

Mathematics Syllabus for 1st & 2nd year / A - Level

Chapter 1: Numbers System

1.1: Introduction

- Introduction to Real Numbers
- Problem-Introduction to Real Numbers

1.2: Rational Numbers and Irrational Numbers

1.3: Properties of Real Numbers

1.5: The Real Line

1.6: Geometrical Representation of Complex Numbers

1.7: To Find Real and Imaginary Parts of $(x + iy)^n$

Chapter 2: Sets, Functions and Groups

2.1: Introduction

- Set Definition
- Problem-Set Definition
- Set Notation & its Characteristics
- Problem-Set Notation & its Characteristics
- Finite & Infinite Set
- Subset Definition
- Set Builder Notation
- Power Set
- Equal & Equivalent Sets
- Universal Set
- Definition of One to One Correspondence
- Definition & Notation of Some Important Sets
- Presentation of a Set
- Order of a Set
- Interval Notation of a Set

2.2: Operations on Sets

2.3: Venn Diagrams

2.4: Operations on Three Sets

2.5: Properties of Union and Intersection

2.6: Inductive and Deductive Logic

- 2.7: Implication or Conditional
- 2.8: Truth Sets, A Link Between Sets Theory and Logic
- 2.9: Relations
- 2.10: Functions
- 2.11: Inverse of a Function
- 2.12: Binary Operations
- 2.13: Groups
- 2.14: Solution of Linear Equations
- 2.15: Reversal Law of Inverse

Chapter 3: Matrices and Determinants

- 3.1: Introduction
- 3.2: Determinant of a 2×2 Matrix
- 3.3: Solution of Simultaneous Linear Equations By Using Matrices
- 3.5: Properties of Matrix Addition, Scalar Multiplication and Matrix Multiplication
- 3.6: Determinants
- 3.7: Properties of Determinants Which Help in Their Evaluation
- 3.8: Adjoint and Inverse of a Square Matrix of Order $n = 3$ or $n > 3$
- 3.9: Elementary Row and Column Operations on a Matrix
- 3.10: Echelon and Reduced Echelon Forms of Matrices
- 3.11: Systems of Linear Equations
- 3.12: Cramer's Rule

Chapter 4: Quadratic Equations

- 4.1: Introduction
- 4.2: Solutions of Equations Reducible to the Quadratic Equation
- 4.3: Three Cube Roots of Unity
- 4.4: Four Fourth Roots of Unity
- 4.5: Polynomial Functions
- 4.6: Theorems
- 4.7: Synthetic Division
- 4.9: Formation of an Equation Whose Roots are Given
- 4.10: Nature of the Roots of a Quadratic Equation
- 4.11: Systems of Two Equations Involving Two Variables
- 4.12: Problems on Quadratic Equations

Chapter 5: Partial Fractions

5.1: Introduction

- Partial Fractions
- Kinds of Equations

5.2: Rational Fraction

5.3: Resolution of a Rational Fraction $P(x)/Q(x)$ Into Partial Fractions

Chapter 6: Sequences and Series

6.1: Introduction

- Introduction to Sequence and Series
- Convergent, Divergent and Periodic Sequences

6.2: Types of Sequences

6.3: Arithmetic Progression (A.P)

6.4: Arithmetic Mean (A.M)

6.5: Series

6.6: Word Problems on A.P.

6.7: Geometric Progressions (G.P)

6.8: Geometric Means

6.9: Sum of n Terms of a Geometric Series

6.10: The Infinite Geometric Series

6.11: Word Problems on G.P.

6.12: Harmonic Progression (H.P)

6.13: Relations Between Arithmetic, Geometric and Harmonic Means

6.14: Sigma Notation (or Summation Notation)

6.15: To Find Formulae For The Sums

Chapter 7: Permutation, Combination and Probability

7.1: Introduction

- The Counting Principles
- Introduction to Factorial Notation

7.2: Permutation

7.3: Combinations

7.4: Probability

Chapter 8: Mathematical Inductions and Binomial Theorems

8.1: Introduction

- Introduction to Mathematical Induction

8.2: Principle of Mathematical Induction

8.3: Principle of Extended Mathematical Induction

8.4: Binomial Theorem

8.5: The Binomial Theorem When the Index n is a Negative Integer or a Fraction.

