Mathematics Syllabus – Primary

Classes I to V

Class I	Class II	Class III	Class IV	Class V
Geometry (10 hrs.) SHAPES & SPATIAL UNDERSTANDING • Develops and uses vocabulary of spatial relationship (Top, Bottom, On, Under, Inside, Outside, Above, Below, Near, Far, Before, After) SOLIDS AROUND US • Collects objects from the surroundings having different sizes and shapes like pebbles, boxes, balls, cones, pipes, etc. • Sorts, Classifies and describes the objects on the basis of faces, edges, shapes, and other observable properties. • Observes and describes the way shapes affect movements like rolling and sliding. • Sorts 2 - D shapes	**Geometry** (13 hrs.) SHAPES & SPATIAL UNDERSTANDING *3-D and 2-D Shapes* • Observes objects in the environment and gets a qualitative feel for their geometrical attributes. • Identifies the basic 3-D shapes such as cuboid, cylinder, cone, sphere by their names. • Traces the 2-D outlines (faces) of 3-D objects. • Observes and identifies these 2-D shapes. • Describes intuitively the properties of these 2-D shapes. • Identifies and makes straight lines by folding, using straight edged objects, stretched strings and draws freehand with a scale. • Draws horizontal, vertical and slant lines (free hand). • Draw straight-line with a ruler. • Distinguishes between straight and curved lines. • Identifies objects by observing their shadows.	**Geometry** (16 hrs.) SHAPES & SPATIAL UNDERSTANDING • Identifies the side view, top view, front view of objects. • Study of the net of a cuboid and its shape. • Tracing circles, rectangles, squares by using different objects. • Making shapes with matchsticks. • Creates shapes/objects through paper folding and paper cutting. • Identifies 2-D shapes (square, rectangle, triangle, circle) without naming. • Tiles a given region using a given shape. • Distinguishes between shapes that tile and shapes that do not tile.	**Geometry** (16 hrs.) SHAPES & SPATIAL UNDERSTANDING • Identifies the side view, top view, front view of simple objects/ planes. • Identifies of nets of cube and cuboid shaped boxes • Identifies cubes from given nets. • Identifies 2-D shapes viz., rectangle, square, triangle and circle by their names. • Making new shapes/objects using known regular shapes. • Making shapes on the geo-board/ dotted board. • Identifying regular 2D & 3D shapes in objects. • Describes the various 2-D & 3D shapes by identifying and counting their edges, corners and faces. • Draws shapes and patterns - free hand and with scale. • Explores perimeter of simple shapes intuitively and can calculate it. • Explores intuitively the reflections through inkblots, paper cutting and paper folding. • Estimation of area.	**Geometry** (16 hrs.) SHAPES & SPATIAL UNDERSTANDING • Draws the side view, top view, front view of simple objects/ plans. • Makes the shapes of cubes, cuboid using nets especially designed for this purpose. • Uses shapes to create different shapes (tangram) and different patterns • Identifies the shadows of the different given objects. • Identifies appropriate nets for cube and cuboid • Explores intuitively line symmetry in familiar 3-D objects expressed as 2 D shapes. • Explores intuitively rotations and reflections of familiar 2-D shapes. • Explores intuitively the perimeter and area of simple shapes. • Estimates area • Gets the feel of an angle through observation and paper folding. • Identifies right angles in the environment. • Identifies right angle and angles more than and less

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			• Measuring area using non standard units • Comparison of big and small non standard units.	than right angles. •Draws right angle and angles more than and less than right angles. • Division of complete angles into parts • Drawing shapes on dotted paper • Identifies and reads floor maps, routes/road maps • Draws simple floor maps of familiar locations • Point, line, vertex, ray • Identifies centre and radius of a circle.
Numbers (46 hrs.) DEVELOPING A SENSE OF NUMBERNESS, COUNTING AND OPERATIONS OF NUMBERS 1 - 9 AND ZERO • Observes object and makes collections of objects. • Arranges the collection of objects in order by – One to one correspondence – Matching • Introduction of number(1-5) • Counts the number of objects in a collection. • Makes collection of objects corresponding to a specific number. • Introduction of numbers (6-9) • Recognizes and speaks numbers from 1 to 9. • Uses numbers from 1 to 9 in counting and	**Numbers** (46 hrs.) • Reads and writes numerals for numbers up to ninety nine. • Counts and regroups objects into tens and ones. • Expands a number with respect to place values. • Uses the concept of place value in the comparison of numbers. • Counts in various ways: – Starting from any number. – Group counting etc. • Arranges numbers upto hundred in ascending and descending order. • Forms the greatest and the smallest two digit numbers with and without repetition of given digits. • Indicates and identifies the position of an object in a	**Numbers** (42 hrs.) NUMBER UPTO 1000 • Reads and writes up to 3-digit numbers. • Understands place value in 3-digit numbers. • Expands a number using place value. • Compares numbers. • Forms numbers using given digits. • Estimates numbers • Arrange the given numbers in ascending and descending order. **ADDITION AND SUBTRACTION** • Solves addition and subtraction problems in different situations presented through pictures and stories. • Adds and subtracts numbers	**Numbers** (40 hrs.) NUMBERS UPTO 10000 • Using word problems/ contextual situations, reads, writes and compares 2, 3-digit numbers. • Estimating 2, 3- digit numbers using the number line • Understands place value in 3-digit numbers. • Expands a number using place value. • Forms numbers using given digits. • Skip counting in terms of tens, hundreds and thousands ADDITION AND SUBTRACTION • Using word problems/ contextual situations for a additions and subtractions up to 999. (compare-combination and comparison types of word problems)	**Numbers** (40 hrs.) NUMBERS UPTO 1,00,000 • Using word problems/ contextual situations, reads, writes and compares 3,4,5-digit numbers. • Understands place value in numbers up to 99,999 • Expands a number using place value. • Forms numbers using given digits. • Skip counting in terms of hundreds, thousands and ten thousands ADDITION AND SUBTRACTION • Using word problems/ contextual situations for a additions and subtractions up to 99999. (compare-combination and comparison types of word problems)

