situation where child says $2+2+2+2+2$ can also be called as 5 times 2. • Activities to write multiplication facts 	<ul style="list-style-type: none"> • Appreciates the use of multiplication for repeated addition

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<p>division</p> <p>Applies multiplication and/or division to solve conceptual (daily life) problems</p>	<p>(times tables) by repeated addition and later on by observing patterns</p> <ul style="list-style-type: none"> • Activities to explore ways of multiplying two digit numbers. Avoid telling the standard algorithm at the first instance. Children may devise their ways of multiplying first the tens and then units or other creative ways. • Solving variety of problems on multiplication to master different algorithms and strategies. 	<ul style="list-style-type: none"> • Explores the multiplication facts of 2,3,4,5 and 10 by different ways like repeated addition, skip counting, identifying and continuing pattern í . • Develops different algorithms to multiply two digit numbers •
<p>Division</p> <p>Explains the meaning of division from context of equal sharing and grouping</p> <p>Relates division with multiplication</p> <p>Completes division facts by grouping and by using multiplication tables</p>	<ul style="list-style-type: none"> • Creating situations of equal sharing/grouping of objects and exploring ways of describing it mathematically. • Conducting activities to explore division facts in different ways like repeated subtraction, inverse of multiplication, pattern recognition etc. • Involving children in discovering their own ways to solve a problem involving division of two digit numbers • Conducting practice activities to help children master algorithms and appreciate the standard algorithms given 	<ul style="list-style-type: none"> • Explores ways of equal grouping /sharing /distribution • Understands division as another way of equal grouping /sharing /distribution • Performs division by grouping / using multiplication tables • Shows her understanding of division of two digit numbers in equal distribution of money to number of persons

Conceptual Area	Pedagogical Processes	Learning Indicators
<p>Money</p> <p>Converts Rupee to Paise using play money</p> <p>Adds and subtracts amounts using column addition, and subtraction without regrouping</p> <p>Makes rate charts and bills</p>	<p>in books.</p> <ul style="list-style-type: none"> • Involving children in groups and/or individually to make play currency notes of different denominations. A set of such actual notes can be shown to them for the activities. • Creating simple selling and buying situations in classroom and let children play with their play money. • Providing small hints to solve situations of transacting money and finding balances • Encouraging children to make estimates of how much money required, what will left etc. and then to actually verify their estimates. Discussions may be held within and across the groups to find out the ways to refine their estimates. • Encouraging children to be critical observers of money transactions while they accompany parents and others for shopping. 	<ul style="list-style-type: none"> • Demonstrates use of numbers in identifying and making currency notes of different denominations • Appreciates the use of money in day-to-day buying and selling situations • Attempts to make small amounts of money by using notes of different denominations in different ways • Describe ways to find balance amount out of a given amount after the purchase of about 100 rupees • Establishes relationship between rupee and paisa • Devises ways of adding and subtracting amounts in daily life activities • Estimates/approximates the money required and money obtained in balance in simple buying situations.
<p>Measurement: Length</p>	<ul style="list-style-type: none"> • Organising discussions among children to showcase their understanding about measuring various things including 	<ul style="list-style-type: none"> • Attempts to resolve conflicts on lengths/distances by using body parts and other non uniform units like hand span etc.(non standard units).

Conceptual Area	Pedagogical Processes	Learning Indicators
<p>Appreciates the need for a standard unit</p> <p>Measures length using appropriate standard units of length by choosing between centimeters and meters</p> <p>Estimate the length of given object in standard units and verifies by measuring</p> <p>Uses a ruler</p> <p>Relates centimeter and meter</p>	<p>lengths and distances and other quantities</p> <ul style="list-style-type: none"> • Creating situations when children get opportunities to measure in their own ways and resolve conflicts, if any, aroused due to use of non uniform units. • Providing hints during discussions so that children can appreciate that a unit is required for measuring anything. • Involving children in devising various units that can remove the confusion and be used by all in a particular context. • Providing children units of centimeter and meter to measure various objects so that children can relate centimeter and meter 	<ul style="list-style-type: none"> • Devises ways of making uniform units for measuring length/distances. • Uses her vocabulary to appreciate meter as a standard (uniform) unit of length. • Demonstrates ways of measuring smaller distances using a meter scale • Appreciates the division of one meter into centimeters to measure relatively smaller lengths
<p>Mass</p> <p>Weighs objects using non-standard units</p> <p>Appreciates the conservation of weight</p>	<ul style="list-style-type: none"> • Encouraging children to make out their meaning about the standard units of measurement they have in their vocabulary like a liter of water, kilogram and gram etc. • Let the children appreciate sub units to measure smaller and bigger quantities like meter-centimeter, kilogram-gram, litre- millilitre etc. • Involving children in speaking about their own daily experience of measuring liquids and comparing the sizes of 	<ul style="list-style-type: none"> • Describes ways of comparing and quantifying mass(es) of common objects • Uses simple balance to compare weights of common objects • Uses non-standard units like small stones and other such objects available in child's vicinity • Understands that objects with different shapes and sizes may have same weights.
<p>Volume</p> <p>Measures and compares the</p>	<ul style="list-style-type: none"> • Involving children in speaking about their own daily experience of measuring liquids and comparing the sizes of 	<ul style="list-style-type: none"> • Estimates capacities of different containers and tries to order them as per their capacities • Shows the ability to compare the capacities of

Conceptual Area	Pedagogical Processes	Learning Indicators
<p>capacity of different containers using non-standard units</p> <p>Appreciates the conservation of Volume</p>	<p>different containers</p> <ul style="list-style-type: none"> • Providing opportunities to children to relate various units and sub units and use their conversion in solving contextual problems 	<p>different containers in terms of non-standard units (like mugs, spoons etc.)</p> <ul style="list-style-type: none"> • Understands general terms of measurement like liter for measuring volume and capacity. • Appreciates the conservation of volume like same amount of liquid seems to be more and less on pouring in to narrow and wide containers respectively but is same in quantity.
<p>Time</p> <p>Reads a calendar to find a particular day and date.</p> <p>Reads time correct to the hours</p> <p>Reads calendar to find a particular date and day</p>	<ul style="list-style-type: none"> • Organising discussions and short stories on the vocabulary children have about time and calendar • Encourage children to tell the time elapsed, time required to complete a task etc. • Conducting group/individual activities to introduce the idea of measuring a day in hours, months in days, and year in months. • Providing opportunities for reading a clock and a calendar. • Initiating discussion in the classroom and encourage children to find other ways of measuring a day, month and year. 	<ul style="list-style-type: none"> • Shows the understanding of shorter and longer duration of different activities performed or to be performed • Uses her experiences and talk of the people around him to express sequence of seasons in her own situation/environment • Attempts to read the clock and tells the time correct to hour. • Demonstrates the skill of reading the calendar to find a particular day and date i.e finds the day corresponding to date from the calendar.
<p>Data Handling</p> <p>Record data using tally marks</p> <p>Collects data and represents in terms of pictograph choosing</p>	<ul style="list-style-type: none"> • Organising activities and providing opportunities to record information in numbers by using tally marks and to draw inferences or make decisions out of it. For example, in organizing a New Year party, how many pieces of different 	<ul style="list-style-type: none"> • Attempts to record information in her own ways. • Realizes problems in interpretation of information. • Devises ways of representing information to make it more clear and easy to understand and interpret i.e uses tally marks to record large number of data. • Participates in discussions with others to draw

