

NUMBERS AND OPERATIONS

STANDARD-1	<p>The students will be able to</p> <ul style="list-style-type: none"> • identify numbers, ways of representing numbers and effects of operations in various situations, • compute fluently with fractions, decimals and percents, • manipulate different types of sequence and apply operations on matrices.
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BENCHMARKS

Grades I-II	Grades III-V	Grades VI-VIII	Grades IX-X	Grades XI-XII
<ul style="list-style-type: none"> • Count, read and write numbers up to 999. • Write numbers up to 100 in words and write ordinal numbers up to 20. • Identify the place value of each digit in a 3-digit number. • Add and subtract up to 3-digit numbers. • Multiply numbers within multiplication tables of 2, 3, 4, 5 and 10. • Divide numbers within multiplication tables of 2, 3, 4, 5 and 10 with remainder zero. • Recognize and represent unit fractions up to $\frac{1}{12}$. 	<ul style="list-style-type: none"> • Read and write Roman numbers up to 20. • Read, write, compare, and identify place values of numbers up to 1 000 000 000. • Add and subtract numbers of complexity and of arbitrary size. • Multiply and divide up to 6-digit numbers by 2- and 3- digit numbers. • Distinguish between even and odd, prime and composite numbers. • Differentiate between factors and multiples. • Calculate HCF (LCM) of three (four) 2-digit numbers using prime factorization and division method. • Use four basic operations on fractions. • Convert percentage to fraction and to decimal and vice versa. • Calculate unit rate, direct and inverse proportions. • Add and subtract measures of distance, time and temperature. 	<ul style="list-style-type: none"> • Identify different types of set with notations. • Verify commutative, associative, distributive and De Morgan's laws w.r.t. union and intersection of sets and illustrate them through Venn diagrams. • Identify and compare integers, rational and irrational numbers. • Apply basic operations on integers and rational numbers and verify commutative, associative and distributive properties. • Arrange absolute values of integers in ascending and descending order. • Find HCF and LCM of two or more numbers using division and prime factorization. • Convert numbers from decimal system to numbers with base 2, 5 and 8 and vice versa. • Add, subtract and multiply numbers with base 2, 5 and 8. • Apply the laws of exponents to evaluate expressions. • Find square and square root, cube and cube root of a real number. • Solve problems on ratio, proportion, profit, loss, mark-up, leasing, zakat, ushr, taxes, insurance and money exchange. 	<ul style="list-style-type: none"> • Add, subtract and multiply matrices. • Evaluate determinant and inverse of a matrix of order 2-by-2. • Explain real numbers with its properties and depict them on the number line. • Distinguish between real and complex numbers and apply four operations on complex numbers. • Apply laws of logarithm. • Identify Cartesian product and binary relation. • Identify function, its domain, co-domain and range. • Prove the fundamental properties of union and intersection of two or three sets. • Apply basic operations on surds of second order. • Calculate ratio, proportions, variations, joint variations. • Apply theorems on proportions. 	<ul style="list-style-type: none"> • Identify complex numbers and their properties and carryout basic operations on complex numbers. • Evaluate determinant, find inverse and rank of a matrix. • Explain and construct various sequences, and series of real numbers. • Apply principle of Mathematical Induction to prove statements, identities and formulae. • Find approximate values of the binomial expansions having indices as rational numbers. • Integrate technology to aid the process of mathematical exploration.

ALGEBRA

STANDARD-2	<p>The students will be able to</p> <ul style="list-style-type: none"> analyze number patterns and interpret mathematical situations by manipulating algebraic expressions and relations, model and solve contextualized problems, interpret functions, calculate rate of change of functions, integrate analytically and numerically, determine orthogonal trajectories of a family of curves and solve non-linear equations numerically.
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BENCHMARKS

Grades I-II	Grades III-V	Grades VI-VIII	Grades IX-X	Grades XI-XII
<ul style="list-style-type: none"> Analyze patterns and relationships with respect to size, number, colour/shape and other properties. 	<ul style="list-style-type: none"> Explain and analyze patterns, identify missing numerals and elements in a pattern or sequence and determine a rule for repeating and extending patterns. Use symbolic notation to represent a statement of equality. 	<ul style="list-style-type: none"> Identify algebraic expressions and basic algebraic formulas. Apply four basic operations on polynomials. Manipulate algebraic expressions using formulas. Formulate linear equations in one and two variables. Solve simultaneous linear equations using different techniques. 	<ul style="list-style-type: none"> Factorize algebraic expressions. Apply remainder/factor theorem to verify that a first degree polynomial is a factor of a given polynomial. Find HCF and LCM and square root of algebraic expressions. Solve system of two linear equations in two unknowns by elimination, graphical and matrix methods. Solve linear inequalities with rational coefficients. Solve equations (quadratic and reducible to quadratic). Analyze attributes of quadratic equations. Form a quadratic equation from the given roots. Resolve rational expressions into partial fractions. 	<ul style="list-style-type: none"> Solve equations with complex coefficients. Solve system of homogeneous and non-homogeneous linear equations by appropriate method (matrix inversion, Gauss elimination, Gauss Jordan and Cramer's rule). Analyze attributes of functions and give their graphical representation. Evaluate limits of functions. Differentiate and integrate algebraic and transcendental functions. Find extreme values of a function. Solve ordinary differential equations of first order and first degree. Find orthogonal trajectories of a given family of curves. Find partial derivatives of a function of two variables and verify Euler theorem. Solve non-linear equations in one variable by numerical techniques. Evaluate definite integrals by numerical methods. Integrate technology to aid the process of mathematical exploration.