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comparison. • Reads and writes numerals from 1 to 9. • Adds and subtracts using real objects and pictures. (Sum not to exceed 9 and difference not to go below 1.) • Adds and subtracts the numbers using symbols '+' and '-'. • Approaches zero through the subtraction pattern. **NUMBERS FROM (10 - 20)** • Introduction of 10 • Forms Number sequence from 10 to 20. • Counts objects using these numbers. • divides objects into a group of 10s and single objects. • Develops the vocabulary of group of 'tens' and 'ones'. • Shows the group of tens and ones by drawing. • Counts the number of tens and ones in a given number. • Writes number names ten to nineteen. • Writes numerals for ten to twenty. • Compares numbers upto 20. **ADDITION AND SUBTRACTION (UPTO 20)** • Adds and subtracts of numbers the total not exceeding 20.	line. **ADDITION AND SUBTRACTION** • Adds and subtracts two digit numbers by drawing representations of tens and ones without and with regrouping. • Adds zero to a number and subtracts zero from a number. • Solves addition, subtraction problems presented through pictures and verbal description. • Describes orally the situations that correspond to the given addition and subtraction facts. **PREPARATION FOR MULTIPLICATION AND DIVISION** • Discussion of situations involving repeated addition and situations involving equal sharing. • Activities of making equal groups. • Observe the cumulative property of multiplication	by writing them vertically and horizontally in the following two cases: – without regrouping. – with regrouping. • Introduction to different strategies of addition and subtraction • Uses the place value in standard algorithm of addition and subtraction. • Frames problems for addition and subtraction facts. **MULTIPLICATION** • Explains the meaning of multiplication (as repeated addition). • Identifies the sign of multiplication. • Constructs the multiplication tables of 2, 3, 4, 5 and 10 • Uses multiplication facts in situations. • Construct tables for 6, 7, 8, 9 • Multiplies two digit numbers by single digit number using standard algorithm and Lattice multiplication algorithm. **DIVISION** • Explains the meaning of division from context of equal grouping and sharing.	• Using word problems/ contextual situations for addition of 3 numbers. • Estimates sums and differences of 2,3 digit numbers through word problems and in sums. • Adds and subtracts 2,3-digit numbers using the empty number line. • Frames word problems. • Estimates the sum and difference between two given numbers **MULTIPLICATION** • Using word problems/ contextual situations revises multiplication facts up to 10*10.(array - rate product and grouping types of word problems) • Multiply by 10's and 100's • Using word problems/ contextual situations multiplies 2 and 3 digit numbers by single digit and two digit numbers using the standard (column) algorithm as well as the distributive law. .(array product - rate product and grouping types of word problems) • Frames word problems. • Estimates products 2 digit by 1 digit and 2 digit, 3 digit by 1 digit	• Estimates sums and differences of 3,4 digit numbers through word problems and in sums. • Frames word problems. **MULTIPLICATION** • Multiply by 10's, 100's, 1000's and 10,000s • Using word problems/ contextual situations multiplies 3 digit number by 2 digit numbers using the standard (column) algorithm as well as the distributive law. (array product - rate product and grouping – Cartesian product types of word problems) • Frames word problems. • Estimates products of 3 digit by 1 digit and 3 digit by 2 digit numbers **DIVISION** • Using word problems/ contextual situations dividing 2-digit numbers by two digit numbers and three digit numbers by two digit numbers- with remainder and without remainder (using both equal grouping and sharing) • Understands the pattern which emerges from division by 10 • Uses standard division

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NUMBERS FROM 21 - 99
• Writes numerals for Twenty-one to Ninety nine.·
• Groups objects into tens and ones.
• Draws representation for groups of ten and ones.
• Groups a number orally into tens and ones.
		• Relates division with multiplication.
		• Completes division facts: (Double digit by single digit)
		  – by repeated subtraction
		  – by grouping
		  – by using multiplication tables.
			DIVISION
			• Using word problems/ contextual situations dividing 2 and 3 digit numbers by one and 2-digit numbers - with remainder and without remainder
			(using both equal grouping and sharing)
			• Frames word problems.
			• Even and odd numbers
			• Estimates quotients for 2 and 3 digit numbers divided by single digit numbers.
			• Explores the relationship between multiplication and division using 2 and 1 digit numbers
				algorithms for two-and three digit numbers divided by one and two-digit numbers
				• Frames word problems.
				• Even and odd numbers
				• Tests of divisibility for 2, 5 & 10.
				• Understanding of the multiples and factors
				• Estimates quotients
				• Explores the relationship between multiplication and division using 2 and 3 digit numbers

			FRACTIONAL NUMBERS • Identifies half, one fourth and three - fourths of a whole. • Identifies the symbols, ½ , ¼ , ¾ . • Explains the meaning of ½ , ¼ and ¾ . • Identifies other fractions- 3/2, 5/2, 5/4 • Appreciates equivalence of 2/4 and ½ ; and of 2/2 , 3/3, 4/4 and 1. • Comparison of like fractions • Addition and subtraction of like fractions intuitively	**FRACTIONAL NUMBERS** • Finds the fractional part of a collection/ object • Identifies equivalent fractions 2/4 and ½ ; 2/6 and 1/3, 2/8 and 1/4 • Compares like and unlike fractions(without LCM) • Addition and subtraction of like fractions • Applies simple fractions to measurements.
Day to Day Maths (3 hrs.) (Money, Length, Weight, Capacity) • Identifies common currency	**Day to Day Maths (3 hrs.) (Money, Length, Weight, Capacity)** •Identifies currency - notes	**Day to Day Maths (5 hrs.) (Money, Length, Weight, Capacity, Space)** • word problems/ contextual	**Day to Day Maths (5 hrs.) (Money, Length, Weight, Capacity, Space)** • word problems/ contextual	**Day to Day Maths (5 hrs.) (Money, Length, Weight, Capacity, Space)** • word problems/ contextual

