



Centre for Teacher Accreditation

## **Syllabus for Mathematics**

# Primary School Mathematics (I-V)

## Number Systems

**Numbers** - Natural Numbers, Whole Numbers, Place Value System, Number Sense (Estimation of numbers), Comparing Numbers, Predecessor, and successor, Ascending and Descending Order, Create numbers using the given digits, Even and odd numbers, Counting, Counting using multiples, Skip / Jump counting, Grouping of numbers

**Arithmetic Operations** - Addition, Subtraction, Multiplication, and Division, Properties of Arithmetic operations, BODMAS, Multiplication tables, Factor tree, Methods of Division (Repeated subtraction, Jump counting, Long Division, Chunking)

**Factors and Multiples** - Properties of Factors and Multiples, Finding Factors and Multiples of a number, Factor Tree, Prime and composite numbers, Co-primes, Finding Common Factors and Multiples of given numbers, Highest common factor (HCF), Lowest Common Multiple (LCM), Prime factorization of a number

**Fractions and Decimals** - Characteristics of fractions, Equivalent fractions, Like and Unlike Fractions, Different models of teaching fractions, Fractions to decimals and vice-versa, Comparing fractions and decimals, Operations on fractions and decimals, Word problems on fractions and decimals

**Sequence and Series** - Identifying Number and Pictorial Patterns, Completing a given sequence of patterns, Coded messages, Partitions a number in different ways, Patterns in division and multiplication, Square numbers, Triangular numbers, Special numbers and words like reads the same from both sides

## Geometry

**Two-Dimensional Geometry** - Line, Line Segment, Curved Line, Digital numbers and letters made with lines, Circles, Radius and Diameter of a circle, Angle and its parts — Vertex, arm, interior and exterior, Types of angles (acute, obtuse, right, reflex, complementary, supplementary, linear pair of angles, vertically opposite angles), Angles formed in a clock, Angles formed in shapes or objects, Measurement of angles, Tangram

**Three-Dimensional Geometry** - Different 3-D shapes, Faces, edges and vertices of different 3D shapes, Perspective drawing - 2D representation of a 3D object, Nets for 3D shapes, Viewing different sections of a solid – Top view, Front view and Side view, Drawing shapes on dot grid

**Practical Geometry** - Using a Compass, Constructing a circle, Finding the centre of a circle, Measuring radius, Objects that can be used to trace a circle, Using a Divider

**Symmetry** - Reflection and Symmetry, Line of Symmetry, Figures with multiple lines of symmetry, Completing a diagram to make it symmetric, Rotational symmetry, Symmetry in shape and colour

**Maps** - Finding distance, route, and data about a place by reading a map, Scaling of maps, Change in the area while scaling, Directions, Abstract maps, Floor / Layout Maps

## Mensuration

**Length** - Comparing lengths, heights, widths, and distance, Longer-shorter, Taller-shorter, Thicker-thinner, Estimating length and distance, Abstract measurement (using hand length, foot length, etc.), Abstract to concrete measurements, Measuring using a ruler, Units of measurement (millimeters, centimeters, meters, kilometers), Conversion of units

**Weight** - Estimating weights, Comparing weights (Heavier or lighter), Balancing scale, conservation of weight, Health chart - age, height, weight, Units of measurement (grams, kilograms), Conversion of units

**Area and Perimeter (Two-dimensional Shapes)** - Characteristics of area and perimeter, Area and perimeter of triangle, circle, square, rectangle, Perimeter and area of Combinations of Plane Figures, Conversion of Units, Change in perimeter when a piece is cut from a regular shape, Comparison of area, Using square grids to find the area

**Volume** - Volume vs Capacity, Comparing capacity, Amount of water displaced by the object, Estimation of volume of different objects, Find volume using measuring bottle, Number of small shapes that can occupy a larger shape (Comparison of volume), Unit of measurements for volume ( $\text{cm}^3$ ,  $\text{m}^3$ , etc) and volume (liter, milliliter, etc), Conversion of units, Arithmetic operations on volume and capacity

**Time** - Distinguish between events occurring in time - earlier and later, Activities done in the morning, evening, day, night, etc., Estimating time to be taken to finish an activity, Sequencing activities, Time tables, Minutes, Hours, Seconds, Dates, Number of total days in a month, Sundays (or any other day) in a month, Number of days and weeks in a year, Days of the week, Months of the year, Seasons during different months depending on regions, Age Line, Sequences the events chronologically, Reading calendar, Calculate information from a birth certificate, Complete a calendar, Patterns in a calendar, Reading time, 24-hour clock, Hands of the clock, Draw hands of the clock according to the time given, Expresses time, using the terms 'a.m.' and 'p.m.'

