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

Instructions:
The objective of "Champion of Subject" is to test the conceptual abilities of the students and candidates regarding the subject.

- This is the comprehensive syllabus for the "Champion of Subject".
- Candidates are advised to thoroughly go through and study the syllabus
- The test will comprise of 120 MCQs.
- The time allowed for the test will be 120 min.
- MCQs will cover part or all the syllabus mentioned below.
- Munzill reserved the right to conduct an online or physical test.

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 + I y) ^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: ruth 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 2x2 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 Hamonic 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 = 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 SinA = k, Cos A = k and TanA = 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: Continous 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: Tailor 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 in2 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