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notes and coins. • Puts together small amounts of money.	and coins. • Puts together amounts of money not exceeding Rs 10/- or Rs. 50/-. • Adds and subtracts small amounts of money mentally. • Transacts an amount using 3-4 notes/coins.	situations using more than one operations and/ or more than one concept and/or multiple stages of solving • estimation in daily life	situations using more than one operations and/ or more than one concept and/or multiple stages of solving • estimation in daily life	situations using more than one operations and/ or more than one concept and/or multiple stages of solving • estimation in daily life
Measurement (13 hrs.) (LENGTH, WEIGHT, CAPACITY) LENGTH: • Distinguishes between near, far, thin, thick, longer/taller, shorter, high, low. • Seriates objects by comparing their length. • Measures short lengths in terms of non-standard units (e.g. hand span etc.) WEIGHT • Compares between heavy and light objects. CAPACITY • Comparison of capacity of vessels	**Measurement (13 hrs.)** (LENGTH, WEIGHT, CAPACITY) LENGTH: • Measures lengths & distances along short & long paths using uniform non-standard units (Foot). WEIGHT • Compares two or more objects by their weight using non-standard units • Appreciates the need for a simple balance. • Compares weights of given objects using simple balance. CAPACITY • Comparison of capacity of vessels	**Measurement (21 hrs.)** (LENGTH, WEIGHT, CAPACITY) LENGTH: • Appreciates the need for a standard unit. • Measures length using appropriate standard units of length by choosing centimeters. • Uses a scale for measuring WEIGHT • Weighs objects using 1kg, 2 kg, 5 kg, 10 kg. • Estimates the weight of an object and verifies using a balance. • Identifies which is lighter or weighter in given things. CAPACITY • Measures and compares the capacity of different containers in terms of nonstandard units. • Appreciates the conservation of capacity. • Solves the problems on 'capacity'(in non standard units)	**Measurement (21 hrs.)** (LENG,TH WEIGHT, CAPACITY) LENGTH: • Identifies meter and cm lengths • Relates meter with cm. • Converts meter into cm. • Measures length in meters, cm's and inches. • Estimates length of an object and distance between two given locations. • Solves problems involving length and distances in *m* and *cm*. WEIGHT • Understands weight in terms of *kg* and *g*, using actual weights and their combinations • Relates Kg with gram • Weighs objects using a balance and standard units. • Appreciates the conservation of weight. • Estimates the weight of an object. Verifies using a balance. • Solves problems involving	**Measurement (26 hrs.)** (LENGTH, WEIGHT, CAPACITY) • Relates commonly used larger and smaller units of length, weight and capacity and converts one to the other. • Relates feet to inches. • Relates km to m; liter-ml; kg-gram; quintal-kg • Applies simple fractions to quantities. • Converts fractional larger unit into complete smaller units. • Applies the four operations in solving problems involving length, weight and capacity. • Determines intuitively area and perimeter. • Estimated length, weight, capacity of a solid body: intuitively and also by informal measurement. • Understands the concept of area

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			weights using *kg* and *g*. **CAPACITY** • Understands capacity in terms of *l* and *ml* • Relates liter with ml. • Measures capacity of given liquid using containers marked with standard units. • Estimates the capacity of a liquid .Verifies by measuring. • Determines sums and differences of capacity. • Solves problems involving capacity in *l* and *ml*	
Time • Distinguishes between events occurring in time using terms -earlier and later. • Narrates the sequence of events in a day.	**TIME** • Gets familiar with the days of the week and months of the year. • Sequences the events occurring over longer periods in terms of dates/days.	**TIME** • Reads a calendar to find a particular day and date. • Reads the time correct to the hour. • Sequences the events chronologically. • Compares the duration of two different events. • Identifies the patterns in a calendar.	**TIME** • Appreciates the difference in time in terms of minutes, hours, days, weeks and months. • Reads the calendar, identifies and correlates the number of days, weeks, months and years. • Understands a leap year. • Reads clock time to the hours and minutes • Solves problems on 'time'	**TIME** • Appreciates the difference in time in terms of seconds, minutes, hours, days, months and years. • Reading time in hour, minutes and seconds • Converts hours into minutes and minutes into seconds • Expresses time, using the terms, 'a.m.' and 'p.m.' • Understanding 24 hour clock (Bus and Railway timetable) and conversion between 12 hour and 24 hour clocks • Computes the number of days between two dates. • Uses addition and subtraction in finding time intervals in simple cases.

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Data Handling (6 hrs.) • Collects data • Records data in a table • Draws inferences from data.	**Data Handling (6 hrs.)** • Collects data • Records data in a table • Draws inferences from data.	**Data Handling (6 hrs.)** • Collects data • Records data in a table •Reads data given in the form of a pictograph • Records data using tally marks • Draws conclusions from the data.	**Data Handling (6 hrs.)** • Reading data using a pictograph • Reading data using a bar graph • Recording data using tally marks	**Data Handling (6 hrs.)** •Reading data using a pictograph •Understands the importance of an appropriate scale for pictograph •Reading data using bar graphs • Organizing data using tally marks using tally marker. •Making bar graphs based on data(without scale)
Patterns (10 hrs.) • Describes sequences of simple patterns found in shapes in the surroundings and in numbers, e.g. stamping activity using fingers and thumb. • Completes a given sequence of simple patterns found in shapes in the surroundings and in numbers.	**Patterns (10 hrs.)** • Observes and extends patterns in sequence of shapes and numbers. • Searches for patterns in different ways of splitting a number. • Creates block patterns by stamping thumbprints, leaf prints, vegetable prints, etc. • Creates patterns of regular shapes by stamping.	**Patterns (6 hrs.)** • Identifies simple symmetrical shapes and patterns. • Makes patterns and designs from straight lines and other geometrical shapes. • Identifies patterns in his Surroundings • Symmetry through paper folding, paper cuttings • Complete a symmetric picture using mirror.	**Patterns (6 hrs.)** • Identifies, carries forward and makes visual patterns. • Carries forward patterns in numbers based on addition, subtraction, multiplication and division	**Patterns (6 hrs.)** • Identifies patterns in square numbers, triangular numbers. • Identifies patterns in multiplication and division. • Numbers between consecutive square numbers. • Makes border strip and tiling patterns. • Identifies the patterns in the multiples of 9. • Draws symmetric pictures and symmetric axis. • Identifies the block or unit of the pattern.