## Data Handling

**Statistics** - Data, Grouped and Ungrouped data, Collection of Data, Organisation of data in a table, Grouping data, Tally marks, Graphical representation of data, Types of graphs - bar graph, pie chart, line graph, Pictograph, Reading graphs, Family tree

**Probability** - Definition of Chance and Probability, Equally likely outcomes, Outcomes as events

## Middle School Mathematics (VI-VIII)

### Number System

**Whole Numbers** - Natural Numbers, Whole numbers, Properties of whole numbers, Operations on numbers and their properties, BODMAS, Comparing numbers, Predecessor and successor, Ascending and Descending Order, Place Value System, Number Sense (Estimation of numbers), Roman Numerals, Shifting digits of a number, Even and Odd numbers, Number line, Identifying patterns, Create numbers using the given digits, Base System, Word problems on real-life issues like time, distance and speed, Profit and Loss

**Integers** - Characteristics of positive and negative Integers, Representation of integers on Number Line, Operations on Integers, Comparing integers

**Rational Numbers** - Properties of Rational Numbers, Comparison of Rational numbers, Equivalent rational numbers, Positive and Negative Rational Numbers, Rational numbers between two Rational numbers, Rational Numbers in standard form, Representation of Rational Numbers on Number Line, Operations on Rational Numbers

**Fractions and Decimals** - Characteristics of fractions, Equivalent fractions, Like and Unlike Fractions, Proper fractions, Improper and mixed fractions, Simplest form of a fraction, Reciprocal of a fraction, Fractions to decimals and vice-versa, Representation of fractions and decimals on Number Line, Comparing fractions and decimals, Operations on fractions and decimals, Word problems on fractions and decimals

**Factors and Multiples** - Properties of properties Factors and Multiples, Prime and composite numbers, Co-primes, Highest common factor (HCF), Lowest Common Multiple (LCM), Properties of HCF and LCM, Prime factorisation of a number, Word Problems on HCF & LCM, Rules of divisibility

**Squares and Square Roots** - Properties of Square Numbers, Finding square of a number, Estimating square roots, Finding Square roots of a number using factor method and division method, Patterns in square numbers, Pythagorean triplets, Square Roots of Decimals

**Cube and Cube Roots** - Estimating cube roots, Finding Cubes and cubes roots using prime factorisation method

**Exponents and power** - Laws of exponents, Expanding exponents, Use of Exponents to Express Small Numbers, Comparing very large or very small numbers

### Algebra

**Algebraic Expressions** - Forming expressions with variables, Identifying constants, coefficient, Like and Unlike terms, Degree of expressions, Types of polynomials based on number of terms, Factors of algebraic expressions, Operations on algebraic expressions, Application of algebraic expressions in geometry and mensuration

**Linear Equations** - Forming linear equation, Reducing Equations to Simpler Form, Solution of a Linear Equation, Solving linear equations in one variable, Algebraic Identities

## Ratio and proportion

Concept of Ratio and Proportion, Equivalent ratio, Comparison of ratios, Unitary method, Percentage, Converting fractions and decimals into percentage and vice-versa, Increase or Decrease as percent, Estimation in percentages, Direct and Inverse proportion, Application to real-life problems like profit and loss, discount, simple interest, compound interest, Rate Compounded Annually or Half Yearly

## Geometry

**Line and Angles** - Line, Line Segment, Ray, Intersecting lines, Parallel lines, Perpendicular lines, Point, Angle and its parts — Vertex, arm, interior and exterior, Measurement of angles, Types of angles (acute, obtuse, right, reflex, complementary, supplementary, linear pair of angles, vertically opposite angles), Angles formed in a clock, Turn by right and straight angles, Bisector of an angle, Congruence of Angles, Angles made by a Transversal, Complementary Angles, Angles formed in a shape or object