Conceptual Area	Pedagogical Processes	Learning Indicators
<p>appropriate scale and unit for display through pictographs</p> <p>Draw conclusions from the data by discussing with the teacher</p>	<p>types would be required for class decoration.</p> <ul style="list-style-type: none"> • Involving children in discussion to highlight the importance of recording of information • Creating situations where in child uses her ways to record and present the information in a meaningful manner like number of students present in days of a week, number of family members each of her friends have, number of children whose name starts with particular letters etc. • Giving opportunities to children for exploring ways of recording and presenting data and draw inferences from the data. 	<p>inferences from the recorded information</p>
<p>Patterns</p> <p>Identifies simple symmetrical shapes and patterns in his/her surroundings</p> <p>Make patterns and design from straight lines and other geometrical shapes.</p> <p>Identifies patterns in the numerals for odd and even numbers and in adding odd and even numbers.</p>	<ul style="list-style-type: none"> • Involving children in recognition and extension of patterns they come across in daily life experiences. These are required to be recorded and interpreted. For example different number patterns like 2,4,6,10, 10,20,30,40,1 and patterns of shapes found on tiles and border designs on sarees, shawls etc. • Organizing group activities where children can create and discuss patterns. Group discussions could be followed by presentation of the patterns that have been found in front of the whole class. 	<ul style="list-style-type: none"> • Identifies simple patterns right from school activities to home like pattern in coming to school to going back, patterns in numbers and shapes, patterns in tiles and designs, etc. • Understands the patterns of even and odd numbers, commutative of addition and multiplication of numbers, multiplication of numbers by 1, adding 1 to numbers etc.

LEARNING INDICATORS: MATHEMATICS up to Class V

Curricular Expectations:

- Develop a connection between the logical functioning of daily life to that of mathematical thinking
- Understands shapes and articulates their observable properties as similarities and differences among them
- Develop own methods of performing operations on numbers in daily life (addition, subtraction, multiplication and division)
- Develop language and symbolic notations with standard algorithms of performing number operations
- Estimate outcome of operation on two or more numbers and use it in daily life activities
- Learn to represent part of whole as a fraction and orders simple fractions
- Collects, represents and interpret simple data from her/his context and uses it in everyday life.
- Identify and extend simple patterns in shapes and numbers

Class IV

Conceptual Area	Pedagogical Processes	Learning Indicators
<p>SHAPES AND SPATIAL UNDERSTANDING</p> <ul style="list-style-type: none"> • Identifies centre, radius and diameter of a circle • Tiles geometrical shapes using one or two shapes • Explores intuitively the 	<p>Utilising childø experiences of drawing a circle by using a rope, with fixing one end and moving the other keeping the rope stretched. The children who do not have such experiences can be involved in groups with others and activities of drawing circular boundary can be performed in the play ground. Draw childø attention to the cases when one end is not fixed and/or the rope is not kept</p>	<ul style="list-style-type: none"> • Shows understanding of terms related to circle like centre, radius, diameter and boundary of the circle. • Attempts to calculate perimeter and area of different shapes available in surroundings (farms, parks etc) for different purposes. • Makes different shapes with the help of easily available material e.g. match sticks, ice cream sticks

Conceptual Area	Pedagogical Processes	Learning Indicators
<p>area and perimeter of simple shapes.</p> <ul style="list-style-type: none"> • Make 4,5 or 6 faced cubes from a given net • Explores intuitively the reflection through inkblots, paper cutting and paper folding • Draws intuitively the plan, elevation and side view of simple objects. 	<p>stretched</p> <p>Taking empty chalk boxes and cutting their one face, two faces etc. Now asking children to cut open the same to make a plan 2-D (flat)shapes . Let the children explore the flat shapes that can make a 6. 5 or 4 faced cubes. Later on the children should be encouraged to draw aa appropriate net on a paper sheet.</p> <p>Organizing activities in the classroom where children make different designs by using liquid colors or ink and paper sheets. The activities can also be conducted by getting a fine thread wet in a color and making beautiful designs by putting the thread on a paper and folding it.</p> <p>Asking children to look a solid shape from different positions and drawing the way it looks from the top, side, front etc.</p>	<p>etc.</p> <ul style="list-style-type: none"> • Explores symmetry in figures formed by ink/color blots on a paper • Draws different views of an object as it looks from top, sides and front.
<p>Numbers and Operations</p> <ul style="list-style-type: none"> • Writes multiplication tables up to 10 and appreciates place, value role. • Multiplies two or three digit 	<p>Provide opportunities to children to write down addition facts of a numbers repeated given number of times like 2,3,4,5,6.. 10 each added five times will form multiplication table of five.</p> <p>Conduct activities with children to explore</p>	<ul style="list-style-type: none"> • Forms tables of multiplication facts up to 10X10 • Creatively draws tables of relatively higher number (say 7) using tables of smaller numbers (say 2 & 5) and also of two digit numbers by using the expanded form of the number

Conceptual Area	Pedagogical Processes	Learning Indicators
<p>numbers</p> <ul style="list-style-type: none"> • Divides a given number by another given number • Frames word problems and solves using number operations • Applies four operations to daily life situations. 	<p>the multiplication facts through patterns and skip counting. Do not force children to rote memorize/cram multiplication tables</p> <p>Encourage child to develop her algorithms for multiplication of numbers and facilitate to decide her best algorithm</p> <p>Providing opportunities to children to try out different ways of multiplication, for example to multiply 257 by 34 some child may develop a strategy to first multiply hundreds by 34 and then tens and ones. Some other child may decide to first multiply ones 34 times and then tens and hundreds</p> <p>Extending the idea of division of numbers in variety of ways like using equal distribution, as inverse process of multiplication.</p> <p>Facilitating children to develop their own algorithms for dividing numbers and then to decide the best one. Activities for equal distribution of some amount of money formed by notes of Rs. 1000, 100, 10 and 1 to some number of persons will help in development of algorithms for division of numbers.</p>	<ul style="list-style-type: none"> • Explores different ways of multiplying two or three digit numbers (eg. using individual digits, place value concept for multiplier etc.) • Demonstrates understanding of division by dividing a given number by another number in a variety of ways, such as by grouping, repeated subtraction, using multiplication facts etc. • Attempts to develop a word problem using her own experiences. And solving it by using various operations • Freely uses four fundamental operations (addition, subtraction, multiplication and division) in day to day activities.