Mathematics Syllabus – High School
Class VI to X

Class – VI	Class – VII	Class – VIII	Class – IX	Class – X

Number System   (60 hrs) **(i) Knowing our Numbers:** Consolidating the sense of Numberness up to 99,999 (five digits)
• Estimation of numbers
• Comparison of numbers
• Place value (recapitulation and extension);
• Connectives: use of symbols =, <, >.
• Word problems on number operations involving large numbers up to a maximum of 5 digits in the answer (This would include conversions of units of length & mass from the larger to the smaller units)
• Estimation of outcome of number operations.
• Introduction to large numbers
  a) up to lakhs and ten lakhs
  b) up to crores and ten crores
• Approximation of large numbers
• International system of numbers (Millions.)
• Use of Large numbers in daily life situations.
	Number System (50 hrs) **(i) Integers**
	• Addition, Subtraction, Multiplication and Division of integers (through patterns).
	• Properties of integers under addition, multiplication & division through patterns (closure, commutative, associative, inverse, including identities and distributive properties)
	  o Expressing properties in a general form.
	  o Construction of counter examples, (e.g. Subtraction is not commutative).
	  o Multiplication and division by zero
	• Word problems involving integers (on all operations)
	(ii) Fractions Decimals and rational numbers:
	• Multiplication of fractions
	• Fraction as an operator "of"
	• Division of fractions
	• Reciprocal of a fraction and its use
	• Word problems involving
		Number System **(50 hrs)** **(67periods)** **(i) Playing with numbers**
		• Writing and understanding a 2 and 3 digit number in generalized form $(100a + 10b) + c$, where a, b, c can be only digits 0-9) and engaging with various puzzles concerning this. (Like finding the missing numerals represented by alphabets in sums involving any of the four operations) Children to solve and create problems and puzzles.
		• Number puzzles and games
		• Understanding the logic behind the divisibility tests of 2, 3,4, 5, 6, 7,8,9, and 11 for a two or three digit number expressed in the general form.
			Number System **(20 periods)**
			• **Real numbers**
			  Review of representation of natural numbers, integers, and rational numbers on the number line.
			• Representation of terminating / non terminating recurring decimals, on the number line through successive magnification.
			• Rational numbers as recurring / terminating decimals.
			• Finding $\sqrt{2}$, $\sqrt{3}$, $\sqrt{5}$ correct to 6-decimal places by division method
			• Examples of nonrecurring / non terminating decimals such as 1.01011011101111--- 1.12112111211112--- and $\sqrt{2}$, $\sqrt{3}$, $\sqrt{5}$ etc.
			• Existence of non-rational numbers (irrational numbers) such as $\sqrt{2}$, $\sqrt{3}$, and their representation on the number line.
			• Existence of each real number on a number line by using
				Number System **(i) Real numbers(15 periods):**
				• Euclid division lemma
				  - Introduction, HCF
				  - Some number generalisations
				• More about rational and irrational numbers.
				• Fundamental Theorem of Arithmetic − statements.
				• LCM, HCF
				• Properties of real numbers in terms of rationality and irrationality
				• Proofs of results- irrationality of $\sqrt{2}$, $\sqrt{3}$ etc. and decimal expansions of rational numbers in terms of terminating, non terminating, recurring of decimals and vice versa.
				• Introduction of logarithms
				• Conversion of a number in exponential form to a logarith tic form
				• Properties of logarithms $\log_a a = 1$; $\log_a 1 = 0$

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(ii) Whole numbers • Natural numbers, whole numbers • Properties of whole numbers (closure, commutative, associative, distributive, additive identity, multiplicative identity) • Division by zero • Number line- Binary operations (addition, subtraction, multiplication) on the number line • Seeing patterns, identifying and formulating rules to be done by children. • Utility of properties in fundamental operations **(iii) Playing with Numbers:** • Consolidating divisibility rules of 2,3,5,6,9,10 • Discovering divisibility rules of 4,8,11 through observing patterns. • Multiples and factors, • Prime & composite numbers, Co-prime numbers and twin prime numbers, • Prime factorization, every number can be written as products of prime factors. • HCF and LCM, prime factorization and division method. • Property LCM × HCF =	mixed fractions (related to daily life) • Introduction to rational numbers • Multiplication and division of decimal fractions • Conversion of units (length & mass) • Comparison of rational numbers.	• General rule of divisibility by any number. **(ii) Rational Number** • Properties of rational numbers. (including identities). • Using general form of expression to describe properties. Appreciation of properties. • Representation of rational numbers on the number line • Between any two rational numbers there lies another rational number • Representation of rational numbers as decimal (denominators other than 10, 100,….) • Representation of decimal numbers (terminating, non terminating but recurring) in rational form. • Consolidation of operations on rational numbers. • Word problems on rational numbers (all operations) • Word problem (higher logic, all	Pythogorian result. • Square root of a surd of the form $a+\sqrt{b}$ (simple problems) • Concept of a Surd. • Rationalisation of a monomial, binomial surds of second order.	• Laws of logarithms log xy = logx + logy; log x/y = logx − logy log xⁿ = n log x, $a^{\log_a^N} = N$ • Standard base of logarithms and usage **(ii) Sets (8 periods):** • Sets and their representations : Empty set, Finite and infinite sets. Equal sets. Subsets, subsets of the set of real numbers (especially intervals with notations). Universal set and cardinality of sets. • Venn diagrams - Sets, subsets - Disjoint sets. • Basic operations on sets - Union, intersection, difference of sets

Class – VI	Class – VII	Class – VIII	Class – IX	Class – X
product of two numbers. • LCM & HCF of co-primes. **(iv) Negative Numbers and Integers** • How negative numbers arise, models of negative numbers, connection to daily life, ordering of negative numbers, representation of negative numbers on number line. • Understanding the definition of integers, identification of integers on the number line • Comparison of integers, ordering of integers by using symbols • Operation of addition and subtraction of integers, showing the operations on the number line (Understanding that the addition of negative integer reduces the value of the number) **(V) Fractions and Decimals:** • Revision of what a fraction is, Fraction as a part of whole • Representation of fractions (pictorially and on number line) • Fraction as a division, proper, improper & mixed fractions, equivalent fractions, like, unlike fractions. • Comparison of fractions		operations, including ideas like area) **(iii) Square numbers, cube numbers, Square roots, Cubes, Cube roots.** • Square numbers and square roots. • Square roots using factor method and division method for numbers containing. a)not more than 4 digits and b)not more than 2 decimal places • Pythagorean triplets and problems involving Pythagorean triplets. • Cube numbers and cube roots (only factor method for numbers containing at most 3 digits). • Estimating square roots and cube roots. Learning the process of moving nearer to the required number.		