**Polygon** - Open and Closed figures, Interior and exterior of closed figures, Curvilinear and linear boundaries, Properties of polygons, Sides, Vertices, Diagonals, Congruence of Plane Figures, Convex and concave polygons, Regular and irregular polygons, Angle sum property of a polygon

**Triangle** - Types of triangles, Altitudes and Medians of a triangle, Properties of Triangle, Rules of congruency of triangles - Congruence (SAS, ASA, SSS, RHS), Angle sum property, Exterior angle property, Pythagoras Theorem

**Quadrilateral** - Properties of sides and angles of quadrilaterals, Types of quadrilaterals, Properties of a parallelogram, Properties of a rectangle, Properties of a square, Properties of a Rhombus

**Circle** - Centre, Radius, Diameter, Chord, Arc, Sector, Segment, Interior and Exterior of the circle, Circumference, Semi-circle, Revolution

**Practical Geometry** - Measuring line segments, Comparison of length of line segments by Construction of a line segment, Measuring angles using a protractor, Construction of Perpendicular to a line, Construction of an angle bisector, Constructing specific angles (30°, 60°, 45°, 90°, and 120°), Constructing a copy of a given line segment or angle, Construction of a circle of a known radius, Construction of simple triangles and quadrilaterals, Construction of a line parallel to a given line from a point outside it

**Symmetry** - Reflection and Symmetry, Line of Symmetry, Figures with multiple lines of symmetry, Completing a diagram to make it symmetric, Rotational symmetry, Symmetry in shapes and colours

**Three-dimensional Geometry** - Different 3-D shapes, Faces, edges and vertices of different 3D shapes, Perspective drawing - 2D representation of a 3D object, Nets for 3D shapes,

Viewing different sections of a solid – Top view, Front view and Side view, Convex and Regular polyhedrons, Euler's formula

## Mensuration

**Area and Perimeter (Two-dimensional Shapes)** - Characteristics of area and perimeter, Area and perimeter of triangle, circle, parallelogram, square, rectangle, trapezium, rhombus, Area of a General Quadrilateral, Area of a Polygon, Perimeter and area of Combinations of Plane Figures, Conversion of Units

**Surface Area and Volume (Solid Objects)** - Surface Area of Cube, Cuboid and Cylinder, Volume vs Capacity

## Statistics and Probability

**Statistics** - Definition of data, Collection of data, Organisation of data in a table, Grouping data, Tally marks, Lower class limit, Upper-class limit, width of the class interval, Graphical representation of data, Types of graphs - bar graph, pie chart, line graph, histogram, Pictograph, Reading Graphs, Measures of Central Tendency (Mean, Median and Mode) of ungrouped data

**Probability** - Definition of Chance and Probability, Equally likely outcomes, Outcomes as events

## Secondary School Mathematics (IX-X)

### Number System

**Real Numbers** - Definition and representation of natural numbers, whole numbers, integers, rational numbers, and irrational numbers on the number line, Properties of irrational numbers, Law of exponents for real numbers, Operations on real numbers, BODMAS, Decimal Expansions of Real Numbers, Rationalisation of Real Numbers, Euclid's Division Lemma, Identifying whether a given number is rational or irrational, The Fundamental Theorem of Arithmetic, Comparing numbers, Predecessor and successor, Ascending and Descending Order, Place Value System, Number Sense (Estimation of numbers)

**Fractions and Decimals** - Characteristics of fractions, Equivalent fractions, Like and Unlike Fractions, Proper fractions, Improper and mixed fractions, Simplest form of a fraction, Reciprocal of a fraction, Fractions to decimals and vice-versa, Representation of fractions and decimals on Number Line, Comparing fractions and decimals, Operations on fractions and decimals, Word problems on fractions and decimals