8.6: Applications of the Binomial Theorem

Chapter 9: Fundamentals of Trigonometry

9.1: Introduction

- Meaning and Importance of Trigonometry

9.2: Units of Measures of Angles

9.3: Relation Between the Length of an Arc of a Circle and the Circular Measure of it

9.4: General Angle (Coterminal Angles)

9.5: Angle in the Standard Position

9.6: Trigonometric Functions

9.7: Trigonometric Functions of Any Angle

9.8: Fundamental Identities

9.9: Signs of the Trigonometric Functions

9.10: The Values of Trigonometric Functions of Acute Angles 45, 30 and 60 Degrees

9.11: The Values of the Trigonometric Functions of Angles 0, 90, 180, 270, 360 Degrees

Values of Trigonometric Ratios at Quadrantal Angle

9.12: Domains of Trigonometric Functions and of Fundamental Identities

Chapter 10: Trigonometric Identities Sum and Difference of Angles

10.1: Introduction

- Derivation of the Distance formula
- Use of Distance formula
- Fundamental Law of Trigonometry
- More on Fundamental Law of Trigonometry

- Proof of Angle Addition Formula for Cosine
- More on Proof of Angle Addition Formula for Cosine

10.2: Deductions From Fundamental Law

10.3: Trigonometric Ratios and Allied Angles

10.4: Further Application of Basic Identities

10.5: Double angle Identities

10.6: Half Angle Identities

10.7: Triple Angle Identities

10.8: Sum, Difference and Product of Sines and Cosines

Chapter 11: Trigonometric Functions and Their Graphs

11.1: Introduction

11.2: Period of Trigonometric Functions

11.4: Graphs of Trigonometric Functions

11.5: Graph of $y = \sin x$ From -360 to 360 Degrees

11.6: Graph of $y = \cos x$ From -360 to 360 Degrees

11.7: Graph of $y = \tan x$ From -180 to 180 Degrees

11.8: Graph of $y = \cot x$ From -360 to 180 Degrees

11.9: Graph of $y = \sec x$ From -360 to 360 Degrees

11.10: Graph of $y = \operatorname{cosec} x$ From -360 to 360 Degrees

Chapter 12: Application of Trigonometry

12.1: Introduction

12.2: Tables of Trigonometric Ratios

12.3: Solution of Right Triangles

12.4: (a)-Heights and Distances

12.5: (b)-Angles of Elevation and Depression

12.6: Engineering and Heights and Distances

12.7: Oblique Triangles

12.8: Solution of Oblique Triangles

12.9: Area of Triangle

12.10: Circles Connected With Triangle

12.11: Engineering and Circles Connected With Triangles

Chapter 13: Inverse Trigonometric Functions

13.1: Introduction

- Introduction to Inverse Trigonometric Functions
- Vertical and Horizontal Line Tests
- More on Vertical and Horizontal Line Tests

13.2: The Inverse Sine Function

13.3: The Inverse Cosine Function

13.4: The Inverse Tangent Function

13.5: Inverse Cotangent, Secant and Cosecant Functions

13.6: Domains and Ranges of Principal Trigonometric Function and Inverse Trigonometry

13.7: Addition and Subtraction Formulas

Chapter 14: Solutions of Trigonometric Equations

14.1: Introduction

- Introduction to Solutions of Trigonometric Equations
- Problem-Introduction to Solutions of Trigonometric Equations
- Solution of the Type $\sin A = k$, $\cos A = k$ and $\tan A = k$

14.2: Solution of General Trigonometric Equations

Chapter 11: Functions and Limits

11.1: Introduction

- Introduction to Function
- More on Introduction to Functions
- Domain & Range of Binary Relation

11.2: Types of Functions

11.3: Composition of Function and Inverse of a Function

11.5: Limits of Important Functions

11.6: Continuous and Discontinuous Functions

Chapter 12: Differentiation

12.1: Introduction

- Introducing Dependent and Independent Variables
- Average Rate of Change
- The derivative of a Function
- More on Derivative of a Function
- Notation for Derivative
- Geometrical Interpretation of a Derivative
- More on Geometrical Interpretation of Derivative