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• Addition and subtraction of fractions • Word problems (Avoid large and complicated calculations) • Review of the idea of a decimal fraction • Place value in the context of decimal fraction, inter conversion of fractions and decimal fractions (avoid recurring decimals at this stage) • Word problems involving addition and subtraction of decimals (word problems should involve two operations) • Contexts: money, mass, length.				
Algebra (15 hrs) **(i) Introduction to Algebra** • Introduction to variable through patterns and through appropriate word problems and generalizations (example $5 \times 1 = 5$ etc.) • Generate such patterns with more examples. • Introduction to unknowns through examples with simple contexts (single operations) • Rules from Geometry and Menstruation. **(ii)Simple Equations** • Introduction • Solution of simple equation	**Algebra (20 hrs)** **(i)Exponents and powers** • Meaning of x in a^x where $a \in Z$ • Writing a number in the exponential form through prime factorization. • Laws of exponents (through observing patterns to arrive at 5 generalizations) where m, n $\in$ N (i) $a^m\, a^n = a^{m+n}$ (ii) $(a^m)^n = a^{mn}$ (iii) $a^m/a^n = a^{m-n}$, where (m, n) $\in$ N (iv) $a^m.b^m = (ab)^m$ (v) number with exponent zero	**Algebra (20 hrs) (27 periods)** **Exponents & powers** **i) Powers** • Decimal numbers in exponential notation. • Integers as exponents. • Laws of exponents with integral powers • Representing large numbers in standard (scientific) notation. **ii) Algebraic Expressions** • Addition and subtraction of algebraic expressions • Multiplications of algebraic expressions (Coefficient should	**Algebra** **(i)Polynomials (25 periods)** • Definition of a polynomial in one variable, its coefficients, with examples and counter examples, its terms, zero polynomial. • Constant, linear, quadratic, cubic polynomials; monomials, binomials, trinomials. Zero / roots of a polynomial / equation. • Division of polynomials • State and motivate the Remainder Theorem with examples and analogy to integers (motivate). • Statement and verification of the Factor Theorem. • Recall of algebraic expressions and identities. • Further identities of the type:	**Algebra** **(i) Polynomials (8 periods)** • Zeroes of a polynomial (Linear, Quadratic cubic polynomials). • Geometrical meaning of Zeroes of quadratic and cubic polynomials using graphs. • Relationship between Zeroes and coefficients of a polynomial with particular reference to quadratic polynomials. • Statement and simple problems on division algorithm for polynomials with integral coefficients. • Zeroes of a biquadratic polynomial. **(ii) Pair of Linear Equations in Two Variables (15 periods)**

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by Trial and Error method.	• Terms with negative base. • • Expressing large number in standard form (Scientific Notation) **(ii)Algebraic Expressions Introduction** Generate algebraic expressions (simple) involving one or two variables • Identifying constants, coefficient, powers • Like and unlike terms, degree of expressions e.g., x^2y etc. (exponent ≤ 3, number of variables ≤ 2) • Types of algebraic expressions. • Addition, subtraction of algebraic expressions (coefficients should be integers). • Finding the value of the expression. **(iii)Simple equations** • Simple linear equations in one variable (in contextual problems) with two operations (integers as coefficients)	be integers) • Identities: Derivation and geometric verification of $(a \pm b)^2 = a^2 \pm 2ab + b^2$, $a^2 - b^2 = (a - b)(a + b)$ • Factorization (simple cases only) as examples of the following types $a(x + y)$, $(x \pm y)^2$, $x^2 - y^2$, $(x + a).(x + b)$ • Division of algebraic expression **(iii)Simple equations** • Solving linear equations in one variable in contextual problems involving multiplication and division (word problems) (with integral coefficient in the equations)	$(x+y+z)^2 = x^2+y^2+x^2+2xy+2yz+2zx$ $(x\pm y)^3 = x^3\pm y^3\pm 3xy\,(x\pm y)$ $x^3 +y^3 +z^3 -3xyz = (x+y+z)$ $\qquad (x^2 +y^2 +z^2 -xy-yz-zx)$ $x^3 +y^3 = (x+y)(x^2 - xy + y^2)$ $x^3 -y^3 = (x-y)(x^2 + xy + y^2)$ and their use in factorization of polynomials. Simple expressions reducible to these polynomials. **(ii)Linear Equations in Two Variables (12 periods)** • Recall of linear equations in one variable. • Introduction to the equation in two variables. • Solution of a linear equation in two variables substitution and graphical methods • Graph of a linear equation in two variables • Equations of lines parallel to x-axis and y-axis. • Simple word problems related to linear equations	• Pair of linear equations in two variables. Geometric representation of different possibilities of solutions / inconsistency. • Algebraic conditions for number of solutions (Consistent, inconsistent). • Solution of pair of linear equations in two variables algebraically – by substitution, by elimination methods – Simple situational problems. • Simple problems on equations reducible to linear equations in two variables. **(iii) Quadratic Equations (12 periods)** • Standard form of a quadratic equation $ax^2+bx+c=0$, $(a \neq 0)$. • Solutions of quadratic equations (only real roots) by factorization and by completing the square, i.e., by using formula to find roots of quadratic equation. • Relationship between discriminant and nature of roots. • Problems related to day-to-day life situations. **(iv) Progressions (11 periods)** • Sequence and series • Progressions – introduction • Motivation for studying AP. Derivation of standard results of finding the nth