Conceptual Area	Pedagogical Processes	Learning Indicators
	<p>Creating and exploring situations from child's daily life to apply number operations in solving problems.</p>	
<p>Money</p> <ul style="list-style-type: none"> • Converts rupees to paisa and vice versa • Adds and subtracts using column addition and subtraction • Uses four fundamental operations in day to day transactions 	<p>Providing opportunity to children to plan a shopping and to make estimates of money required in different denominations and the balance she will get.</p> <p>The children playing shopkeepers have to get exact amount by using different operations and also will try out their own ways to provide a record of the shopping in the form of a bill.</p> <p>Let children have discussion with the shopkeepers/hawkers etc. to know how do they make quick calculations for transaction</p>	<ul style="list-style-type: none"> • Find rupees for given number of paisa and pais for given number of rupees • Shows understanding of finding total amount required or balance given in a transaction • Uses addition and subtraction mentally for making calculations of small day to day dealings like small purchase (vegetables, milk, etc.) from market • Attempts multiplication and division to find out total cost on the basis of unit cost and vice versa.
<p>4.1 Measurement: Length</p> <ul style="list-style-type: none"> • Converts meter into centimeter and vice versa • Solves problem involving length and distance. • Estimates lengths and distances in meters and centimeters 	<p>Conducting activities related to measuring lengths of different objects by using a meter scale or a tape.</p> <p>Involving learners in discussions for the need of writing bigger units into smaller (meter to cm) and smaller into bigger (cm to m) by using their understanding of decimal fractions</p>	<ul style="list-style-type: none"> • Relates commonly used larger and smaller units of length (meter, centimeter) and converts one to another. • Attempts to calculate length of particular objects (a rod, a piece of cloth etc) and finds total length of two or more objects • Estimates distance between two places (school to home, own home to friend's home

Conceptual Area	Pedagogical Processes	Learning Indicators
<p>4.2 Measurement: Weight/mass</p> <ul style="list-style-type: none"> • Weighs objects using balance and standard units • Determines sums and differences of weights 	<p>Initiating discussion on weights of different objects like weight of children in the class in order to explore various ways of measuring weight and having idea of its units.</p> <p>Using child's exposure of listening to standard unit of weight like kilogram and gram to relate them. Conduct activities related to observing empty pouches/boxes where weights in grams and kilograms are marked</p> <p>Involving children in estimating weights of different objects and to reach to the conclusion that bigger objects are to measured in kilograms and smaller in grams.</p> <p>Conducting activities to obtain weight of two or more objects by adding the number of kilograms/grams in the objects</p> <p>Relating the understanding of weights with money and activities of selling and buying situations</p>	<ul style="list-style-type: none"> • Attempts to estimate weight of an object and then verifies it with balance and standard units of weight (grams, kilograms etc) • Tries to differentiate between the heavy and light weight objects and calculates the total weight of two different objects (addition) and difference in their weights (subtraction) where out of some given amount some amount is consumed, what left?
<p>4.3 Measurement: Volume</p> <ul style="list-style-type: none"> • Measures volumes of liquids with the help of container marked with the standard units 	<p>Relating child's experience of units of measuring capacity like quantity of liquid in a water bottle, soft drink pack, oil etc. where child sees the units like liter and milliliter</p>	<ul style="list-style-type: none"> • Attempts to estimate volume of liquids and then verifies it using container marked with the standard units. • Makes one liter by adding several quantities expressed in milliliters

Conceptual Area	Pedagogical Processes	Learning Indicators
<ul style="list-style-type: none"> • Estimates volume of a solid object • Performs addition and subtraction of volumes. 	<p>Conducting activities to fill a given container by using different shapes like cubes, cuboids, spheres, prisms etc. and encourage children to decide which shapes can completely a given space.</p> <p>Discussing with children why unit cube is taken as unit of measuring space/volume Involving children in measuring volume by counting the number of unit cubes that can completely fill a given space.</p> <p>Involving children in comparison of volume/capacity of two objects and finding the difference by subtraction and the total volume by addition</p>	<ul style="list-style-type: none"> • Devises her ways to differentiate between more and less volumes of liquids and calculates difference in volumes. • Applies her understanding of addition to find total weight of two or more objects • Estimates volume of a solid object by informal measurement intuitively.
<p>4.4 Measurement: Time</p> <ul style="list-style-type: none"> • Computes number of weeks and days in a year, and correlates number of days in a year with number of days in each month. • Reads clock time in hours and minutes and expresses time in am and pm • finds the time intervals in simple cases by using forward 	<p>Putting children in situation where they have to read a calander to find different days corresponding to dates</p> <p>Let children explore their own ways of finding number of days between two dates and to decide the methods of finding numbers of days in a month of a year.</p> <p>Utilizing child's experiences gained outside class and with in class having exposure to read clock in hours and minutes. Let the child learn the ways of</p>	<ul style="list-style-type: none"> • Attempts to showcase the concept of week, month and year on the basis of number of days and uses this understanding to compute number of weeks in a year • Shows interest in reading the clock time nearest to hours and minutes and expresses the time using the terms -a.m.ø and -p.m.ø • Explores ways (mental addition and subtraction) of finding time intervals between different familiar events and computes number of days between two dates.

Conceptual Area	Pedagogical Processes	Learning Indicators
<p>counting and using addition and subtraction</p>	<p>reading different types of clocks with the help of other children</p> <p>Providing exposure to find the time lapsed in two events by forward counting and by addition and subtraction. Let the child realize that operations on time are different than the operations on numbers being done by using place value system.</p>	
<p>Data Handling</p> <ul style="list-style-type: none"> • Collects quantitative data on two variables and represents it through table and bar graph. • Draws inferences with the help of teacher 	<p>The collection of information and making out meaningful inferences, out of it, is a routine activity being done by every child in daily life. Utilising this experience, involve children in devising ways of presenting data in different pictorial forms.</p> <p>Involve children in reading data given in various pictures/diagrams from newspapers and magazines. Help them draw out meaningful inferences out of the data given.</p>	<ul style="list-style-type: none"> • Engages herself in organizing the two dimensional data in the form of tables, pictographs and/or bar graphs • Attempts to understand the key points emerging from the represented data
<p>Patterns</p> <ul style="list-style-type: none"> • Identifies patterns in multiplication and division : multiples of 9 • Multiplies and divides by 10, 100 etc by using the patterns • Identifies geometrical patterns based on symmetry. 	<p>Providing opportunities to children to explore patterns in designs and geometrical shapes available in their vicinity and to find ways of extending them creatively</p> <p>Asking children to explore patterns in numbers and multiplication facts like in multiples of 9 the sum of digits is also multiple of nine, table is formed by</p>	<ul style="list-style-type: none"> • Identifies patterns in multiples of 9 and extends them to find more facts • Engages herself in understanding specific pattern of numbers in a series and extends it • Evolves patterns on sarees, clothes and tiles and extends them.