12.2: Finding $f'(x)$ from Definition of Derivative

12.3: Theorems on Definition

12.4: The Chain Rule

12.5: Derivative of Inverse Functions

12.6: Derivative of Functions Given in the Form of Parametric Equations

12.7: Differentiation of Implicit Relations

12.8: Derivatives of Trigonometric Functions

12.9: Derivatives of Inverse Trigonometric Functions

12.10: Derivative of Exponential Functions

12.11: Derivative of Logarithmic Functions

12.12: Logarithmic Differentiation

12.13: Derivative of Hyperbolic Functions

12.14: Derivatives of the Inverse Hyperbolic Functions

12.15: Successive Differentiation Or Higher Derivatives

12.16: Series Expansion of Functions

12.17: Taylor Series Expansion of Functions

12.18: Geometrical Interpretation of a Derivative

12.19: Increasing and Decreasing Functions

12.20: Relative Extrema

12.21: Critical Values of Critical Points

Chapter 13: Integration

13.1: Introduction

- Antidifferentiation and Indefinite Integral
- Differentials of Variables
- Integral Language and Notation

- Difference between Delta y and dy

13.2: Integration as Anti-Derivative

13.3: Integration By Method of Substitution

13.4: Some Useful Substitutions

13.5: Integration By Parts

13.6: Integration Involving Partial Fractions

13.7: The Definite Integrals

13.8: Applications of Definite Integrals

13.9: Differential Equations

Chapter 14: Introduction to Analytic Geometry

14.1: Introduction

- Cartesian Coordinate System & Cartesian Plane
- Derivation of the Distance formula
- Use of Distance formula
- Points Dividing the Join of Two Points in Given Ratio
- More on Points Dividing Join of Two Points in Given Ratio

14.2: Translation and Rotation of Axes

14.3: Equations of Straight Lines

14.4: Two and Three Straight Lines

14.5: Angles Between Two Lines

14.6: Homogeneous Equations-Second Degree in 2 Variables

Chapter 15: Linear Inequalities and Linear Programming

15.1: Introduction

- Introduction to Linear Inequalities

15.2: Linear Inequalities

15.3: Region Bounded By 2 or 3 Simultaneous Inequalities

15.4: Problem Constraints

15.5: Feasible Solution Set

15.6: Linear Programming

15.7: Linear Programming Problems

Chapter 16: Conic Section

- 16.1: Introduction
- 16.2: Tangents and Normals
- 16.3: Analytical Proofs of Important Properties of a Circle
- 16.4: Parabola
- 16.5: Ellipse and Its Elements
- 16.6: Hyperbola and Its Elements
- 16.7: Tangents and Normals
- 16.8: Translation and Rotation of Axes
- 16.9: The General Equation of Second Degree

Chapter 17: Vectors

17.1: Introduction

- Scalar and Vector Quantities
- Terminologies and Notations of Vectors
- Equal Vectors
- Vectors which are Opposite
- Column Vectors
- Addition of Vectors
- Vector Addition is Associative
- Zero Vectors
- Subtraction of Vectors
- Scalar Multiple of a Vector
- Problem-Scalar Multiple of a Vector
- Expression of a Given Vector in Terms of two Vectors
- Position Vectors
- Introducing Vector Geometry
- Properties of Magnitude of Vector
- More on Notation for Representing Vectors in Plane
- Components of a Vector
- Properties of Vectors in Plane
- More on Properties of Vectors in Plane
- A Unit Vector in the Direction of Another Vector
- Notation for Vectors in Coordinate System
- The Ratio Formula in Vector
- Mid-Point Theorem By Vectors

- Diagonals of Parallelogram Bisect Each Other by Vectors
- Ratio Theorem By Vectors

17.2: Introduction of Vector in Space

- Introducing Vector Geometry
- Concept of Vector in Space
- More on Vectors in Space
- Properties of Vectors
- Vectors Addition in Space
- Direction Numbers or Direction Ratios
- Scalar Multiplication in Space
- Notation of Vectors in Space
- Distance Between Two Points in Space
- Direction Angles and Direction Cosines of Vector

17.3: The Scalar Product of Two Vectors

17.4: Cross Product or Vector Product of Two Vectors

17.5: Scalar Triple Product of Vectors