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				term and sum of first n terms of A.P. • Motivation for studying G.P • n^{th} term of G.P.
Ratio and Proportion(15hrs) • Concept of Ratio • Ratio in different situations. • Comparison of ratios of different units • Division of a quantity in a given ratio. • Proportion as equality of two ratios • Unitary method (with only direct variation implied) • Word problems • Understanding ratio and proportion in Arithmetic.	**Ratio - Applications (20 hrs)** • Ratio and proportion (revision) • Unitary method continued, consolidation, general expression. • Direct proportion • Percentage- an introduction. • Understanding percentage as a fraction with denominator 100. • Converting fractions and decimals into percentage and vice-versa. • Application to profit and loss (single transaction only) • Discount. • Application to simple interest (time period in complete years).	**Business Mathematics (25 hrs)** • Compound ratio – Word problems. • Problems involving applications on percentages, profit & loss, overall expenses, discount, tax. (Multiple transactions) • Difference between simple and compound interest (compounded yearly up to 3 years or half-yearly up to 3 steps only), Arriving at the formula for compound interest through patterns and using it for simple problems. • Direct variation – Simple and direct word problems. Inverse variation – Simple and direct word problems. Mixed problems on direct , inverse variation • Time & work problems– Simple and direct word		**Trigonometry** **(i) Introduction (15 periods)** • Trigonometric ratios of an acute angle by using right-angled triangle i.e. sine, cosine, tangent, cosecant and cotangent. • Values (with proofs) of the trigonometric ratios of 30^0, 45^0 and 60^0. • Motivate the ratios, whichever are defined at 0^0 and 90^0. • Relationship between the ratios. • Trigonometric Identities: Proof and applications of the identities $\sin^2A+\cos^2A=1$. $1+\tan^2A=\sec^2A$ $\cot^2+1=\csc^2A$ • Simple problems on identities • Trigonometric ratios of complementary angles. **(ii) Applications of trigonometry (8 periods)** • Angle of elevation, angle of depression • Simple and daily life problems on heights and distances. Problems should not involve more

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		problems • Time & distance : Simple and direct word problems		than two right triangles and angles elevation/ depression should be only 30^0, 45^0, 60^0.
			Coordinate geometry (9 periods) • Introduction • Cartesian system • Representation of a point in a plane by its location. • Plotting a point in a plane if its co-ordinates are given.	**Coordinate geometry Lines (In two-dimensions) (15 periods)** • Review the concepts of coordinate geometry done by the graphs of linear equations. • Distance between two points i.e. P (x_1, y_1) and Q (x_2, y_2) • Section formula (internal division of a line segment in the ratio m:n). • Area of a triangle on coordinate plane. • Slope of a line joining two points.
Geometry (65 hrs) **i) Basic geometrical ideas (2-D):** • Introduction to geometry. Its linkage with and reflection in everyday experience. • Point, Line, line segment, ray. • Open and closed figures. • Curvilinear and linear boundaries • Interior and exterior of closed figures. • Angle — Vertex, arm, interior and exterior, Triangle — vertices, sides, angles, interior and	**Geometry (60 hrs)** **(i) Lines and Angles** • Pairs of angles (linear pair) 1. complementary, 2. supplementary, 3. adjacent, vertically opposite angles. (verification and simple proof of vertically opposite angles) • Transversal – Angles formed by the transversal. • Properties of parallel lines with transversal (alternate, corresponding, interior, exterior angles, interior angles on the same side of transversal.	**Geometry (40 hrs)** **(i) Construction of Quadrilaterals: (54 periods)** • Review of quadrilaterals and their properties. • Four sides, one angle • Four sides, one diagonal • Two adjacent sides, three angles • Three sides, two diagonals. • Three sides, two angles in between. • Construction of	**Geometry** **(i) Introduction to Euclid's Geometry (6 periods)** • History – Euclid and geometry in India. Euclid's method of formalizing observed phenomenon onto rigorous mathematics with definitions, common / obvious notions, axioms / postulates, and theorems. The five postulates of Euclid. Equivalent **varies** of the fifth postulate. Showing the relationship between axiom and theorem. • Given two distinct points, there exists one and only one line through them.	**Geometry** **(i) Similar triangles (18 periods)** Meaning, examples, properties of similar triangles. • Difference between congruency and similarity of triangles. • (Prove) If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio. • (Motivate) If a line divides two sides of a triangle in

