

CLASS XII
MATHEMATICS (CODE 041)
SYLLABUS
SESSION (2020-21)

CONTENT
Unit-I: Relations and Functions
<p>1.Relations and Functions: Types of relations: reflexive, symmetric, transitive and equivalence relations. One to one and onto functions.</p> <p>2.Inverse Trigonometric Function: Definition, range, domain, principal value branch.</p>
Unit-II: Algebra
<p>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-commutability of multiplication of matrices, invertible matrices; (Here all matrices will have real entries).</p> <p>2. Determinants: Determinants of square matrix (upto 3 x 3 matrices), minors, co- factors and applications of determinants in finding the area of 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.</p>
YUVA Session : Towards better understanding of gender and sex
Unit-III: Calculus
<p>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. Logarithmic differentiation, derivative of functions expressed in parametric forms. Second order derivatives.</p> <p>2. Applications of Derivatives: Applications of derivatives: increasing/decreasing functions, tangents and normal, 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).</p>
YUVA SESSION : Let everyone Live

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.

4.Applications of the Integrals:

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

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 :

$$\frac{dy}{dx} = f\left(\frac{y}{x}\right)$$

Solutions of linear differential equation of the type : $\frac{dy}{dx} + py = q$ Where p and q are functions of x or constants

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.

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.

Unit-V: Linear Programming

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)

Unit-VI: Probability

Probability: Conditional probability, multiplication theorem on probability, independent events, total probability, Bayes' theorem, Random variable and its probability distribution.

Suggestive Activities for Class XII

Activity 1 -To verify that the relation R in the set L of all lines in a plane, defined by $R = \{(l, m) : l \perp m\}$ is symmetric but neither reflexive nor transitive.

Activity 2- To verify that the relation R in the set L of all lines in a plane, defined by $R = \{(l, m) : l \parallel m\}$ is an equivalence relation.

Activity 3- To demonstrate a function which is not one-one but is onto.

Activity 4- To demonstrate a function which is one-one but not onto.

Activity 5-To draw the graph of $\sin^{-1}x$, using the graph of $\sin x$ and demonstrate the concept of mirror reflection (about the line $y = x$).

Activity 6-To explore the principal value of the function $\sin^{-1}x$ using a unit circle.

Activity 7 -To sketch the graphs of a^x and $\log_a x$, $a > 0$, $a \neq 1$ and to examine that they are mirror images of each other.

Activity 8-To establish a relationship between common logarithm (to the base 10) and natural logarithm (to the base e) of the number x.

Activity 9-To find analytically the limit of a function $f(x)$ at $x = c$ and also to check the continuity of the function at that point.

Activity 10-To verify that for a function f to be continuous at given point x_0 , $\Delta y = |f(x_0 + \Delta x) - f(x_0)|$ is arbitrarily small provided Δx is sufficiently small.

Activity 11 -To verify Rolle's Theorem. **(Deleted for this session)**

Activity 12 -To verify Lagrange's Mean Value Theorem. **(Deleted for this session)**

Activity 13-To understand the concepts of decreasing and increasing functions.

Activity 14 -To understand the concepts of local maxima, local minima and point of inflection.

Activity 15-To understand the concepts of absolute maximum and minimum values of a function in a given closed interval through its graph.

Activity 16-To construct an open box of maximum volume from a given rectangular sheet by cutting equal squares from each corner.

Activity 17-To find the time when the area of a rectangle of given dimensions become maximum, if the length is decreasing and the breadth is increasing at given rates.

Activity 18-To verify that amongst all the rectangles of the same perimeter, the square has the maximum area.

Activity 19-To evaluate the definite integral $\int_a^b \sqrt{1-x^2} dx$ as the limit of a sum and verify it by actual integration. **(Deleted for this session)**

Activity 20-To verify geometrically that $\vec{c} \times (\vec{a} + \vec{b}) = \vec{c} \times \vec{a} + \vec{c} \times \vec{b}$

Activity 21-To verify that angle in a semi-circle is a right angle, using vector method.

Activity 22-To locate the points to given coordinates in space, measure the distance between two points in space and then to verify the distance using distance formula.

Activity 23-To demonstrate the equation of a plane in normal form.

Activity 24-To verify that the angle between two planes is the same as the angle between their normals.

Activity 25-To find the distance of given point (in space) from a plane (passing through three non-collinear points) by actual measurement and also analytically.

Activity 26-To measure the shortest distance between two skew lines and verify it analytically.

Activity 27-To explain the computation of conditional probability of a given event A, when event B has already occurred, through an example of throwing a pair of dice.

INTERNAL ASSESSMENT 20 MARKS
Periodic Tests (Best 2 out of 3 tests conducted) 10 Marks
Mathematics Activities 10 Marks

Note: For activities NCERT Lab Manual may be referred. **Throughout the year any 10 activities** shall be performed by the student from the activities given in the Laboratory Manual for the respective class XII which is available on the link

[:http://www.ncert.nic.in/exemplar/labmanuals.html](http://www.ncert.nic.in/exemplar/labmanuals.html)

CLASS: XII SESSION: 2020-21
SUBJECT: MATHEMATICS

BLUE PRINT

Time Allowed: 3 Hours Maximum Marks: 80

General Instructions:

1. This question paper contains two parts A and B. Each part is compulsory.
2. Part A carries 24 marks and Part B carries 56 marks
3. Part-A has Objective Type Questions and Part -B has Descriptive Type Questions
4. Both Part A and Part B have choices.

Part – A:

1. It consists of two sections- I and II.
2. Section I comprises of 16 very short answers type questions.
3. Section II contains 2 case studies. Each case study comprises of 5 case-based MCQs.

An examinee is to attempt any 4 out of 5 MCQs.

Part – B:

1. It consists of three sections- III, IV and V.
2. Section III comprises of 10 questions of 2 marks each.
3. Section IV comprises of 7 questions of 3 marks each.
4. Section V comprises of 3 questions of 5 marks each.
5. Internal choice is provided in 3 questions of Section –III, 2 questions of Section IV and 3 questions of Section-V.

You need to attempt only one of the alternatives in all such questions.

