IOI Syllabus 2023 vs Mathematics Curriculum (9-12) 2006

IOI Syllabus 2023	Mathematics Curriculum (9-12) 2006 (Covered topics)
5.1 Arithmetics and Geometry ✓ Integers, operations (incl. exponentiation), comparison ✓ Basic properties of integers (sign, parity, divisibility) ✓ Basic modular arithmetic: addition, subtraction, multiplication ✓ Prime numbers ✓ Fractions, percentages ✓ Line, line segment, angle, triangle, rectangle, square, circle ✓ Point, vector, coordinates in the plane ✓ Polygon (vertex, side/edge, simple, convex, inside, area) ✓ Euclidean distances ✓ Pythagorean theorem ✗ Geometry in 3D or higher dimensional spaces ✗ Analyzing and increasing precision of floating-point computations ✗ Modular division and inverse elements ✗ Complex numbers ✗ General conics (parabolas, hyperbolas, ellipses) 　✗ Trigonometric functions	• **Topics 1 to 8 are included at Elementary Level** • **Topics 9 and 10 are included in class 9th; 100% coverage of IOI syllabus** • **Topics 11 to 13 are not included at any level** • Complex numbers are included both in IX and X class • **'General conics' are included in class XII covers about 50% weightage of IOI syllabus** • Trigonometric functions are included in class XI; **covers about 100% weightage of IOI syllabus** .
5.2 Discrete Structures (DS) **DS1**. Functions, relations, and sets ✓ Functions (surjections, injections, inverses, composition) ✓ Relations (reflexivity, symmetry, transitivity, equivalence relations, total/linear order relations, lexicographic order) ✓Sets (inclusion/exclusion, complements, Cartesian products, power sets) ✗ Cardinality and countability (of infinite sets)	• **Sets (**complements, Cartesian products, power sets) are included in Class X • **Functions (**surjections, injections) **are included, in Class X &XI; covers about 70% weightage of IOI syllabus** • **Functions (**inverses, composition) are included in class XII; **covers about 100% weightage of IOI syllabus** • Rest of the topics are not included .

DS2. Basic logic ✓ First-order logic ✓ Logical connectives (incl. their basic properties) ✓ Truth tables ✓ Universal and existential quantification (Note: statements should avoid definitions with nested quantifiers whenever possible.) ✓p Modus ponens and modus tollens ? Normal forms ✗ Validity ✗ Limitations of predicate logic✓🗎 Linked structures	**These topics are not Included**
DS3. Proof techniques ✓ Notions of implication, converse, inverse, contrapositive, negation, and contradiction ✓ Direct proofs, proofs by: counterexample, contraposition, contradiction ✓ Mathematical induction ✓ Strong induction (also known as complete induction) ✓ Recursive mathematical definitions (incl. mutually recursive definitions)	**Only Mathematical induction is included; covers about 10% syllabus of IOI of this section**
DS4. Basics of counting ✓ Counting arguments (sum and product rule, arithmetic and geometric progressions, Fibonacci numbers) ✓ Permutations and combinations (basic definitions) ✓ Factorial function, binomial coefficients ✓ Inclusion-exclusion principle ✓ Pigeonhole principle ✓ Pascal's identity, Binomial theorem ✗ Solving of recurrence relations ✗ Burnside lemma	• **Counting arguments** • **(arithmetic and geometric progressions) are included; covers 40% syllabus of IOI of this section.** • **Permutations and combinations (basic definitions) are included, covers 100% syllabus of IOI of this section.** • **binomial coefficients Pascal's identity, and Binomial theorem are included; covers about 75% syllabus of IOI of this section**
, DS5. Graphs and trees ✓q Undirected graphs (vertex/node, edge, degree, adjacency, vertex and edge labels) ✓q Directed graphs (in-degree, out-degree) ✓q Multigraphs, graphs with self-loops ✓q Paths in graphs (undirected and directed path, cycle, tour, walk; Euler tour; Hamiltonian path/cycle) ✓q Reachability (connected component, shortest distance) ✓q Trees (leaf, diameter, center, centroid, forest) ✓q Rooted trees (root, parent, child, ancestor, subtree)	**.** **Not Included**

✓q Spanning trees (subgraph) ✓q Traversal strategies ✓q Bipartite graphs ✓q Directed acyclic graphs ✓p Planar graphs ✓p Basic combinatorial properties of graphs9 ✗ Hypergraphs ✗ Specific graph classes such as perfect graphs ✗ Structural parameters such as treewidth and expansion ✗ Planarity testing 　✗ Finding separators for planar graphs	
. DS6. Discrete probability Applications where everything is finite (and thus arguments about probability can be easily turned into combinatorial arguments) 　are ?, everything more complicated is ✗.	**Not Included**
5.3 Other Areas in Mathematics ✗ Geometry in three or more dimensions. ✗ Linear algebra, including (but not limited to): – Matrix multiplication, exponentiation, inversion, and Gaussian elimination – Fast Fourier transform ✗ Calculus ✗ Theory of combinatorial games, e.g., NIM game, Sprague- 　Grundy theo	**Linear algebra** **(**Matrix multiplication, • inversion, and Gaussian elimination) are included in class XI and cover about 80% weightage of IOI syllabus • Calculus are included in class XII; cover about 80% weightage of IOI syllabus

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