Conceptual Area	Pedagogical Processes	Learning Indicators
	<p>writing 9, 8, 7, 6 in ones place and 0, 1, 2, 1, 9 in tens place respectively</p> <p>Ask children to explore similar patterns in multiplication facts of other numbers.</p> <p>There are many such patterns in the mathematics which child has learnt up till now. Let children explore, extend and generalize these patterns</p>	

CLASS V

Conceptual Area	Pedagogical Processes	Learning Indicators
<p>SHAPES AND SPATIAL UNDERSTANDING</p> <ul style="list-style-type: none"> • Explores and represents angles and classifies into right, acute and obtuse angles • Explores reflection and rotational symmetry in familiar 2-D and 3-D shapes • Makes the shapes of 	<p>Interacting with the children on their earlier understanding of angles and encouraging them to describe what an angle is. Let children compare angles with reference to angles made at the corners of a book, note book etc.</p> <p>Ask children to explore angles they see in their vicinity and to describe whether the angle is smaller/bigger/equal than the angle at a corner of a book or note book</p> <p>Symmetry lies in many shapes. Children may be asked to fold a sheet of paper and</p>	<ul style="list-style-type: none"> • Indicates understanding of making angles of different types using the things easily available to the child. • Explores different types of angles existing in the environment around the child. • Demonstrates to differentiate between angles of different types, acute, obtuse and right angles. • Makes different shapes with the help of their nets

Conceptual Area	Pedagogical Processes	Learning Indicators
<p>cubes, cuboids, cylinders and cones by their respective cones</p>	<p>cut a shape on its fold. On opening we find a shape which is symmetric about the line drawn along the fold.</p> <p>Providing opportunities to children to reach to the conclusion that a line is said to line of symmetry of a shape when</p> <ol style="list-style-type: none"> 1. On folding the shape along that line one part completely overlaps/congruent to the other part 2. On placing a mirror on the line the image and the visible part of the shape make the complete shape <p>Playing with shapes so that children can hypothesize that on rotation some shapes look the same like a circle, a rectangle, an equilateral triangle etc. and some shapes look the same only after a complete rotation.</p>	<ul style="list-style-type: none"> • Explores symmetry in various objects having 3-D shapes. • Creatively explores reflection and rotational symmetry in 2-D shapes.
<p>Numbers and Operations</p> <ul style="list-style-type: none"> • Finds place value in numbers beyond 1000 • Appreciates the role of place value in algorithms for four fundamental operations • Divides a given number by another given number using 	<p>Extending the idea of division of numbers in variety of ways like using equal distribution, as inverse process of multiplication.</p> <p>Encourage child to develop her algorithms for division of numbers and facilitate to decide her best algorithm</p> <p>Creating the idea of multiples of number through its multiplication facts, skip</p>	<ul style="list-style-type: none"> • Demonstrates understanding of division by dividing a given number by another number in a variety of ways, such as by grouping, repeated subtraction, using multiplication facts etc. • Attempts to develop a word problem on multiplication and division of numbers using her own experiences. • Participates actively in activities organised in the class for explaining concepts of <i>multiples and factors</i>

Conceptual Area	Pedagogical Processes	Learning Indicators
<p>standard division algorithms</p> <ul style="list-style-type: none"> • Explains concept of factors and multiples • Estimates sum, difference, product and quotients and verifies using approximation 	<p>counting using number grid and number line</p> <p>Providing the concept of factors through division of numbers and multiples.</p> <p>Creating and exploring situations from childø daily life to apply number operations in solving problems.</p>	<ul style="list-style-type: none"> • Freely uses four fundamental operations (addition, subtraction, multiplication and division) in day to day activities.
<p>Fractions</p> <ul style="list-style-type: none"> • Represents part of a whole as a fraction • Realizes fraction as a number • Adds and subtracts like fractions 	<p>Involving children in activities related to dividing a whole in equal parts by using paper folding, dividing a given shape like square, rectangle, circle etc</p> <p>Using childø understanding of half, one third etc. to develop her ways of representing other parts of whole.</p> <p>Providing opportunities to represent a given fraction by shading/colouring parts of whole</p> <p>Conducting activities targeting to counting the shaded parts corresponding to given fractions to add them and to recognize and generalize a pattern.</p> <p>Conducting activities targeting to cutting removing parts of a whole corresponding</p>	<ul style="list-style-type: none"> • Demonstrates understanding of the concept of half and one fourth by completing the incomplete figures or by filling colours etc. • Attempts to write part of a whole as a number called fraction • Appreciates that a part of a whole can be re[presented by more than one fraction called equivalent fractions • Adds and subtract two like fractions by colouring/shading corresponding parts of whole • Generalises the patterns of adding and subtracting fractions and develops her algorithms.

Conceptual Area	Pedagogical Processes	Learning Indicators
	to the fraction to be subtracted and counting the parts remained in order to subtract fractions and to recognize and generalize a pattern.	
Money <ul style="list-style-type: none"> • Uses four fundamental operations to solve problems in day to day life activities 	<p>Providing opportunity to children to plan a shopping and to make estimates of money required in different denominations and the balance she will get.</p> <p>The children playing shopkeepers have to get exact amount by using different operations and also will try out their own ways to provide a record of the shopping in the form of a bill.</p>	<ul style="list-style-type: none"> • Shows understanding about addition and subtraction using columns eg. rupees and paisa through its application in daily life • Uses addition and subtraction mentally for making calculations of small day to day dealings like small purchase (vegetables, milk, etc.) from market • Attempts multiplication and division to find out total cost on the basis of unit cost and vice versa.
4.1 Measurement: Length <ul style="list-style-type: none"> • Converts meter into centimeter and vice versa • Solves problem involving length and distance. • Converts larger fractional units into smaller units 	<p>Conducting activities related to measuring lengths of different objects by using a meter scale or a tape. Then involve children in finding total length, length of the piece remained after cutting a piece from a given rope, thread/cloth etc.</p> <p>Involving learners in discussions for the need of writing bigger units into smaller (meter to cm) and smaller into bigger (cm to m) by using their understanding of decimal fractions</p>	<ul style="list-style-type: none"> • Relates commonly used larger and smaller units of length (meter, centimeter) and converts one to another. • Estimates distance between two places (school to home, own home to friend's home) • Attempts to use four operations to solve daily life problems related to measurement of length/distance

Conceptual Area	Pedagogical Processes	Learning Indicators
<p>4.2 Measurement: Weight/mass</p> <ul style="list-style-type: none"> • Applies sum, difference, product and quotient of weights in solving daily life problems 	<p>Conducting activities to obtain weight of two or more objects by adding the number of kilograms/grams in the objects</p> <p>Relating the understanding of weights with money and activities of selling and buying situations encourage children to find the required amount by using operations on weight and money</p>	<ul style="list-style-type: none"> • Relates larger and smaller units of weight and converts one to other
<p>4.3 Measurement: Volume</p> <ul style="list-style-type: none"> • Estimates volume of a solid object • Performs addition and subtraction of volumes. 	<p>Relating child's experience of units of measuring capacity like quantity of liquid in a water bottle, soft drink pack, oil etc. where child sees the units like liter and mili liter</p> <p>Conducting activities to fill a given space by using different shapes like cubes, cuboids, spheres, prisms etc. and encourage children to decide which shapes can completely a given space.</p> <p>Discussing with children why unit cube is taken as unit of measuring space/volume Involving children in measuring volume by counting the number of unit cubes that can completely fill a given space.</p> <p>Activities targeting to exploration by child to derive their formulas to find volume of a cuboid</p>	<ul style="list-style-type: none"> • Attempts to estimate volume of liquids and then verifies it using container marked with the standard units. • Tries to differentiate between more and less volumes of liquids and calculates difference in volumes. • Estimates volume of a solid object by informal measurement intuitively. • Appreciates volume of a solid body: intuitively and also by informal measurement.

