

UPSC SCRA Mathematics Syllabus

Algebra

Concept of a **set**, Union and Intersection of sets, Complement of a set, Null set, Universal set and Power set, Venn diagrams and simple applications, Cartesian product of two sets, relation and mapping - examples, Binary operation on a set - examples, Representation of real numbers on a line.

Complex numbers: Modulus, Argument, Algebraic operations on complex numbers, Cube roots of unity.

Binary system of numbers, Conversion of a decimal number to a binary number and vice-versa.

Arithmetic, Geometric and Harmonic **progressions**, Summation of series involving A.P., G.P., and H.P..

Quadratic equations with real co-efficients, Quadratic expressions: extreme values.

Permutation and Combination

Binomial theorem and its applications.

Matrices and Determinants: Types of matrices, equality, matrix addition and scalar multiplication -properties, Matrix multiplication - non-commutative and distributive property over addition, Transpose of a matrix, Determinant of a matrix, Minors and Cofactors, Properties of determinants, Singular and non-singular matrices, Adjoint and Inverse of a square-matrix, Solution of a system of linear equations in two and three variables-elimination method, Cramers rule and Matrix inversion method (Matrices with m rows and n columns where $m, n \leq 3$ are to be considered), Idea of a Group, Order of a Group, Abelian Group, Identity and inverse elements Illustration by simple examples.

Trigonometry

Addition and subtraction formulae, multiple and sub-multiple angles, Product and factoring formulae, Inverse trigonometric functions - Domains, Ranges and Graphs, DeMoivre's theorem, expansion of $\sin n\theta$ and $\cos n\theta$ in a series of multiples of Sines and Cosines, Solution of simple trigonometric equations, Applications: Heights and Distance.

Analytic Geometry (Two Dimensions)

Rectangular Cartesian, Coordinate system, distance between two points, equation of a straight line in various forms, angle between two lines, distance of a point from a line, Transformation of axes, Pair of straight lines, general equation of second degree in x and y - condition to represent a pair of straight lines, point of intersection, angle between two lines, Equation of a circle in standard and in general form, equations of tangent and normal at a point, orthogonality of two circles, Standard equations of parabola, ellipse and hyperbola - parametric equations, equations of tangent and normal at a point in both cartesian and parametric forms.

Differential Calculus

Concept of a real valued function - domain, range and graph, Composite functions, one to one, onto and inverse functions, algebra of real functions, examples of polynomial, rational, trigonometric, exponential and logarithmic functions, Notion of limit, Standard limits - examples, Continuity of functions - examples, algebraic operations on continuous functions, Derivative of a function at a point, geometrical and physical interpretation of a derivative - applications, Derivative of sum, product and quotient of functions, derivative of a function with respect to another function,

derivative	of	a	composite
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Scra Math Guide

Daniela Niemeyer



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Table of Contents Scra Math Guide

1. Understanding the eBook Scra Math Guide
 - The Rise of Digital Reading Scra Math Guide
 - Advantages of eBooks Over Traditional Books
2. Identifying Scra Math Guide
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Scra Math Guide
 - User-Friendly Interface
4. Exploring eBook Recommendations from Scra Math Guide
 - Personalized Recommendations
 - Scra Math Guide User Reviews and Ratings
 - Scra Math Guide and Bestseller Lists
5. Accessing Scra Math Guide Free and Paid eBooks

- Scra Math Guide Public Domain eBooks
- Scra Math Guide eBook Subscription Services
- Scra Math Guide Budget-Friendly Options
- 6. Navigating Scra Math Guide eBook Formats
 - ePub, PDF, MOBI, and More
 - Scra Math Guide Compatibility with Devices
 - Scra Math Guide Enhanced eBook Features
- 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Scra Math Guide
 - Highlighting and Note-Taking Scra Math Guide
 - Interactive Elements Scra Math Guide
- 8. Staying Engaged with Scra Math Guide
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Scra Math Guide
- 9. Balancing eBooks and Physical Books Scra Math Guide
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Scra Math Guide
- 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
- 11. Cultivating a Reading Routine Scra Math Guide
 - Setting Reading Goals Scra Math Guide
 - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Scra Math Guide
 - Fact-Checking eBook Content of Scra Math Guide
 - Distinguishing Credible Sources
- 13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development

- Exploring Educational eBooks

14. Embracing eBook Trends

- Integration of Multimedia Elements
- Interactive and Gamified eBooks

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