

Half-Yearly Syllabus (2023-24)

Class : XII

Subject : MATHEMATICS

Max. Marks : 80

Unit-I : Relations and Functions

1. Relation and Functions :

15 Periods

Types of relations : reflexive, symmetric, transitive and equivalence relations. One to one and onto functions.

Unit-II : Algebra

1. Matrices :

25 Periods

Concept, notation, order, equality, types of matrices, zero and identity matrix, transpose of a matrix, symmetric and skew symmetric matrices. Operations on matrices : Addition and multiplication and multiplication with a scalar. Simple properties of addition, multiplication and scalar multiplication. Non-commutativity of multiplication of matrices and existence of non-zero matrices whose product is the zero matrix (restrict to square matrices of order 2). Invertible matrices and proof of the uniqueness of inverse, if it exists; (Here all matrices will have real entries).

Unit-III : Calculus

1. Continuity and Differentiability :

20 Periods

Continuity and differentiability, chain rule, derivative of inverse trigonometric functions, like $\sin^{-1}x$, \cos^{-1} and $\tan^{-1}x$, derivative of implicit functions. Concept of exponential and logarithmic functions.

Derivatives of logarithmic and exponential functions, Logarithmic differentiation, derivative of functions expressed in parametric forms. Second order derivatives.

3. Integrals :

20 Periods

Integration as inverse process of differentiation. Integration of a variety of functions by substitution, by partial fractions and by parts. Evaluation of simple integrals of a following types and problems based on them.

$$\int \frac{dx}{x^2 \pm a^2}, \int \frac{dx}{\sqrt{x^2 \pm a^2}}, \int \frac{dx}{\sqrt{a^2 - x^2}}, \int \frac{dx}{ax^2 + bx + c}, \int \frac{dx}{\sqrt{ax^2 + bx + c}}$$
$$\int \frac{px + q}{ax^2 + bx + c} dx, \int \frac{px + q}{\sqrt{ax^2 + bx + c}} dx, \int \sqrt{a^2 \pm x^2} dx, \int \sqrt{x^2 - a^2} dx$$
$$\int \sqrt{ax^2 + bx + c} dx.$$

Fundamental Theorem of Calculus (without proof). Basic properties of definite integrals and evaluation of definite integrals.

5. Differential Equations :

15 Periods

Definition, order and degree, general and particular solutions of a differential equation. Solution of differential equations by method of separation of variables, solutions of homogeneous differential equations of first order and first degree. Solutions of linear differential equations of the type :

$$\frac{dx}{dy} + py = q, \text{ where } p \text{ and } q \text{ are functions of } x \text{ or constants.}$$

$$\frac{dx}{dy} + px = q, \text{ where } p \text{ and } q \text{ are functions of } y \text{ or constants.}$$

Unit-IV : Vectors and Three-Dimensional Geometry

1. Vectors :

15 Periods

Vectors and scalars, magnitude and direction of a vector. Direction cosines and direction ratios of a vector. Types of vectors (equal, unit, zero, parallel and collinear vectors), position vector of a point, negative of a vector, components of a vector, addition of vectors, multiplication of a vector by a scalar, position vector of a point dividing a line segment in a given ratio. Definition, Geometrical Interpretation, properties and application of scalar (dot) product of vectors, vector (cross) product of vectors.

Unit-V : Linear Programming

1. Linear Programming :

20 Periods

Introduction, related terminology such as constraints, objective function, optimization, graphical method of solution for problems in two variables, feasible and infeasible regions (bounded or unbounded), feasible and infeasible solutions, optimal feasible solutions (up to three non-trivial constraints).

Syllabus
Class - XII
Subject : Mathematics
Half-Yearly Examination- 2023-24

Time : 3 hrs.