Conceptual Area	Pedagogical Processes	Learning Indicators
	Involving children in comparison of volume/capacity of two objects and finding the difference by subtraction	
Measurement: Time <ul style="list-style-type: none"> • Uses addition and subtraction in finding the time intervals in simple cases. 	Providing exposure to find the time lapsed in two events by addition and subtraction. Let the child realize that operations on time are different than the operations on numbers being done by using place value system. For example when sum of months become 12 or more it is converted into years, when sum of minutes become 60 more it is converted into hours etc.	<ul style="list-style-type: none"> • Explores ways (mental addition and subtraction) of finding time intervals between different familiar events and computes number of days between two dates., number of minutes and hours between two times etc.
Data Handling <ul style="list-style-type: none"> • Collects quantitative data on two variables and represents it through table and bar graph. 	The collection of information and making out meaningful inferences, out of it, is a routine activity being done by every child in daily life. Utilising this experience, involve children in devising ways of presenting data in different pictorial forms. Involve children in reading data given in various pictures/diagrams from newspapers and magazines.	<ul style="list-style-type: none"> • Engages herself in organizing the two dimensional data in the form of tables, pictographs and/or bar graphs • Attempts to understand the key points emerging from the represented data
Patterns <ul style="list-style-type: none"> • Identifies patterns in square numbers, triangular numbers • Relates sequence of odd numbers between consecutive square numbers • Makes border strips and tiling 	Asking children to explore patterns in numbers while doing various operations and to generalize them like patterns in square numbers  <p>Triangular numbers like</p>	<ul style="list-style-type: none"> • Observes patterns printed on dress material, tiles on floor and wall or other objects available in surroundings. • Identifies patterns in square and triangular numbers • Attempts to creatively develop patterns for border strips and Tiling by using stamps made by wood, vegetables, bottle caps etc.

Conceptual Area	Pedagogical Processes	Learning Indicators
patterns.	 <p data-bbox="611 386 1115 418">Ask children to explore similar patterns</p> <p data-bbox="611 461 1163 600">There are many such patterns in the mathematics which child has learnt up till now. Let children explore, extend and generalize these patterns</p>	

Learning Indicators Mathematics up to class VIII

Curricular Expectations

- Moves from number sense number patterns
- Sees relationships between numbers and look for patterns in relationships
- Gain proficiency in using newer language of mathematics like, variables, expressions, equations, identities etc
- Uses arithmetic and algebra to solve real life problems and pose meaning problems
- Discover symmetries and acquire sense of aesthetics by looking around regular shapes like triangles, circles, quadrilaterals etc.
- Comprehend the idea of space as region enclosed within boundaries of a shape
- Relate numbers with shapes in terms of perimeter, area and volume and uses them to solve every day life problems
- Learn to provide reasoning and convincing arguments to justify their own conclusions particularly in mathematics
- Collects, represents (graphically and in tables) and interprets data/information from her/his life experiences

CLASS VI

Conceptual Area	Pedagogical Processes	Learning Indicators
<ul style="list-style-type: none"> • Numbers É Consolidates the sense of numberness up to 5 digits in terms of its size of estimation É Gets familiar with large numbers up to 8 digits É Understands the importance of brackets and other symbols like, =, <, >. É formulates divisibility rules of 2, 3, 4, 5, 10 and uses them as and when required É Appreciates the classification of numbers as even, odd, prime, co prime etc. 	<ul style="list-style-type: none"> • Through various situations make children compare numbers up to 5 digits like cost of two houses, number of spectators present in two cricket matches etc. É Number patterns could be used to extend numbers up to 8 digits and then daily life situations involving 8 digit numbers could be discussed e.g. cost of property, É Involve children in classification of numbers on the basis of tier properties like even, odd, multiples and factors. these numbers can be used to classify numbers in to various categories É Divisibility rules can be introduced 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 its digits divisible by 3, multiple of 5 has either 5 or zero in its ones place etc. 	<ul style="list-style-type: none"> Create situations around her in which she finds numbers. É Through situations like money transactions, measuring of height budget etc. child uses larger numbers and thus appreciates their use. É Child reduces fractions involving larger numbers to simplest (lowest) forms • child attempts to construct examples through which she demonstrates the add
<ul style="list-style-type: none"> • Understands the significance of HCF and LCM and finds them É By observing patterns identifies and formulates rules for whole numbers É Appreciates the need for negative numbers É Through patterns formulates rules for 	<ul style="list-style-type: none"> É encourage children to create number patterns through which HCF and LCM can be discussed. É Different number operations could be performed by students which through discussions could help to know the different 	<ul style="list-style-type: none"> • Given a fraction child identifies a situation for 0. • the given fraction • uses divisibility rules to find factors of a number

Conceptual Area	Pedagogical Processes	Learning Indicators
<p>ordering of integers, their representation on number line, addition and subtraction of integers etc.</p> <p>Érepresents fractions and decimals pictorially and on number line</p> <ul style="list-style-type: none"> • Finds sum and difference of two fractions 	<p>properties like closure, commutatively etc.</p> <p>ÉSituations could be created and discussed in which numbers are required to be represented for opposite situations, like directions, give and take situations etc.</p> <ul style="list-style-type: none"> • Daily life situations and pictures could be presented to introduce fractions and decimals like representing part of a whole as number, a dot mark placed to separate rupees and paisa, meter and centimeter, kilometer and meter, liter and milliliter etc. • Encourage children to look at the pictures showing sum and difference of like fractions and to generalize. • Let children evolve that to add or subtract two unlike fractions it is required to convert them into equivalent fractions of same denominators (like fractions) 	<ul style="list-style-type: none"> • demonstrates her ways of finding HCF and LCM of two numbers • devises her strategies to identify appropriate situations to use the concepts of HCF and LCM. <p>Écreates daily life situations where opposites are involved and represents such quantities by positive and numbers</p> <p>Émakes her own strategies of ordering, adding and subtracting integers</p>
<p>2. Algebra</p> <p>ÉUnderstands variables through patterns</p> <p>É Classifies quantities as variable and constant</p>	<p>É Situations may be presented before the children that would prompt them to form patterns and feel the need for a symbol in place of number.</p> <p>É Discussions may be held to show different methods of comparison of quantities are helpful in different situation situations.</p>	<p>Échild tries to identify a pattern</p> <p>Échild tries to formulate the pattern identified by her and tries to suggest a symbol for a general term of the pattern</p> <p>ÉChild tries to construct examples that require</p>