**Factors and Multiples** - Properties of properties Factors and Multiples, Prime and composite numbers, Co-primes, Highest common factor (HCF), Lowest Common Multiple (LCM), Properties of HCF and LCM, Prime factorisation of a number, Word Problems on HCF & LCM, Rules of divisibility

**Squares and Square Roots** - Properties of Square Numbers, Finding square of a number, Estimating square roots, Finding Square roots of a number using factor method and division method, Patterns in square numbers, Pythagorean triplets, Square Roots of Decimals

**Cube and Cube Roots** - Estimating cube roots, Finding Cubes and cubes roots using prime factorisation method

**Exponents and power** - Laws of exponents, Expanding exponents, Use of Exponents to Express Small Numbers, Comparing very large or very small numbers

### Algebra

**Polynomials** - Definition of a polynomial in one variable, its coefficients, its terms, Types of polynomials based on degree and number of terms, Zeros of a Polynomial, Relationship between zeros and coefficients of a polynomial, Remainder Theorem, Factorisation of polynomials, division algorithm for polynomials with real coefficients, Algebraic expansion of  $(x + y + z)^2$  and  $(x^2 + y^2 + z^2 - 3xyz)$ , Graph of linear and quadratic polynomial

**Algebraic Solutions** of Pair of Linear Equations in Two Variables and their Graphical Representation, Graphical Solution of Linear Inequalities in Two Variable, Number of solutions, Equations of Lines Parallel to the x-axis and y-axis

**Quadratic Equations** - Standard form of a quadratic equation  $ax^2 + bx + c = 0$ , ( $a \neq 0$ ), Solution of quadratic equations (only real roots) by factorization and by using quadratic formula, Relationship between discriminant and nature of roots, Problems related to real-life activities

**Sequence & Series** - Arithmetic Progressions (AP), common difference, General form of an AP, Infinite AP, n-th term of an AP, Sum of First n Terms of an AP, Geometric Progression (GP), common ratio, General form of a GP, Infinite GP, n-th term of a GP, Sum of First n Terms of a GP

## Ratio and proportion

Concept of Ratio and Proportion, Equivalent ratio, Comparison of ratios, Unitary method, Percentage, Converting fractions and decimals into percentage and vice-versa, Increase or Decrease as percent, Estimation in percentages, Direct and Inverse proportion, Application to real-life problems like profit and loss, discount, simple interest, compound interest, Rate Compounded Annually or Half Yearly

## Coordinate Geometry

**Points (In two-dimensions)** - The Cartesian plane, Coordinates of a point, Terms associated with the coordinate plane, Locating a point on a plane, Plotting a point in the plane, Position of a point with reference to more than one line

**Lines (In two-dimensions)** - Distance between two points, section formula (internal), Area of a triangle using distance formula

## Geometry

**Euclid's Geometry** - Euclid's Definitions, Axioms and five Postulates, Relationship between axiom and theorem

**Lines and Angles** - Basic Terms and Definitions - line-segment, ray, collinear points, non-collinear points, angle, arms of an angle, vertex of an angle, types of angles (acute, obtuse, right, complementary, supplementary, adjacent, linear pair of angles, vertically opposite angles), Angle Sum Property of a Triangle, Properties of angles formed when a transversal intersects two parallel lines

**Triangles** - Rules of congruency of triangles - Congruence (SAS, ASA, SSS, RHS), Relation between angle and facing side; inequalities in a triangle. Rules of similarity of triangles (AA, SAS, SSS), Areas of Similar Triangles, Thales Theorem, Proof of Pythagoras Theorem, Properties of a line drawn parallel to one side of a triangle to intersect the other two sides, Conditions of Similarity for two polygons with the same number of sides

**Quadrilaterals** - Types of Quadrilaterals, Properties of a Parallelogram, The Mid-point Theorem of a triangle

**Circles** - Definitions of circle related concepts like radius, circumference, diameter, chord, arc, subtended angle, Circle through Three Points, Properties of the Chords of a Circle, Angle Subtended by an Arc of a Circle, Cyclic Quadrilaterals, Angles in the same segment of a circle, Properties of a Tangent to a circle, Secant of the circle

