

Latest Revised Syllabus Issued by CBSE for Academic Year (2020-2021)

MATHEMATICS (CODE NO. 041)

Time: 3 Hours

THEORY

Max. Marks: 80

Unit	Title	No. of Periods	Marks
I.	Relations and Functions	17	08
II.	Algebra	35	10
III.	Calculus	57	35
IV.	Vectors and Three - Dimensional Geometry	26	14
V.	Linear Programming	13	05
VI.	Probability	20	08
Total		168	80

Unit-I: Relations and Functions

1. Relations and Functions

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

✘ **Composite functions, inverse of a function.**

2. Inverse Trigonometric Functions

Definition, range, domain, principal value branch.

✘ **Graphs of inverse trigonometric functions. Elementary properties of inverse trigonometric functions.**

Unit-II: Algebra

1. Matrices

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 Invertible matrices (Here all matrices will have real entries).

✘ **Existence of non-zero matrices whose product is the zero matrix (restrict to square matrices of order 2). Concept of elementary row and column operations; Proof of the uniqueness of inverse, if it exists**

2. Determinants

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. Solving system of linear equations in two or three variables (having unique solution) using inverse of a matrix.

✘ **Properties of determinants; Consistency, inconsistency and number of solutions of system of linear equations by examples**

Unit-III: Calculus

1 Continuity and Differentiability

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 (without proof) and their geometric interpretation.
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2. Applications of Derivatives

Applications of derivatives: increasing/decreasing functions, tangents and normals, 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).

✘	Rate of change of bodies; use of derivatives in approximation
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3 Integrals

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 the following types and problems based on them.

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

$$\int \sqrt{a^2 \pm x^2} dx; \int \sqrt{x^2 - a^2} dx;$$

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

✘	$\int \sqrt{ax^2 + bx + c} dx; \int (px + q)\sqrt{ax^2 + bx + c} dx$; Definite integrals as a limit of a sum,
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4. Applications of the Integrals

Applications in finding the area under simple curves, especially lines, circles/ parabolas/ellipses (in standard form only), (the region should be clearly identifiable).

✘	Area between any of the two above said curves
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5. Differential Equations

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 of the type $\frac{dy}{dx} = f(y/x)$. Solutions of linear differential equation of the type:

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

✘	$\frac{dx}{dy} + px = q$, where p and q are functions of y or constants.
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Unit-IV: Vectors and Three-Dimensional Geometry

1. Vectors

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

✘	Scalar triple product of vectors.
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2. Three - 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 (i) two lines, (ii) two planes, (iii) a line and a plane.
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Unit-V: Linear Programming

1. Linear Programming

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

✘	Mathematical formulation of L.P. problems; Unbounded regions.
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Unit-VI: Probability

1. Probability

Conditional probability, multiplication theorem on probability, independent events, total probability, Baye's theorem, Random variable and its probability distribution

✘	Mean and variance of random variable.
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INTERNAL ASSESMENT	20 Marks
Periodic Tests (Best 2 out of 3 tests Conducted)	10 Marks
Mathematics Activities	10 Marks

Note: Topics/Chapters/Units in the boxes are not in the syllabus for the academic year 2020-21.