

MIND MASTERS LIBERIA INITIATIVE (MMLI)

Study Outline – National Mathematics Championship

1. Number Theory

- *Divisibility rules and prime numbers*
- *Greatest common divisor and least common multiple*
- *Modular arithmetic and congruences*
- *Factorials, binomial coefficients, and number patterns*
- *Properties of integers and Diophantine equations*

2. Algebra

- *Polynomials: identities, factorization, and simplification*
- *Equations and inequalities: linear, quadratic, and higher degrees*
- *Functions and graphs: domains, ranges, transformations*
- *Sequences and series: arithmetic and geometric progressions*
- *Inequalities and the AM-GM inequality*

3. Geometry

- *Euclidean geometry: lines, angles, triangles, and circles*
- *Coordinate geometry: distances, midpoints, slopes, and equations of lines*
- *Geometric transformations: reflections, rotations, translations, dilations*
- *Mensuration: perimeter, area, surface area, and volume*
- *Advanced problems involving symmetry and loci*

4. Trigonometry

- *Trigonometric ratios and identities*
- *Graphs of sine, cosine, and tangent functions*
- *Solving triangles using sine and cosine rules*
- *Angle of elevation and depression problems*
- *Trigonometric equations and applications*

5. Combinatorics & Probability

- *Counting principles: permutations and combinations*
- *Basic and conditional probability*
- *Expected value and independent events*
- *Pigeonhole principle and inclusion-exclusion principle*

- *Applications in real-life and logic puzzles*

6. Calculus (Introductory Concepts)

- *Limits and continuity*
- *Basic differentiation and rules of derivatives*
- *Applications of derivatives: slopes, maxima and minima*
- *Area under a curve and basic integration (optional for advanced rounds)*

7. Problem Solving & Mental Math

- *Speed techniques for arithmetic calculations*
- *Logical reasoning and math puzzles*
- *Multi-step problems and Olympiad-style questions*
- *Time management in solving competition problems*
- *Maths Olympiad*



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