**Constructions** - Construction of bisectors of a line segment, Division of a line segment in a given ratio (internally), Construction of angles measuring  $60^\circ$ ,  $90^\circ$ ,  $45^\circ$  etc, Construction of a triangle given its base, sum or difference of the other two sides and one base angle, Construction of a triangle of given its perimeter and base angles, Construction of a triangle similar to a given triangle, Construction of a circle, Tangent to a circle from a point outside it

## Trigonometry

**Basic Concepts** - Trigonometric ratios  $0^\circ$ ,  $30^\circ$ ,  $45^\circ$ ,  $60^\circ$  and  $90^\circ$ , Trigonometric Ratios of Complementary Angles, Trigonometric ratios of an acute angle of a right-angled triangle, Relationships between the ratios, Basic trigonometric identities

**Height and Distance** - Line of sight, Angles of elevation and depression, word problems on heights and distances

## Mensuration

**Perimeter and Area (Two-dimensional figures)** - Using Heron's formula to find area of triangles and quadrilaterals, area of parallelograms, area of triangles on the same base and between the Same parallels, Relationship between congruent shapes and their areas, area and circumference of a circle, area of sectors and segments of a circle, Length of an arc of a sector of angle  $\theta$ , Areas of Combinations of Plane Figures

**Surface Areas and Volumes** - Total Surface areas, Curved Surface area and volumes of cubes, cuboids, spheres, hemispheres, right circular cylinders, right circular cones, and Frustum of a Cone, Surface Area and Volume of a Combination of Solids

## Statistics and Probability

**Statistics** - Collection of data, presentation of data in tabular form, presentation of data in graphical form, Types of graphs - bar graphs, histograms, frequency polygons, Cumulative frequency graph, Measures of Central Tendency (Mean, Median and Mode) of grouped and ungrouped data

**Probability** - Definition of probability, Empirical probability  $P(E)$  of an event  $E$ , Sure and Impossible Event, Complementary events, Theoretical Probability (Classical Probability)

## Senior Secondary School Mathematics (XI - XII)

### Algebra

**Complex Numbers** - Argand Plane and Polar Representation, Operations on complex numbers, Identities and proof, Polar representation of a complex number, principal argument, Power of  $i$ , Quadratic Equations with complex number root, The Modulus and the Conjugate of a Complex Number, The square roots of a negative real number

**Expressions and Equations** - Binomial theorem for any positive integer  $n$ , Binomial Theorem for Positive Integral Indices, General and Middle Terms, Properties of coefficients

**Algebraic Solutions** of Linear Inequalities in One Variable and their Graphical Representation, Graphical Solution of Linear Inequalities in Two Variable, Literal inequalities, double inequalities, strict inequalities, slack inequalities, linear inequalities in one variable  $x$  when  $a$  not equal to  $0$ , inequalities in two variables  $x$  and  $y$  when  $a$  not equal to  $0$ ,  $b$  not equal to  $0$ , quadratic inequalities in one variable  $x$  when  $a$  not equal to  $0$ , Solution of System of Linear Inequalities in Two Variables

**Combinations**, Fundamental Principle of Counting (multiplication principle), Permutations, Factorial notation, Derivation of the formula for  $nPr$ , Permutations when all the objects are not distinct objects

**Sets** - Definition, Complement of a Set, Difference of sets, Disjoint sets, Equal Sets, Finite and Infinite Sets, Intersection of sets, Intervals as subsets of  $R$ , Operations on Sets, Power Set, Roster or tabular form, Set-builder form, Sets and their Representations, Properties of Complement Sets, Operation of Intersection & Operation of Union, Subsets of set of real numbers, The Empty Set, Universal Set, Venn Diagrams

**Relations and Functions** - Definition and distinction between relations and functions, Algebra of real functions, Cartesian Products of Sets, Functions and their graphs, Linear function, Real valued function, Range and Codomain

**Sequence & Series** - Arithmetic Progressions (AP), common difference, General form of an AP, Infinite AP,  $n$ -th term of an AP, Sum of First  $n$  Terms of an AP, Geometric Progression (GP), common ratio, General form of a GP, Infinite GP,  $n$ -th term of a GP, Sum of First  $n$  Terms of a GP, Arithmetic Mean (AM), Geometric Mean (GM), Relation between AM and GM, Sum to  $n$  terms of the special series - Sum of the First  $n$  Positive Integers, Sum of squares of the First  $n$  Positive Integers, Sum of cubes of the First  $n$  Positive Integers