Blue Print of Marks Distribution

Total Marks : 80 (Eighty)

Unit's No. & Name	Chapter's Name	MCQ (1 Mark)	VSA (1 Mark)	SA-I (2 Marks)	SA-II (3 Marks)	LA-I (4 Marks)	LA-II (5 Marks)	Total Marks
I. Relations & Functions	1. Relation & Function	2	1	1	1	-	-	08
II. Algebra	1. Matrices	1	3	1	-	1	-	10
III. Calculus	1. Continuity & Differentiability	1	1	1	-	2	-	35
	2. Integrals (Indefinite)	1	1	1	1	2	-	
	3. Differential Equations	2	2	-	-	1	-	
IV. Vectors & 3D-Geometry	1. Vectors	2	1	-	2	-	1	14
V. Linear Programming	1. Linear Programming	-	-	-	-	-	1	05
VI. Probability	1. Probability (Conditional Probability, multiplication theorem on probability, Independent events, total probability)	1	1	1	-	1	-	08
Total Marks (Nos. of questions)		1x10 (10 Nos)	1x10 (10 Nos)	2x5 (5 Nos)	3x4 (4 Nos)	4x7 (7 Nos)	5x2 (2 Nos)	80 (38 Nos)

Internal Assessment -20

Pre-Board / Board Final Exam. (2023-24)**Class : XII****Subject : Mathematics****Course Structure****Max Marks : 80**

No.	Units	No. of Periods	Marks
I.	Relations and Functions	30	08
II.	Algebra	50	10
III.	Calculus	80	35
IV.	Vectors and Three-Dimensional Geometry	30	14
V.	Linear Programming	20	05
VI.	Probability	30	08
	Total	240	80
	Internal Assessment		20

Unit-I : Relations and Functions

- 1. Relations and Functions :** 15 Periods
Types of relations : reflexive, symmetric, transitive and equivalence relations. One to one and onto functions.
- 2. Inverse Trigonometric Functions :** 15 Periods
Definition, range, domain, principal value branch. Graphs of inverse trigonometric functions.

Unit-II : Algebra

- 1. Matrices** 25 Periods
Concept, notation, order, equality, types of matrices, zero and identity matrix, transpose of a matrix, symmetric and skew symmetric matrices. Operations on matrices : Addition and multiplication and multiplication with a scalar. Simple properties of addition, multiplication and scalar multiplication. Non-commutativity of multiplication of matrices and existence of non-zero matrices whose product is the zero matrix (restrict to square matrices of order 2). Invertible matrices and proof of the uniqueness of inverse, if it exists; (Here all matrices will have real entries).
- 2. Determinants :** 25 Periods
Determinant of a square matrix (up to 3×3 matrices), minors, co-factors and applications of determinants in finding the area of a triangle. Adjoint and inverse of a square matrix. Consistency, inconsistency and number of solutions of system of linear equations by examples, solving system of linear equations in two or three variables (having unique solution) using inverse of a matrix.

Unit-III : Calculus

- 1. Continuity and Differentiability :** 20 Periods
Continuity and differentiability, chain rule, derivative of inverse trigonometric functions, like $\sin^{-1}x$, \cos^{-1} and $\tan^{-1}x$, derivative of implicit functions. Concept of exponential and logarithmic functions.

Derivatives of logarithmic and exponential functions, Logarithmic differentiation, derivative of functions expressed in parametric forms. Second order derivatives.

2. Applications of Derivatives 10 Periods

Applications of derivatives : rate of change of quantities, increasing/decreasing functions, maxima and minima (first derivative test motivated geometrically and second derivative test given as a provable tool). Simple problems (that illustrate basic principles and understanding of the subject as well as real-life situations).

3. Integrals : 20 Periods

Integration as inverse process of differentiation. Integration of a variety of functions by substitution, by partial fractions and by parts. Evaluation of simple integrals of a following types and problems based on them.

$$\int \frac{dx}{x^2 \pm a^2}, \int \frac{dx}{\sqrt{x^2 \pm a^2}}, \int \frac{dx}{\sqrt{a^2 - x^2}}, \int \frac{dx}{ax^2 + bx + c}, \int \frac{dx}{\sqrt{ax^2 + bx + c}}$$

$$\int \frac{px + q}{ax^2 + bx + c} dx, \int \frac{px + q}{\sqrt{ax^2 + bx + c}} dx, \int \sqrt{a^2 \pm x^2} dx, \int \sqrt{x^2 - a^2} dx$$

$$\int \sqrt{ax^2 + bx + c} dx.$$

Fundamental Theorem of Calculus (without proof). Basic properties of definite integrals and evaluation of definite integrals.

