Periodic Table of Mathematical Structures (PTMS)

Pu Justin Scarfy Yang

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Abstract

The Periodic Table of Mathematical Structures (PTMS) aims to systematically organize and classify mathematical structures by their levels of complexity and abstractness. Inspired by the periodic table of elements, this project seeks to create an ever-expanding framework that serves as an educational and research tool, highlighting the relationships and hierarchies among mathematical concepts.

1 Periodic Table of Mathematical Structures

Abstractness Complexity	**1 (Low)**	**2 (Moderate)**	**3 (High)**	**4 (Very High)**	**5**
1 (Concrete)	Set: Distinct objects	Relation: Ordered pairs	Function: Mappings	Tuple: Ordered list of elements	Multiset: Elements with multiplicities
2 (Basic Algebraic)	Group: Binary operation	Ring: Two operations	Field: Ring with inverses	Module: Generalized vector space	Semi-Group: Associative operation
3 (Advanced Algebraic)	Vector Space: Vectors with ops	Algebra: Vector space with product	Lie Algebra: Non-associative product	Hopf Algebra: Bialgebra with antipode	Coxeter Group: Symmetry group
4 (Geometric/Topological)	Topological Space: Neighborhoods	Manifold: Locally Euclidean	Symplectic Manifold: 2-form	Tensor Category: Tensor product	Fiber Bundle: Space with a projection
5 (Homological)	Chain Complex: Abelian groups	Derived Category: Complexes	Motivic Homotopy: Homotopy for varieties	Higher Category: Multiple morphisms	Exact Sequence: Chain of maps
6 (Analytic)	Riemann Surface: 1D complex manifold	Modular Form: Analytic function	Automorphic Form: Invariant functions	Noncommutative Geometry: Noncommutative algebras	Complex Manifold: Multi-dimensional
7 (Combinatorial)	Graph: Vertices and edges	Hypergraph: Generalized graph	Matroid: Generalized independence	Simplicial Complex: Generalized graph	Polytope: Multi-dimensional shape

8 (Category Theory)	Category: Objects and morphisms	Functor: Maps between categories	Natural Transformation: Functors of functors	Monoidal Category: Tensor category	Closed Category: Functors as objects
9 (Order Theory)	Partial Order: Ordered pairs	Lattice: Ordered structure	Boolean Algebra: Boolean operations	Heyting Algebra: Generalizes Boolean algebra	Complete Lattice: All sup and inf
10 (Logic)	Propositional Logic: True/False	First-Order Logic: Quantifiers	Modal Logic: Necessity/Possibility	Intuitionistic Logic: Constructivist approach	Higher Order Logic: Quantifies over functions
11 (Higher Order Topology)	CW Complex: Space decomposed into cells	Simplicial Complex: Collection of simplices	Differentiable Stack: Stack with smooth structure	Orbifold: Generalized manifold with singularities	Stratified Space: Space with stratification
12 (Higher Order Algebra)	Azumaya Algebra: Generalization of central simple algebras	Clifford Algebra: Algebra associated with quadratic forms	Witt Group: Group of quadratic forms over a field	Brauer Group: Group classifying division algebras	Quantum Torus: Noncommutative deformation of the torus
13 (Higher Order Geometry)	Algebraic Surface: Two-dimensional algebraic variety	Calabi-Yau Manifold: Ricci-flat Kähler manifold	K3 Surface: Special type of Calabi-Yau manifold	Fano Variety: Variety with ample anticanonical bundle	Enriques Surface: Algebraic surface with certain properties
14 (Higher Order Homological)	A-Category: Category with A-morphisms	E-Category: Category with E-morphisms	Derived -Category: Generalization of derived categories	DG-Category: Differential graded category	Infinity-Category: Generalization of categories with infinite levels
15 (Higher Order Analytic)	Hilbert Modular Form: Generalizes modular forms	Siegel Modular Form: Modular forms for symplectic groups	Automorphic Representation: Representation of automorphic forms	Theta Function: Special function of several complex variables	Moduli Space of Curves: Parameter space for algebraic curves
16 (Higher Order Combinatorics)	Matroid Theory: Generalizes linear independence	Greedoids: Generalizes matroids and antimatroids	Delta-Matroid: Generalizes matroids	Chow Ring: Intersection theory on algebraic varieties	Graph Homomorphism: Map preserving graph structure
17 (Higher Order Category Theory)	Infinity-Topos: Generalization of topoi to -categories	(,1)-Category: Category with weak equivalences and higher morphisms	(,n)-Category: Generalization of (,1)-categories to n-levels	Double Category: Category with two types of morphisms	Tricategory: Generalization of bicategories to three levels