MEASUREMENTS AND GEOMETRY

STANDARD-3	<p>The students will be able to</p> <ul style="list-style-type: none"> • identify measurable attributes of objects, construct angles and two dimensional figures, • analyze characteristics and properties of geometric shapes and develop arguments about their geometric relationships, • recognize trigonometric identities, analyze conic sections, draw and interpret graphs of functions.
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BENCHMARKS

Grades I-II	Grades III-V	Grades VI-VIII	Grades IX-X	Grades XI-XII
<ul style="list-style-type: none"> • Identify and apply measurable attributes of length, weight/ mass, capacity/ volume and time. • Identify square, rectangle, triangle, circle and oval. 	<ul style="list-style-type: none"> • Add, subtract and convert standard units of length, weight/ mass, capacity/ volume, time and temperature. • Draw, label and classify lines, angles, quadrilaterals and triangles based on their properties. • Determine the perimeter and area of a square, rectangle and triangle using formulas. 	<ul style="list-style-type: none"> • Draw and subdivide a line segment and an angle. • Construct triangle (given SSS, SAS, ASA, RHS), parallelogram and segments of a circle. • Apply properties of lines, angles and triangles to develop arguments about their geometric relationships. • Apply appropriate formulas to calculate perimeter and area of quadrilateral, triangular and circular regions. • Determine surface area and volume of cube, cuboid, sphere, cylinder and cone. • Find trigonometric ratios of acute angles and use them to solve right angled triangles. 	<ul style="list-style-type: none"> • Use distance formula to find distance between two points in Cartesian plane. • Convert degrees into radians and vice versa. • Calculate length of an arc and area of a sector of a circular region. • Use trigonometric identities to verify relationships between trigonometric ratios. • Apply characteristics and properties of angles, triangles, parallelograms and circles to develop arguments about their geometric relationships. • Draw external (internal) tangent to two equal/unequal circles. • Circumscribe/inscribe /escribe a circle to a given triangle. • Circumscribe/inscribe a square and an equilateral triangle in a given circle. 	<ul style="list-style-type: none"> • Identify vectors in space and apply vector addition, dot/ cross product, scalar triple product. • Differentiate and integrate vector functions. • Use appropriate laws of trigonometry to solve the triangles. • Apply trigonometric formulas to find area of a triangle. • Find radii of circles connected with triangles and prove their relationships. • Interpret graphically the algebraic and transcendental functions. • Interpret and recognize equations of a straight line in standard form. • Show the concurrency of right bisectors/ medians/altitudes of a triangle. • Identify and analyze conic sections (circle, parabola, ellipse and hyperbola). • Integrate technology to aid the process of mathematical exploration.

INFORMATION HANDLING

STANDARD-4	The students will be able to collect, organize, analyze, display and interpret data/ information.
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BENCHMARKS

Grades I-II	Grades III-V	Grades VI-VIII	Grades IX-X	Grades XI-XII
	<ul style="list-style-type: none"> • Compare data and interpret quantities represented on charts, tables and different types of graphs (pictogram and bar) and make predictions based on the information. 	<ul style="list-style-type: none"> • Read, display and interpret bar and pie graphs. • Collect and organize data, construct frequency tables and histograms to display data. • Find measure of central tendency (mean, median and mode). 	<ul style="list-style-type: none"> • Collect data from variety of sources and construct frequency table (distribution) with equal and unequal class intervals. • Find measures of central tendency and dispersion to draw conclusions. • Draw, interpret and identify the graph of a linear function. 	<ul style="list-style-type: none"> • Solve real life problems involving arithmetic/geometric sequence and series. • Use partial fractions to find sum to n terms and to infinity the series. • Find sum to n terms of arithmetico-geometric series. • Solve problems involving permutation and combination. • Use various methods to solve probability problems. • Integrate technology to aid the process of mathematical exploration.

REASONING AND LOGICAL THINKING

STANDARD-5	<p>The students will be able to</p> <ul style="list-style-type: none"> • use patterns, known facts, properties and relationships to analyze mathematical situations, • examine real life situations by identifying, mathematically valid arguments and drawing conclusion to enhance their mathematical thinking.
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BENCHMARKS

Grades I-II	Grades III-V	Grades VI-VIII	Grades IX-X	Grades XI-XII
<ul style="list-style-type: none"> • Sort, classify and compare familiar shapes. • Apply analytical reasoning to explain features of a shape. 	<ul style="list-style-type: none"> • Communicate reasoning about patterns and geometric figures. • Explain method and reasoning when solving problems involving numbers and data. 	<ul style="list-style-type: none"> • Find different ways of approaching a problem to develop logical thinking and explain their reasoning. • Solve problems using mathematical relationships and present results in an organized way. • Construct and communicate convincing arguments for geometric situations. 	<ul style="list-style-type: none"> • Investigate general statements. • Choose appropriate strategy to solve mathematical problems. • Formulate and test logical arguments about geometric figures and patterns and communicate reasoning. • Show step by step deduction in solving a problem, explain and justify how they arrived at a conclusion. 	<ul style="list-style-type: none"> • Identify valid and invalid arguments. • Apply mathematical ideas and arguments logically. • Use graphics to optimize a situation. • Acquire ability to apply mathematics in physical situations and use numerical techniques to find approximate solution. • Develop and communicate logical proofs and counter examples for geometrical and mathematical statements.