4. Applications of the Integrals : 15 Periods

Applications in finding the area under simple curves, especially lines, circles/parabolus/ellipses (in standard form only).

5. Differential Equations : 15 Periods

Definition, order and degree, general and particular solutions of a differential equation. Solution of differential equations by method of separation of variables, solutions of homogeneous differential equations of first order and first degree. Solutions of linear differential equations of the type :

$$\frac{dx}{dy} + py = q, \text{ where } p \text{ and } q \text{ are functions of } x \text{ or constants.}$$

$$\frac{dx}{dy} + px = q, \text{ where } p \text{ and } q \text{ are functions of } y \text{ or constants.}$$

Unit-IV : Vectors and Three-Dimentional Geometry

1. Vectors : 15 Periods

Vectors and scalars, magnitude and direction of a vector. Direction cosines and direction ratios of a vector. Types of vectors (equal, unit, zero, parallel and collinear vectors), position vector of a point, negative of a vector, components of a vector, addition of vectors, multiplication of a vector by a scalar, position vector of a point dividing a line segment in a given ratio. Definition, Geometrical Interpretation, properties and application of scalar (dot) product of vectors, vector (cross) product of vectors.

2. Three-dimensional Geometry : 15 Periods

Direction cosines and direction ratios of a line joining two points. Cartesian equation and vector equation of a line, skew lines, shortest distance between two lines. Angle between two lines.

Unit-V : Linear Programming

1. Linear Programming :

20 Periods

Introduction, related terminology such as constraints, objective function, optimization, graphical method of solution for problems in two variables, feasible and infeasible regions (bounded or unbounded), feasible and infeasible solutions, optimal feasible solutions (up to three non-trivial constraints).

Unit-VI : Probability

1. Probability :

30 Periods

Conditional probability, multiplication theorem on probability, independent events, total probability, Bayes' theorem, Random variable and its probability distribution, mean of random variable.

Pre-Board / Board Final Examination- 2023-24

Class : XII (Twelve)

Subject : Mathematics

Unit/Chapter-wise Marks Distribution

Time : 3 hrs.

Total Marks : 80 (Eighty)

Unit's No. & Name	Chapter's Name	MCQ (1 Mark)	VSA (1 Mark)	SA-I (2 Marks)	SA-II (3 Marks)	LA-I (4 Marks)	LA-II (5 Marks)	Total Marks
I. Relations & Functions	1. Relation & Function	1	-	1	-	-	-	08
	2. Inverse Trigonometric Functions	1	1	-	1	-	-	
II. Algebra	1. Matrices	-	2	-	-	1	-	10
	2. Determinants	1	1	1	-	-	-	
III. Calculus	1. Continuity & Differentiability	-	-	1	-	1	-	35
	2. Application of Derivatives	1	-	1	-	1	-	
	3. Integrals	1	2	-	1	1	-	
	4. Application of Integrals	1	-	-	-	1	-	
	5. Differential Equations	1	2	-	-	1	-	
IV. Vectors & 3D-Geometry	1. Vectors	1	1	-	1	-	-	14
	2. 3-Dimensional Geometry	1	-	-	1	-	1	
V. Linear Programming	1. Linear Programming	-	-	-	-	-	1	05
VI. Probability	1. Probability	1	1	1	-	1	-	08
Total Marks (Nos. of questions)		1x10 (10 Nos)	1x10 (10 Nos)	2x5 (5 Nos)	3x4 (4 Nos)	4x7 (7 Nos)	5x2 (2 Nos)	80 (38 Nos)

Internal Assessment - 20