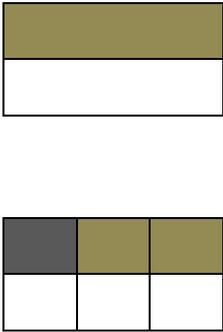
Conceptual Area	Pedagogical Processes	Learning Indicators
<p>Ratio and Proportion</p> <p>É Understands how the comparison of two quantities through ratio is different from comparisons done earlier</p> <p>É Understands the meaning of proportion</p> <p>É Knows how ratio and proportion are related to unitary method.</p> <p>É solves problems related to daily life using unitary method.</p>	<p>É Children may be encouraged to create examples to show the difference between comparison of quantities done through operation of subtraction and that through ratio</p> <p>É Examples could be discussed to show the difference between ratio and proportion and to relate them</p> <p>É Daily life problems related to unitary method could be discussed that lie in child's everyday life like shopping finding rate etc.</p>	<p>the concept of ratio.</p> <p>É By constructing examples child tries to know how the concept of proportion is built upon that of ratio.</p> <p>É While solving problems on unitary method child tries to understand unit of which quantity is to be found.</p> <p>Finds rate and the total amount in related context using unitary methods</p>
<p>3. Geometry</p> <ul style="list-style-type: none"> • Differentiates between different geometrical figures on the basis of their observable properties • Classifies angle into different types on the basis of their measurement • Understands the difference between different types of triangles and the basis on which they are classified. • Classifies Quadrilaterals as trapezium, parallelogram, rectangle, square, rhombus • Identifies 3-D shapes and their parts. • Identifies 2-D symmetrical objects. • Understands reflection symmetry. • Constructs angles of different measures using compasses. <p>Draws perpendicular line segments</p>	<ul style="list-style-type: none"> • Activities can be performed in which students can be shown concrete models and pictures of different geometrical shapes. Students can be involved in activities related to identify, angles, triangles & quadrilaterals and nets. • A better way of connecting 2-D with 3-D is relating nets of various solids with their shapes. • Models and Nets of 3-D shapes can be made by students to get an idea of their edges, faces etc. • Discussion can be held after showing objects to the children • Activities can be performed using mirror and children may be made to observe the reflections. The observations can then be discussed. Folding a paper cutout of a shape along specific lines can also be used 	<ul style="list-style-type: none"> • classifies angles in different groups/types • Child tries to draw different types of triangles and quadrilaterals. • Child attempts to prepare solids using their Nets. • Child observes the objects and tries to make strategies to decide about the symmetry of the object. • Child observes the reflection of objects in mirror and then tries to formulate rules about the symmetry of the object. • Child tries to see the logic behind drawing an angle of certain measure using geometrical properties. • After learning to draw an angle of certain measure child tries to device ways to draw related angles.

Conceptual Area	Pedagogical Processes	Learning Indicators
	<p>to show the reflection symmetry in case the two halves exactly cover each other.</p> <ul style="list-style-type: none"> • After discussing the drawing of 60° angle using compasses, the construction of other angles like 30°, 120° etc. can be discussed with the children. Give them a feel of dividing a circle into equal segments that correspond to angle. For example a circle can be divided into six equal parts by the chords of length equal to radius of the circle and this actually forms $1/6^{\text{th}}$ of complete angle i.e 60° at the centre. • Different geometrical figures may be given to draw that involves angles of various measures, line segments etc. 	
<p>Mensuration</p> <ul style="list-style-type: none"> • Understands the concept of perimeter of a shape. • Understands the concept of area of a shape. 	<ul style="list-style-type: none"> • Different shapes can be shown to the students and through the notion of boundary, the concept of perimeter can be discussed. • Discussion can be held about boundary and region, which can lead to concept of area. 	<ul style="list-style-type: none"> • Child tries to calculate the perimeter of different shapes given. She tries to formulate the perimeter of shapes like rectangle, square etc. • Child tries to calculate the areas of rectangle and square by dividing them into appropriate smaller units. She tries to think of such small units.
<p>Data Handling</p> <ul style="list-style-type: none"> • Understand the use of organizing data. • Represent data through pictograph, bar graph. 	<ul style="list-style-type: none"> • Daily life situation involving quantitative information can be discussed with students. • Discussion can be held about why data should be organised. Children can be motivated to use their own ways of organising data. • Children may be asked to explore their own ways of representing the data. 	<ul style="list-style-type: none"> • Child tries to identify daily life situations in which the information is required to be properly arranged. • Child tries to explore different ways to organise and represent data.

Conceptual Area	Pedagogical Processes	Learning Indicators
	<ul style="list-style-type: none"> In picture and in table of numbers. 	

CLASS VII

Conceptual Area	Pedagogical Processes	Learning Indicators
<p>Numbers</p> <ul style="list-style-type: none"> Multiplication and division of integers Properties of integers Problem solving using operations on integers Multiplication and division of fractions Introduction to rational numbers Operations on rational numbers Decimal representation of rational numbers Multiplication and division of decimal fractions Problem solving using operations on rational numbers and decimal fractions Exponents 	<ul style="list-style-type: none"> The rules for multiplication and division of whole numbers have already been studied by children. Involve children in discussion to find their ways of multiplying integers. Use of patterns in multiplying a negative integer by another integer may be a new idea for children as up till now they have learnt that multiplication is repeated addition or an operator in case of fractions. Give proper time to children to appreciate why product of two negative integers is positive. Similarly encourage children to explore and using 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 $-4 \div -2$ 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 $+ve \div -ve = -ve$, $-ve \div +ve = -ve$ and $-ve \div -ve = +ve$. 	<ul style="list-style-type: none"> Multiplies integers by using patterns and generalizes the rules to multiply a positive integer by a negative integer, a negative integer by a positive integer and two negative integers Divides two integers by using patterns and forms rules to perform division in integers. Multiplies fractions by using patterns/paper folding/pictures and generalizes the rules Divides fractions by using patterns/visualization/picture and forms rules Forms rules to add, subtract, multiply and divide rational numbers by using the operations on fractions and integers. Represents a rational number as decimal fraction and forms rules for operations on decimal fractions Uses exponential form and their rules to

Conceptual Area	Pedagogical Processes	Learning Indicators
	<p>É Involve 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</p> <p>É Divisibility rules can be introduced 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 its digits divisible by 3, multiple of 5 has either 5 or zero in its ones place etc.</p> <ul style="list-style-type: none"> • Utilise childrens knowledge about describing multiplication of fractions as operator \times 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  <p>The double shaded region is one-sixth of the</p>	<p>solve problems related to repeated multiplication.</p> <ul style="list-style-type: none"> • Observes patterns in multiplication tables and forms divisibility rules.