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exterior. • Quadrilateral — Sides, vertices, angles, diagonals, adjacent sides and opposite sides, adjacent and opposite angles (only convex quadrilateral are to be discussed), interior and exterior of a quadrilateral. • Circle — Centre, radius, diameter, chord, arc, sector, segment, semicircle, circumference, interior and exterior. **(ii) Measures of Lines and Angles:** • Measure of Line segment • Types of angles- acute, obtuse, right, straight, reflex, complete and Zeroes angle. • Examples of angles in the surroundings. • Measure of angles • Classifying angles according to their measure. • Pair of lines Intersecting and perpendicular lines and parallel lines **iii) Practical Geometry (Constructions)** • Drawing of a line segment (using Straight edged Scale, compasses) • Construction of circle • Perpendicular bisector • Drawing a line	**(ii) Triangles:** • Definition of triangle. • Types of triangles according to sides and angles • Properties of triangles • Sum of the sides, difference of two sides. • Angle sum property (with notion of proof and verification through paper folding, proofs , using property of parallel lines , difference between proof and verification • Exterior angle property of triangle • Median and Altitude of a triangle, centriod. **(iii) Congruence**: • Congruence through superposition **ex**. Blades, stamps etc.. • Extend congruence to simple geometrical shapes ex: Triangle , Circles, • Criteria of congruence (by verification only) • Property of congruencies of triangles SAS, SSS, ASA, RHS Properties with figures **(iv) Construction of triangles (all models)** • Constructing a Triangles when the lengths of its 3 sides are known (SSS Criterion)	special type of quadrilaterals. **(ii) Representing 3-D in 2-D** • Identify and Match pictures with objects [more complicated e.g. nested, joint 2-D and 3-D shapes (not more than 2)]. • Drawing 2-D representation of 3-D objects (Continued and extended) with isometric sketches. • Counting vertices, edges & faces & verifying Euler's relation for 3-D figures with flat faces (cubes, cuboids, tetrahedrons, prisms and pyramids) **(iii)Exploring geometrical figures** • Congruent figures • Similar figures • Symmetry in geometrical figures w.r.t. to triangles, quadrilaterals and circles. Revision of reflection symmetry, rotational symmetry and it's applications • Point symmetry • Estimation of heights and distances by	• (Prove) Two distinct lines cannot have more than one point in common. **(ii) Lines and Angles (10 periods)** • Pair of angles. • (Motivate) If a ray stands on a line, then the sum of the two adjacent angles so formed is 180^0 and it's converse. • (Prove) If two lines intersect, the vertically opposite angles are equal. • (Motivate) Relation between corresponding angles, alternate angles, interior angles when a transversal intersects two parallel lines. • Concurrent lines concurrent point. • (Motivate) Lines, which are parallel to given line, are parallel. • (Prove) The sum of the angles of interior triangle is 180^0. • (Motivate) If a side of a triangle is produced, the exterior angle so formed is equal to the sum of the two interior opposite angles. **(iii) Triangles (20 periods)** • (Motivate) Two triangles are congruent if any two sides and the included angle of one triangle are equal to any two sides and the included angle of the other triangle (SAS Congruence). • (Prove) Two triangles are congruent if any two angles and the included side of one triangle are equal to any two angles and the included side of the other triangle (ASA Congruence).	the same ratio, the line is parallel to the third side. • (Motivate) If in two triangles, the corresponding angles are equal, their corresponding sides are proportional and the triangles are similar (AAA). • (Motivate) If the corresponding sides of two triangles are proportional, their corresponding angles are equal and the two triangles are similar (SSS). • (Motivate) If one angle of a triangle is equal to one angle of another triangle and the sides including these angles are proportional, the two triangles are similar. • (Prove) The ratio of the areas of two similar triangles is equal to the ratio of the squares on their corresponding sides. • (Motivate) If a perpendicular is drawn from the vertex of the right angle to the hypotenuse, the triangles on each side of the perpendicular are similar to the whole triangle and to each other. • (Prove) In a right triangle, the square on the hypotenuse is equal to the

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perpendicular to a given line from a point a)on the line b)outside the line. • Construction of angles (using protractor) • Angle equal to a given angle (using compass) • Angle 60°, 120° (Using Compasses) • Angle bisector- making angles of 30°, 45°, 90° etc. (using compasses) **vi) Understanding 3D, 2D shapes** • Identification of 3-D shapes: Cubes, Cuboids, cylinder, sphere, cone, prism (triangular), pyramid (triangular and square) Identification and locating in the surroundings • Elements of 3-D figures. (Faces, Edges and vertices) • Polygons- introduction, types of polygons, regular polygons **v) Symmetry: (reflection)** • Observation and identification of 2-D symmetrical objects for reflection symmetry • Operation of reflection (taking mirror images) of simple 2-D objects • Recognizing reflection symmetry (identifying axes) • Demonstrates an under standing of line symmetry by (one line) linear symmetry.	• Constructing a triangle when the lengths of 2 sides and the measures of the angles between them are known (SAS criterion) • Constructing triangle when the measures of 2 of its angles and length of the side included between them is given (ASA criterion) • Constructing a right angle triangle when the length of one leg hypotenuse are given (RHS criterion). • Constructing a triangle when the lengths of 2 sides and the measures of the non included angle are known (SSA criterion) **(v) Quadrilaterals** • Quadrilateral-definition. • Quadrilateral, sides, angles, diagonals. • Interior, exterior of quadrilateral • Convex, concave quadrilateral differences with diagrams • Angle sum property (By verification) , problems • Types of quadrilaterals • Properties of parallelogram, trapezium, rhombus, rectangle, square and kite. **(vi) Symmetry** • Recalling reflection, line symmetry, lines of symmetry for regular	similar figures • Dilations • Tessellations •	• (Motivate) Two triangles are congruent if the three sides of one triangle are equal to three sides of the other triangle (SSS Congruence). • (Motivate) Two right triangles are congruent if the hypotenuse and a side of one triangle are equal to the hypotenuse and a side of the other triangle. • (Prove) The angles opposite to equal sides of a triangle are equal. • (Motivate) The sides opposite to equal angles of a triangle are equal. • (Motivate) Triangle inequalities and relation between 'angle and facing side'; inequalities in a triangle. **(iv)Quadrilaterals (10 periods)** • (Prove) The diagonal divides a parallelogram into two congruent triangles. • (Motivate) In a parallelogram opposite sides are equal and its converse. • (Motivate) In a parallelogram opposite angles are equal and its converse. • (Motivate) A quadrilateral is a parallelogram if a pair of its opposite sides is parallel and equal. • (Motivate) In a parallelogram, the diagonals bisect each other and its converse. • (Motivate) In a triangle, the line segment joining the mid points of any two sides is parallel to the third side and its converse.	sum of the squares on the other two sides. • (Prove) In a triangle, if the square on one side is equal to sum of the squares on the other two sides, the angles opposite to the first side is a right triangle. • Problems based on above theorems. • **Construction:** • Division of a line segment using basic proportionality theorem. • A triangle similar to given triangle as per the given scale factor. **(ii) Tangents and secants to a circle (15 periods)** • Tangents to a circle motivated by chords drawn from points coming closer and closer to the point. • (Prove) The tangent at any point of a circle is perpendicular to the radius through the point of contact. • (Prove) The lengths of tangents drawn from an external point to a circle are equal.

