BIHAR BOARD MATHEMATICS SYLLABUS WITH MARKS WEIGHTAGE

## Unit-Wise Distribution of Marks

| UNIT NAME | Marks |
| :--- | :--- |
| UNIT:1 Relation and Function | 10 |
| UNIT:2 Calculus | 44 |
| UNIT:3 Algebra | 13 |
| UNIT:4 Probability | 10 |
| UNIT:5 Vector and 3D-Geometry | 17 |
| UNIT:6 Linear-Programming Problem | 06 |

## Detailed Syllabus for Mathematics Class $12^{\text {th }}$

Unit 1: Relations and Functions

- Relations and Functions: Types of relations: Reflexive, Symmetric, Transitive and Equivalence relations.
- Functions: One to one and onto functions, composite functions, inverse of a function. Binary operations.
- Inverse Trigonometric Functions: Definition, range, domain, principal value branch.
- Graphs of inverse trigonometric functions. Elementary properties of inverse trigonometric functions.


## Unit 2: Algebra

## Matrices

- Basics: Concept, notation, order, equality, types of matrices, zero and identity matrix, transpose of a matrix, symmetric and skew symmetric matrices.
- Operation 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
- Concept of elementary row and column operations. Invertible matrices and proof of the uniqueness of inverse, if it exists; (Here all matrices will have real entries).


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## Determinants

- Determinant of a square matrix (up to $3 \times 3$ matrices), properties of determinants, minors, cofactors 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 3: Calculus

## Continuity and Differentiability

- Derivative of composite functions, chain rule, derivatives of inverse trigonometric functions, 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.
- Rolle's and Lagrange's Mean Value Theorems and their geometric interpretation.


## Applications of Derivatives

- Rate of change of bodies, increasing/decreasing functions, tangents and normal, use of derivatives in approximation, maxima and minima.
- Simple problems (based on basic principles and understanding of the subject as well as real-life situations).


## Integrals

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

$$
\begin{aligned}
& \int \frac{d x}{x^{2} \pm a^{2}}, \int \frac{d x}{\sqrt{x^{2} \pm a^{2}}}, \int \frac{d x}{\sqrt{a^{2}-x^{2}}}, \int \frac{d x}{a x^{2}+b x+c}, \int \frac{d x}{\sqrt{a x^{2}+b x+c}} \\
& \int \frac{p x+q}{a x^{2}+b x+c} d x, \int \frac{p x+q}{\sqrt{a x^{2}+b x+c}} d x, \int \sqrt{a^{2} \pm x^{2}} d x, \int \sqrt{x^{2}-a^{2}} d x \\
& \int \sqrt{a x^{2}+b x+c} d x, \int(p x+q) \sqrt{a x^{2}+b x+c} d x
\end{aligned}
$$

- Definite integrals as a limit of a sum, Fundamental Theorem of Calculus (without proof). Basic properties of definite integrals and evaluation of definite integrals.


## Applications of Integrals

- Applications in finding area under simple curves, Straight lines, circles/parabolas/ellipses.


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- Area between any of the two above said curves (the region should be clearly identifiable)


## 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 solutions of homogeneous differential equations of first order and first degree.
- Solutions of linear differential equation of the type:
- $d y / d x+p y=q$, where $p$ and $q$ are functions of $x$ or constants.


## Unit 4: Vectors and 3-Dimensional Geometry

## Vectors

- Vectors and scalars, magnitude and direction of a vector.
- Direction cosines and direction ratios of a vector.
- Types of 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.
- Geometrical Interpretation, properties and application of scalar (dot) product of vectors, vector (cross) product of vectors, scalar triple product of vectors.


## 3 - Dimensional Geometry

- Direction cosines and direction ratios of a line joining two points.
- Cartesian equation and vector equation of a line, coplanar and skew lines, shortest distance between two lines.Cartesian and vector equation of a plane.
- Distance of a point from a plane.
- Angle between
a. two lines,
b. two planes
c. a line and a plane


## Unit 5: Linear Programming

- Introduction
- Related terminology: constraints, objective function, optimization, different types of linear programming (L.P.) problems.
- Mathematical formulation of L.P. problem.
- Graphical method of solution for problems in two variables, feasible and infeasible regions (bounded and unbounded), feasible and infeasible solutions
- Optimal feasible solutions.


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Unit 6: Probability

- Multiplication theorem on probability
- Conditional probability
- Independent events, total probability, Baye's theorem
- Random variable and its probability distribution
- Mean and variance of the random variable
- Repeated independent (Bernoulli) trials \& Binomial distribution.