Conceptual Area	Pedagogical Processes	Learning Indicators
	<p>whole which shows that $\frac{1}{3} \times \frac{1}{2} = \frac{1}{6}$. Let children do lot of such sums and observe the pattern that in all cases the product of fractions can be obtained by multiplying their numerators and their denominators</p> <p>Similarly $\frac{1}{2} \div \frac{1}{4}$ means the number of one-fourths in one-half. Simple visualization is required to find that one-half contains two one-fourths. Let children</p> <p>Observe pattern and find their own ways of dividing a fraction by another fraction.</p> <ul style="list-style-type: none"> • Involve children in exploring their ways of writing repeated multiplication in short form as repeated addition is represented by multiplication. With discussion let the children reach to the conclusion of writing repeated multiplication in exponent form. 	
<p style="text-align: center;">Algebra</p> <p>ALGEBRAIC EXPRESSIONS</p> <ul style="list-style-type: none"> • Generate algebraic expressions • Performs operations on algebraic expressions • Simple linear equations in one variable (in contextual problems) with two operations 	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • Forms, add and subtract algebraic expressions involving one or two variables/unknowns • Expresses situations in to simple linear equations and solves them

Conceptual Area	Pedagogical Processes	Learning Indicators
	simple equations and solve them. Textbooks have many such examples.	
<p style="text-align: center;">Ratio and Proportion</p> <ul style="list-style-type: none"> • Ratio and proportion and Unitary method continued • Understanding percentage as a fraction with denominator 100 • Percentage and conversion of 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). 	<ul style="list-style-type: none"> • 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 children's daily life experiences which can be used to form various formulae and solving problems using them. 	<ul style="list-style-type: none"> • Describes ratios as percentage and forms formulae for profit/loss and simple interest using unitary method
<p style="text-align: center;">Geometry</p> <p>Understanding shapes:</p> <ul style="list-style-type: none"> • Pairs of angles (linear, supplementary, complementary, adjacent, vertically opposite) • Properties of parallel lines with transversal (alternate, corresponding, interior, exterior angles) <p>Properties of triangles:</p> <ul style="list-style-type: none"> • Angle sum property • Exterior angle property • Pythagoras Theorem (Verification only) <p>Symmetry</p> <ul style="list-style-type: none"> ○ Recalling reflection symmetry ○ Idea of rotational symmetry, observations of rotational symmetry of 2-D objects. (90°, 120°, 180°) <p>Representing 3-D in 2-D:</p> <ul style="list-style-type: none"> ○ Identification and counting of vertices, edges, faces, nets (for cubes cuboids, and cylinders, 	<ul style="list-style-type: none"> • Diagrams and use of upper primary mathematics kit (developed by NCERT) 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. • Conduct activities with children given in textbooks (paper folding and observing diagrams) and encourage children to visualize symmetry and criterion for rotational symmetry of various shapes. • Children working in groups with traced 	<ul style="list-style-type: none"> • Identifies pairs of angles like linear, supplementary, complementary, adjacent and vertically opposite and finds the one when other is given • Hypothesize the relationship between pairs of angles out of eight angles formed by a transversal with parallel lines. • Verifies angle sum and other properties of triangles and uses these properties to find unknown elements of a triangle. • Appreciates the rotational symmetry of various shapes and figures • Reads simple maps and forms her own maps like home to school, map of her village, house etc. • Establishes congruence criterion for triangles

Conceptual Area	Pedagogical Processes	Learning Indicators
<p>cones).</p> <ul style="list-style-type: none"> ○ Mapping the space around approximately through visual estimation. <p>Congruence</p> <ul style="list-style-type: none"> ○ Congruence through superposition ○ Extend congruence to simple geometrical shapes e.g. triangles, circles. ○ Criteria of congruence <p>Construction</p> <ul style="list-style-type: none"> ○ Construction of a line parallel to a given line from a point outside it ○ Construction of simple triangles.. 	<p>copies of various shapes and superimposing one above the other help them in establishing congruence criterion.</p>	<p>and circles.</p> <ul style="list-style-type: none"> ● Constructs simple triangles when three out of six elements are given(like three sides, two sides and included angle, a side and two angles etc.)
<p>Mensuration</p> <ul style="list-style-type: none"> • Revision of perimeter and Idea of Circumference of Circle <p>Area</p> <ul style="list-style-type: none"> • Concept of measurement using a basic unit area of a square, rectangle, triangle, parallelogram and circle 	<ul style="list-style-type: none"> ● Involve children in activities targeted to measurement of region enclosed by closed figures on a plan surface and encourage them to come to the conclusion that a unit is required. ● Conduct activities related to measuring units squares within a figure drawn on a square grid and to compare various regions. 	<ul style="list-style-type: none"> ● Measures approximate area of simple regular and irregular closed shapes by using unit square grid sheet ● Forms formulae to find area of the region enclosed in a rectangle and a square as a better way of counting the number of units squares that fill them completely.
<p>Data handling</p> <ul style="list-style-type: none"> • 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 bar graphs • Feel of probability using data. 	<ul style="list-style-type: none"> ● Utilize 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. Starting with small sets of numbers will be easier to visualize and represent it by bar graphs. ● Involve children in drawing inferences for future events from the existing data 	<ul style="list-style-type: none"> ● Finds various representative values for simple data from her daily life. ● Represents data by simple bar graphs and interprets them.

CLASS VIII

Conceptual Area	Pedagogical Processes	Learning Indicators
<p>Number System Rational Numbers:</p> <ul style="list-style-type: none"> • Properties of rational numbers. (including identities). Using general form of expression to describe properties • Representation of rational numbers on the number line • Between any two rational numbers there lies another rational number • Word problem <p>Powers É Laws of exponents with integral powers</p> <ul style="list-style-type: none"> • Square and Square roots using factor method and division method for numbers containing (a) no more than total 4 digits and (b) no more than 2 decimal places • Cubes and cubes roots (only factor method for numbers containing at most 3 digits) <p>Playing with numbers</p> <ul style="list-style-type: none"> • Writing and understanding a 2 and 3 digit number <i>in generalized form</i> ($100a + 10b + c$, where a, b, c can be only digit 0-9) and engaging with various puzzles Children to solve and create problems and puzzles. • Deducing the divisibility test rules of 2, 3, 5, 9, 10 for a two or three-digit number expressed in the general form. 	<ul style="list-style-type: none"> • Involve children in writing general form of rational numbers and to associate it with rules of algebra. The operations on algebraic expressions will help in describing properties of rational numbers. • Let children use the rules for comparison of integers and fractions to develop their own rules for comparison of rational numbers. • Encourage children to conclude that the half of the sum of two rational numbers lies between them and thus a rational number can be obtained between any two rational numbers. Provide hints to the children to reach to the conclusion that the process of finding a rational number between any two numbers never stops and thus there lies infinite many rational numbers between any two rational numbers • 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. • Make children observe patterns in square numbers and to form their rules for perfect square numbers and square roots. • Likewise let children observe patterns in perfect cube numbers and form rule for cube root numbers • Allow children to play with numbers to find 	<ul style="list-style-type: none"> • Describes properties of rational numbers and expresses them in general form • Performs operations on rational numbers • Reach to the conclusion that between any two rational numbers there lies infinite many rational numbers. • Finds square, square root, cube and cube root of numbers using different methods • Provide logic and valid reasoning for divisibility tests of 2, 3, 5, 9 and 10