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• Multiple lines of symmetry. • Creating symmetrical 2-D shapes.	polygons. • Idea of rotational symmetry, observations of rotational symmetry of 2-D objects. (90°, 120°, 180°) • Operation of rotation through 90° and 180° of simple figures. • Order of rotational symmetry • Examples of figures with both rotation and reflection symmetry (both operations) • Examples of figures that have reflection and rotation symmetry and vice-versa **(vii) Understanding 3-D in 2-D shapes:** • Nets for cube, cuboids, cylinders, cones and tetrahedrons. • Drawing 3-D figures in 2-D showing hidden faces through oblique sketches and Isometric sketches.		**(v)Area (4 periods)** • Review concept of area, recall area of a rectangle. • (Prove) Parallelograms on the same base and between the same parallels have the same area. • (Motivate) Triangles on the same base and between the same parallels are equal in area and its converse. • If A parallelogram and a triangle are on the same base and between the same parallels. The area of the triangle is equal to half the area of the parallelogram. **(vi)Circles (15 periods)** • Definitions of circle related concepts of circle; radius, circumference, diameter, chord, arc, subtended angle. The points within, on outside the circle. • (Prove) Equal chords of a circle subtend equal angles at the centre and (motivate) its converse. • (Motivate) The perpendicular from the centre of a circle to a chord bisects the chord and its converse • (Motivate) There is one and only one circle passing through three non-collinear points. • (Motivate) Equal chords of a circle (or of congruent circles) are equidistant from the centre (s) and its converse. • (Prove) The angle subtended by an arc at the centre is double the angle subtended by it at any point on the remaining part of the circle. • (Motivate) Angles in the same segment of a circle are equal. • (Motivate) If a line segment joining two points subtends equal angle at two other points lying on the same side of	• Segment of a circle made by the secant. • Finding the area of the minor/ major segment of a circle. • **Constructions** A tangent to a circle through point given on it. • Pair of tangents to a circle drawn from an external point.

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			the line segment, the four points lie on a circle. • (Motivate) The sum of the either pairs of the opposite angles of a cyclic quadrilateral is 180^0 and its converse. **(vii)Constructions (10 periods)** • Construction of a triangle given its base, sum / difference of the other two sides and one base angles. • Construction of a triangle when its perimeter and base angles are given. • Construct of segment of a circle containing given chord and angle.	
Mensuration (15 hrs) **Perimeter and Area** • Introduction and general understanding of perimeter using many shapes. • Shapes of different kinds with the same perimeter. • Perimeter of a rectangle – and its special case – a square. • Perimeter of regular polygons • Deducing the formula of the perimeter for a rectangle and then a square through pattern and generalization. • Concept of area, Area of a rectangle and a square. Counter examples to different misconcepts related to perimeter and area.	**Mensuration (15 hrs)** **Area and Perimeter** • Revision of perimeter and Area of Rectangle, Square. • Area of parallelogram. • Area of a triangle • Area of rhombus. • Idea of Circumference of Circle. • Area of rectangular paths.	**Mensuration (15 hrs)** • Area of a triangle: formulae (without proof) and its application in finding the area of a quadrilateral. • Area of a trapezium • Area of the quadrilateral and other polygons. • Area of the circle & circular paths and area of sector – Simple word problems. • Surface area of a cube, cuboid • Concept of volume, measurement of volume using a basic unit,	**Mensuration (15 hrs)** **Surface Areas and Volumes (14 periods)** **Areas of Plane figures (4 periods)** • Revision of surface area and volume of cube, cuboid • Surface areas of right circular cylinder, cone, sphere, hemi sphere. • Volume of right circular cylinder, cone, sphere and hemi sphere • Word problems on cylinder, cone, sphere, hemi sphere. • Relationship between surface areas of any two comparable solids. • Relationship in between volumes two comparable solids.	**Mensuration** **I. Surface Areas and Volumes (10 periods)** • Problems on finding surface areas and volumes of combinations of any of the following: cubes, cuboids, spheres, hemispheres and right circular cylinders / cones. • Problems involving converting one type of metallic solid into another and other mixed problems. (Problems with combination of not more than two different solids be taken.)

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• Word problems on perimeter and area.		volume of a cube, cuboid • Volume and capacity.		
Data handling **(10 hrs)** • What is data • Collection and organisation of data - examples of organizing it in tally marks and a table. • Pictograph- Need for scaling in pictographs interpretation & construction. • Bar graphs: Interpreting bar graphs, drawing vertical and horizontal bar graphs for given data.	**Data handling** **(15 hrs)** • Collection and organisation of data. • Mean median and mode of ungrouped data – understanding what they represent. • Reading bar-graphs Constructing double bar graphs. • Simple pie charts with reasonable data numbers	**Data handling** **(15 hrs)** • Revision of Mean, Median and Mode of ungrouped data. • Determination of mean by Deviation Method. • Scope and necessity of grouped data. • Preparation of frequency distribution table • Cumulative frequency distribution table • Frequency graphs (histogram for equal and unequal class intervals, frequency polygon, frequency curve, cumulative frequency curves)	**Data handling** **(15 hrs)** **Statistics (13 periods)** • Frequency distribution for ungrouped and grouped data • Mean, Median and Mode of ungrouped frequency distributions (weighted scores). **Probability (12 periods)** • Feel of probability using data through experiments. Notion of chance in events like tossing coins, dice etc. • Tabulating and counting occurrences of 1 to 6 in a number of throws. • Comparing the observation with that for a coin. Observing strings of throws, notion of randomness. • Consolidating and generalizing the notion of chance in events like tossing coins / dice. • Relating probability to chances in life-events. • Visual representation of frequency outcomes of repeated throws of the same kind of coins or dice. • Throwing a large number of identical dice/coins together and aggregating the result of the throws to get large number of individual events. • Observing and aggregating number	**Data handling** **(15 hrs)** **(i) Statistics (15 periods)** • Revision of Mean, median and mode of ungrouped (frequency distribution) data. • Understanding, the concept of Arithmetic Mean, Median and Mode for grouped (classified) data. • The meaning and purpose of arithmetic Mean, Median and Mode • Simple problems on finding Mean, Median and Mode for grouped / ungrouped data. • Usage and different values and central tendencies through Ogives. **(ii) Probability (10 periods)** • Concept and definition of Probability. • Simple problems (day to day life situation) on single events simple using set notation. • Concept of complimentary events.

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			over a large number of repeated events. Observing strings of throws notion of randomness	
			Proofs in Mathematics • Mathematical Statement, Verification of statement • Mathematical Reasoning, Deductive reasoning • Theorems, Conjectures and Axioms • What is a Mathematical proof? Steps of Mathematical proofs.	**Mathematical Modeling (8 periods)** • Concept of Mathematical modeling • Discussing the broad stages of modeling – real life, situations (Simple Interest, probability, fare installments, payments etc.)