**Linear Algebra** - Adjoint and Inverse of a Matrix, Applications of Determinants and Matrices, Area of a Triangle (vertices are determinants), Determinant - definition, representation, Determinant of a matrix of order  $3 \times 3$ , order one, order two, Expansion along first Column (C1), Row (R1), second row (R2), Minors and Cofactors, Properties of Determinants, Solution of system of linear equations using inverse of a matrix, Elementary Operation (Transformation) of a Matrix, Equality of matrices, Inverse of a matrix by elementary operations, Invertible Matrices, Multiplication of matrices, Operations on Matrices, Order of a matrix, Properties of matrix addition, multiplication Existence of additive identity, The existence of additive inverse, existence of multiplicative identity, Properties of scalar multiplication of a matrix, Symmetric and Skew Symmetric Matrices,

Transpose of a Matrix and properties, Types of Matrices - row, column, square, diagonal, scalar, identity, Zero matrix as the product of two non-zero matrices

**Addition of Vectors** - Triangle law of vector addition, parallelogram law of vector addition, Components of a vector, Directed line – definition, Direction Cosines, Multiplication of a Vector by a Scalar, Negative of a Vector, Position Vector, Scalar product of two vectors, Projection of a vector on a line, Properties of scalar product, Properties of vector addition, Section formula, Types of Vectors - Zero Vector, Unit Vector, Coinitial Vectors, Collinear Vectors, Equal Vectors, Vector - directed line segment, initial point, terminal point, magnitude of a vector, Vector (or cross) product of two vectors, Vector joining two points

## Logic and Proof

**Mathematical Induction** - The principle of mathematical induction and simple applications

**Mathematical Reasoning** - Simple and Compound statement, Conditional and Biconditional statement, Connecting words/phrases - understanding of “if and only if (necessary and sufficient) condition”, “implies”, “and/or”, “implied by”, “and”, “or”, “there exists” and their application, Validating the statements involving the connecting words - the difference between contradiction, converse and contrapositive, Negation of a negation, Negation of compound statements, Negation of conjunction, Negation of disjunction

**Linear Programming (L.P.)** - Constraints, Objective Function, Optimization, Different types of linear programming problems, Mathematical Formulation of L.P. problems, Graphical method of solution for problems in two variables, Feasible and Infeasible regions, feasible and infeasible solutions, Optimal feasible solutions (up to three non-trivial constraints)

## Trigonometry

**Basic Concepts** - Trigonometric ratios (for  $30^\circ$ ,  $45^\circ$ ,  $60^\circ$  and  $90^\circ$ ), Trigonometric Ratios of Complementary Angles, Trigonometric ratios of an acute angle of a right-angled triangle, Relationships between the ratios, Basic trigonometric identities

**Height and Distance** - Line of sight, Angles of elevation and depression, word problems on heights and distances

**Trigonometric Functions** - Positive and negative angles, Measuring angles in radians and in degrees and conversion from one measure to another, Definition of trigonometric functions with the help of unit circle, Domain and range of trigonometric functions, Signs of trigonometric functions and their graphs, Trigonometric Functions of Sum and Difference of Two Angles, Identities related to  $\sin 2x$ ,  $\cos 2x$ ,  $\tan 2x$ ,  $\sin 3x$ ,  $\cos 3x$  and  $\tan 3x$ , General solution of trigonometric equations of the type  $\sin \theta = \sin \alpha$ ,  $\cos \theta = \cos \alpha$  and  $\tan \theta = \tan \alpha$ , Proofs and simple applications of sine and cosine formulae

**Inverse Trigonometric Functions** - Meaning, range, domain, principal value branches, Graphs of inverse trigonometric functions, Elementary properties of inverse trigonometric functions

