

BITSAT Syllabus~ Mathematics

1. Algebra

- 1.1. Complex numbers, addition, multiplication, conjugation, polar representation, properties of modulus and principal argument, triangle inequality, roots of complex numbers, geometric interpretations; Fundamental theorem of algebra.
- 1.2. Theory of Quadratic equations, quadratic equations in real and complex number system and their solutions, relation between roots and coefficients, nature of roots, equations reducible to quadratic equations.
- 1.3. Arithmetic, geometric and harmonic progressions, arithmetic, geometric and harmonic means, arithmetico-geometric series, sums of finite arithmetic and geometric progressions, infinite geometric series, sums of squares and cubes of the first n natural numbers.
- 1.4. Logarithms and their properties.
- 1.5. Exponential series.
- 1.6. Permutations and combinations, Permutations as an arrangement and combination as selection, simple applications.
- 1.7. Binomial theorem for a positive integral index, properties of binomial coefficients, Pascal's triangle
- 1.8. Matrices and determinants of order two or three, properties and evaluation of determinants, addition and multiplication of matrices, adjoint and inverse of matrices, Solutions of simultaneous linear equations in two or three variables, elementary row and column operations of matrices,
- 1.9. Sets, Relations and Functions, algebra of sets applications, equivalence relations, mappings, one-one, into and onto mappings, composition of mappings, binary operation, inverse of function, functions of real variables like polynomial, modulus, signum and greatest integer.
- 1.10. Mathematical Induction
- 1.11. Linear Inequalities, solution of linear inequalities in one and two variables.

2. Trigonometry

- 2.1. Measurement of angles in radians and degrees, positive and negative angles, trigonometric ratios, functions and identities.
- 2.2. Solution of trigonometric equations.
- 2.3. Properties of triangles and solutions of triangles
- 2.4. Inverse trigonometric functions
- 2.5. Heights and distances

3. Two-dimensional Coordinate Geometry

- 3.1. Cartesian coordinates, distance between two points, section formulae, shift of origin.

- 3.2. Straight lines and pair of straight lines: Equation of straight lines in various forms, angle between two lines, distance of a point from a line, lines through the point of intersection of two given lines, equation of the bisector of the angle between two lines, concurrent lines.
- 3.3. Circles and family of circles : Equation of circle in various form, equation of tangent, normal & chords, parametric equations of a circle , intersection of a circle with a straight line or a circle, equation of circle through point of intersection of two circles, conditions for two intersecting circles to be orthogonal.
- 3.4. Conic sections: parabola, ellipse and hyperbola their eccentricity, directrices & foci, parametric forms, equations of tangent & normal, conditions for $y=mx+c$ to be a tangent and point of tangency.

4. Three dimensional Coordinate Geometry

- 4.1. Co-ordinate axes and co-ordinate planes, distance between two points, section formula, direction cosines and direction ratios, equation of a straight line in space and skew lines.
- 4.2. Angle between two lines whose direction ratios are given, shortest distance between two lines.
- 4.3. Equation of a plane, distance of a point from a plane, condition for coplanarity of three lines, angles between two planes, angle between a line and a plane.

5. Differential Calculus

- 5.1. Domain and range of a real valued function, Limits and Continuity of the sum, difference, product and quotient of two functions, Differentiability.
- 5.2. Derivative of different types of functions (polynomial, rational, trigonometric, inverse trigonometric, exponential, logarithmic, implicit functions), derivative of the sum, difference, product and quotient of two functions, chain rule.
- 5.3. Geometric interpretation of derivative, Tangents and Normals.
- 5.4. Increasing and decreasing functions, Maxima and minima of a function.
- 5.5. Rolle's Theorem, Mean Value Theorem and Intermediate Value Theorem.

6. Integral Calculus

- 6.1. Integration as the inverse process of differentiation, indefinite integrals of standard functions.
- 6.2. Methods of integration: Integration by substitution, Integration by parts, integration by partial fractions, and integration by trigonometric identities.
- 6.3. Definite integrals and their properties, Fundamental Theorem of Integral Calculus, applications in finding areas under simple curves.
- 6.4. Application of definite integrals to the determination of areas of regions bounded by simple curves.

7. Ordinary Differential Equations

- 7.1. Order and degree of a differential equation, formulation of a differential equation whose general solution is given, variables separable method.
- 7.2. Solution of homogeneous differential equations of first order and first degree
- 7.3. Linear first order differential equations

8. Probability

- 8.1. Various terminology in probability, axiomatic and other approaches of probability, addition and multiplication rules of probability.
- 8.2. Conditional probability, total probability and Baye's theorem
- 8.3. Independent events
- 8.4. Discrete random variables and distributions with mean and variance.

9. Vectors

- 9.1. Direction ratio/cosines of vectors, addition of vectors, scalar multiplication, position vector of a point dividing a line segment in a given ratio.
- 9.2. Dot and cross products of two vectors, projection of a vector on a line.
- 9.3. Scalar triple products and their geometrical interpretations.

10. Statistics

- 10.1. Measures of dispersion
- 10.2. Measures of skewness and Central Tendency, Analysis of frequency distributions with equal means but different variances

11. Linear Programming

- 11.1. Various terminology and formulation of linear Programming
- 11.2. Solution of linear Programming using graphical method, feasible and infeasible regions, feasible and infeasible solutions, optimal feasible solutions (up to three non-trivial constraints)