Conceptual Area	Pedagogical Processes	Learning Indicators
	<p>square roots and cube roots using prime factorisation</p> <ul style="list-style-type: none"> • Let children practice the division method to find square roots of numbers. • Utilising children's understanding about algebra introduce the generalised form of 2 and 3 digit numbers and to prove divisibility test of numbers. 	
<p>Algebra Algebraic Expressions</p> <ul style="list-style-type: none"> • Multiplication and division of algebraic expression (Coefficient should be integers) • Identities $(a \pm b)^2 = a^2 \pm 2ab + b^2$, $a^2 \div b^2 = (a \div b)(a + b)$ • Factorisation (simple cases only) as examples the following types $a(x + y)$, $(x \pm y)^2$, $a^2 \div b^2$, $(x + a)(x + b)$ • Solving linear equations in one variable in contextual problems involving multiplication and division (word problems) (avoid complex coefficient in the equations) 	<ul style="list-style-type: none"> • The multiplication of algebraic expressions based upon the distributive property of multiplication over addition and subtraction of numbers. Moreover children already have the idea that same number multiplied repeatedly can be expressed in powers and the same is true for variables. Let children develop their own results for algebraic identities by using the multiplication of algebraic expressions. • Continuing the idea of numerical coefficient and factors of a term to evolve methods of writing an expression in terms of product of two or more expressions. This will lead to the factorisation of algebraic expressions. • Give special emphasis to the common errors that children commit while learning algebra like $2 + x = 2x$, $7x + y = 7xy$ etc. 	<ul style="list-style-type: none"> • Multiplies two algebraic expressions and forms algebraic identities for square of binomials • Factorizes an algebraic expression using identities • Describes simple contextual situations into linear equations and solves them using different methods

Conceptual Area	Pedagogical Processes	Learning Indicators
<p>Ratio and Proportion</p> <ul style="list-style-type: none"> Slightly advanced problems involving applications on percentages, profit & loss, overhead expenses, Discount, tax. Difference between simple and compound interest (compounded yearly up to 3 years or half-yearly up to 3 steps only) Direct and inverse variations ó Simple and direct word problems Time & work problemsó Simple and direct word problems 	<p>), Arriving at the formula for compound interest through patterns and using it for simple problems.</p>	
<p>Geometry</p> <p>Understanding shapes:</p> <ul style="list-style-type: none"> Properties of quadrilaterals ó Angle Sum property Properties of parallelogram (By verification) (i) Opposite sides of a parallelogram are equal, (ii) Opposite angles of a parallelogram are equal, (iii) Diagonals of a parallelogram bisect each other. (iv) Diagonals of a rectangle are equal and bisect each other. (v) Diagonals of a rhombus bisect each other at right angles. (vi) Diagonals of a square are equal and bisect each other at right angles. <p>Representing 3-D in 2-D</p> <p>É Identify and Match pictures with objects [more complicated e.g. nested, joint 2-D and 3-D shapes (not more than 2)].</p> <p>É Drawing 2-D representation of 3-D objects (Continued and extended)</p> <p>É Counting vertices, edges & faces & verifying Euler's relation for 3-D figures with flat faces (cubes, cuboids, tetrahedrons, prisms and</p>	<p>Involve children in activities of measuring angles and sides of shapes like quadrilaterals and parallelograms and to identify patterns in the relationship among them. Let them make their hypothesis on the basis of the generalisation of the patterns and later on to verify their assertions.</p> <p>Involve children in expressing/representing a 3-D shape into 2-D from their life like drawing a box on plane surface, showing bottles on paper etc.</p> <p>Let children make nets of various shapes like cuboids, cubes, pyramids, prisms etc. Again from nets let them make the shapes and to establish relationship among vertices, edges and surfaces. Through pattern let them reach to Euler's relation</p>	<ul style="list-style-type: none"> Generalizes sum of angles of quadrilateral and uses it in solving various problems related to finding angles of a quadrilateral Explains properties of parallelograms and tries to reason out how one property is related to other Represents 3-D shapes on a plan surface like paper, board, wall etc. Makes nets of prisms and pyramids and forms the shapes from the nets. Identifies relationship among number of edges, vertices and surfaces in various 3-D shapes and generalizes it. Constructs quadrilaterals using compasses and straight edge given <ul style="list-style-type: none"> Four sides and one diagonal

Conceptual Area	Pedagogical Processes	Learning Indicators
pyramids) Construction of Quadrilaterals: <ul style="list-style-type: none"> • Given four sides and one diagonal • Three sides and two diagonals • Three sides and two included angles • Two adjacent sides and three angles 	Children enjoy constructing various figures by using compasses and a straight edge. But it is also important to involve children to argue why a particular step is required. For example, on drawing an arc using compasses we find all those points that are at the given distance from the point where the metal end of the compasses was placed.	<ul style="list-style-type: none"> • Three sides and two diagonals • Three sides and two included angles • Two adjacent sides and three angles
Mensuration <ul style="list-style-type: none"> • Area of a trapezium and a polygon. • Surface area of a cube, cuboid, cylinder. • Concept of volume, measurement of volume using a basic unit, volume of a cube, cuboid and cylinder • Volume and capacity (measurement of capacity) 	<ul style="list-style-type: none"> • Children already know the method of finding area of a rectangle. Let children discuss in groups to convert trapezium and parallelograms into rectangles of equal area. This will help them in formation of formulae to find these areas. • In finding surface areas of cube and cuboid involve children in opening such boxes and realize that all these surfaces are made up of rectangles and squares only. The rest of the job of finding total surface area will only be to add these areas. • Children already have vocabulary related to measurement of volume and capacity through their daily life experiences. Involve them in activities to get a feel of filling a given space and to measure it by just counting the unit items that fill it completely. This will also hel 	<ul style="list-style-type: none"> • Finds area of trapezium and polygons by using square grid and also by using formulae • Forms formula to find volume of a cuboid by observing and generalizing patterns of counting units cubes that completely fill the cuboids • Finds surface area of cuboid and cube through their nets and later on by using formulae.

Conceptual Area	Pedagogical Processes	Learning Indicators
	<p>them in deciding why a cube is taken as a unit of measuring volume.</p>	
<p>Data handling</p> <ul style="list-style-type: none"> • Arranging ungrouped data it into groups, representation of grouped data through bar-graphs, constructing and interpreting bar-graphs. • Simple Pie charts with reasonable data numbers • Consolidating and generalising the notion of chance in events like tossing coins, dice etc. Relating it to chance in life events. 	<p>Conduct activities related to throwing a large number of identical dice/coins together and aggregating the result of the throws to get large number of individual events. Involve children in making their assumption for the future events on the basis of the above data. Observing the aggregating numbers over a large number of repeated events also help in forecasting the chances of future events Comparing with the data for a coin. Observing strings of throws will help children in developing notion of randomness</p>	<p>Makes hypothesis on chances of coming events on the basis of its earlier occurrences like after repeated throws of dice and coins.</p>
<p>Introduction to graphs</p> <ul style="list-style-type: none"> • Axes (Same units), Cartesian Plane • Plotting points for different kind 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.) • Reading off from the graphs <ul style="list-style-type: none"> ○ Reading of linear graphs ○ Reading of distance vs time Graph 	<p>Involve children in representing the rectangular arrangement of children in a class by using numbers and encourage them to come to the conclusion of using two axes and a unit. By this way they will appreciate that each child can be identified by a pair of numbers.</p> <p>Making such drawings will help in categorizing the set of points as in a line of on a curve or randomly placed</p>	<p>Draws and reads points plotted on Cartesian plane</p>

Conceptual Area	Pedagogical Processes	Learning Indicators