## Coordinate Geometry

**Points (In two-dimensions)** - The Cartesian plane, Coordinates of a point, Terms associated with the coordinate plane

**Lines (In two-dimensions)** - Distance between two points, section formula (internal), Area of a triangle using distance formula, Slope of a line and angle between them, Forms of equations of a line (Parallel to Axes, Point-Slope form, Slope-Intercept form, Two-Point form, Intercepts form and Normal form), General equation of a line, Equation of family of lines passing through the point of intersection of two lines, Distance of a point from a line

**Conic Sections (In two-dimensions)** - Sections of a cone - Circles, Ellipse, Parabola, Hyperbola, a Point, a Straight Line and Degenerate conic section, Standard equations and simple properties of Parabola, Ellipse, and Hyperbola, Standard equation of a Circle, Latus Rectum, Eccentricity

**Three-dimensional Coordinate Geometry** - Coordinate axes and coordinate planes in three dimensions, Coordinates of a point, Distance between two points, Section formula, Direction cosines/ratios of a line joining two points, Cartesian and vector equation of a line, coplanar and skew lines, Distance between parallel lines, Distance between two skew lines, shortest distance between two lines, Cartesian and vector equation of a plane, Angle between- (i) two lines, (ii) two planes, (iii) a line and a plane, Distance of a point from a plane, Coplanarity of Two Lines, Plane passing through the intersection of two given planes

## Calculus

**Limits and Derivatives** - Application of calculus, Meaning and intuitive idea of Derivative, Concept of limit, derivative of the sum, difference, product and quotient of functions, Derivatives of polynomial and trigonometric functions, Limits of polynomials and rational functions, Limits of Trigonometric Functions, Sandwich Theorem

**Continuity and Differentiability** - Continuity and differentiability, Derivative of Composite Functions, Chain Rule, Derivatives of inverse trigonometric functions, Derivative of implicit function, Concepts of exponential, logarithmic functions, Derivatives of  $x$  and  $e^x$ , Logarithmic differentiation, Derivative of functions expressed in parametric forms, Second-order derivatives, Rolle's and Lagrange's Mean Value Theorems and their geometric interpretations

**Applications of Derivatives** - Rate of change, Increasing and Decreasing functions, Tangents and Normals, Approximation, Maxima and Minima, First Derivative Test, Second Derivative Test, Word problems

**Integrals and their applications** - Meaning of Integration, Comparison between differentiation and integration, Integration of a variety of functions by substitution, by partial fractions and by parts, Definite integrals as a limit of a sum, Fundamental Theorem of Calculus, Basic properties and Evaluation of definite integrals, Geometrical interpretation and properties of Indefinite Integral, Area between Two Curves, Area under Simple Curves (circles, parabolas, and ellipses), Area of the region bounded by a curve and a line

**Differential Equations** - Definition, Order and Degree, General and Particular Solutions of a Differential Equation. Formation of differential equation whose general solution is given, Solution of differential equations by the method of separation of variables, Methods of Solving First Order, First Degree Differential Equations

## Statistics and Probability

**Statistics** - Collection of data, presentation of data in tabular form, presentation of data in graphical form, Types of graphs - bar graphs, histograms, frequency polygons, Cumulative frequency graph, Measures of Central Tendency (Mean, Median and Mode) of grouped and ungrouped data, Measure of dispersion (Range, Mean deviation, Variance and Standard Deviation) of ungrouped and grouped data, Analysis of frequency distributions with equal means but different variances, Limitations of Mean and Mean Deviation, Types of the relationship between data, Meaning and properties of the correlation coefficient, Scatter diagram, Types of correlation, Correlation vs causality, Correlation vs Regression

**Probability** - Definition of probability, Empirical probability  $P(E)$  of an event  $E$ , Sure and Impossible Event, Complementary events, Theoretical Probability (Classical Probability), Random experiments – outcomes and sample spaces, Occurrence of events, 'not', 'and' & 'or' events, Exhaustive events, Mutually Exclusive Events. Axiomatic Probability, Probability of 'not', 'and', & 'or' events, Multiplications theorem on probability, Conditional probability, Independent events, Total Probability, Bayes' theorem, Random variable and its probability distribution, Mean and Variance of haphazard variable, Repeated independent (Bernoulli) trials and Binomial distribution