18 (Higher Order Order Theory)	Continuous Lattice: Lattice with certain completeness properties	Algebraic Lattice: Lattice with certain algebraic properties	Stone Duality: Duality between topological spaces and lattices	Scott Domain: Continuous domain theory	Fuzzy Set: Generalizes set theory with degrees of membership
19 (Higher Order Logic)	Probabilistic Logic: Logic with probabilistic truth values	Temporal Logic: Logic for reasoning about time	Dynamic Logic: Logic for reasoning about programs	Epistemic Logic: Logic for reasoning about knowledge	Substructural Logic: Logic without certain structural rules
20 (Advanced Structures)	TQFT: Topological Quantum Field Theory	Vertex Algebra: Algebraic structure used in conformal field theory	Tensor Network: Network of tensors used in quantum computing	AdS/CFT Correspondence: Duality between a gravitational theory in Anti-de Sitter space and a conformal field theory	Quantum Gravity: Study of gravity in the context of quantum mechanics
21 (Higher Order Topological Quantum Structures)	TQFT: Topological Quantum Field Theory	D-brane: Objects in string theory that boundaries of strings attach to	Quantum Cohomology: Cohomology theory using quantum mechanics principles	Seiberg-Witten Theory: Study of 4-manifolds using gauge theory	Floer Theory: Intersection theory for symplectic manifolds
22 (Advanced Lie Structures)	Lie 2-Algebra: Generalization of Lie algebras with 2-categories	Lie Groupoid: Generalization of Lie groups to groupoids	Lie Supergroup: Supergroup structure extending Lie groups	Loop Group: Infinite-dimensional Lie group associated with loops in a Lie group	Virasoro Algebra: Infinite-dimensional Lie algebra related to conformal field theory
23 (Advanced Homotopy Theory)	-Groupoid: Generalization of groupoids to infinite levels	Simplicial Set: Combinatorial model for topological spaces	Cubical Set: Generalization of simplicial sets using cubes	Kan Complex: Special type of simplicial set used in homotopy theory	Model Category: Category with a notion of weak equivalences, fibrations, and cofibrations
24 (Advanced Algebraic Geometry)	Derived Scheme: Generalization of schemes in derived algebraic geometry	Derived Stack: Generalization of stacks in derived algebraic geometry	Perfectoid Space: Topological space used in p-adic Hodge theory	Berkovich Space: Non-Archimedean analytic space	Tropical Geometry: Study of piecewise linear structures that arise as limits of algebraic varieties

25 (Advanced Category Theory)	Higher Topos Theory: Study of higher categories with topological structures	(,1)-Category: Category with weak equivalences and higher morphisms	(,n)-Category: Generalization of (,1)-categories to n-levels	-Topos: Generalization of topoi to -categories	Double Category: Category with two types of morphisms
26 (Advanced Homological Algebra)	Derived Category of Sheaves: Category of complexes of sheaves	Tate Cohomology: Cohomology theory for finite groups	Adams Spectral Sequence: Tool for calculating homotopy groups	Etale Cohomology: Cohomology theory for algebraic varieties	Crystalline Cohomology: Cohomology theory for p-adic varieties
27 (Advanced Representation Theory)	Geometric Representation Theory: Study of representations using geometry	Categorical Representation Theory: Study of representations in higher categories	Quantum Group Representation: Study of representations of quantum groups	Hecke Algebra Representation: Study of representations of Hecke algebras	Affine Lie Algebra Representation: Study of representations of affine Lie algebras
28 (Advanced Algebra)	Symmetric Tensor Category: Category with a symmetric tensor product	Braided Tensor Category: Category with a braided tensor product	Fusion Category: Tensor category with additional properties	Modular Tensor Category: Fusion category satisfying modularity conditions	Factorization Algebra: Algebraic structure used in quantum field theory
29 (Advanced Homotopy Theory)	Homotopy Type Theory: Homotopy theory interpreted in type theory	Stable Homotopy Theory: Study of stable homotopy groups of spheres	Chromatic Homotopy Theory: Study of periodic phenomena in stable homotopy theory	Motivic Homotopy Theory: Homotopy theory for algebraic varieties	Equivariant Homotopy Theory: Homotopy theory considering group actions
30 (Advanced Quantum Structures)	Quantum Field Theory: Study of quantum fields	Conformal Field Theory: Quantum field theory invariant under conformal transformations	Topological Quantum Field Theory: Quantum field theory invariant under topological transformations	String Theory: Theoretical framework in which particles are replaced by one-dimensional strings	M-Theory: Theory unifying the five superstring theories
31 (Higher Order Topological Structures)	TQFT: Topological Quantum Field Theory	D-brane: Objects in string theory that boundaries of strings attach to	Quantum Cohomology: Cohomology theory using quantum mechanics principles	Seiberg-Witten Theory: Study of 4-manifolds using gauge theory	Floer Theory: Intersection theory for symplectic manifolds

32 (Advanced Lie Structures)	Lie 2-Algebra: Generalization of Lie algebras with 2-categories	Lie Groupoid: Generalization of Lie groups to groupoids	Lie Supergroup: Supergroup structure extending Lie groups	Loop Group: Infinite-dimensional Lie group associated with loops in a Lie group	Virasoro Algebra: Infinite-dimensional Lie algebra related to conformal field theory
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34 (Advanced Algebraic Geometry)	Derived Scheme: Generalization of schemes in derived algebraic geometry	Derived Stack: Generalization of stacks in derived algebraic geometry	Perfectoid Space: Topological space used in p-adic Hodge theory	Berkovich Space: Non-Archimedean analytic space	Tropical Geometry: Study of piecewise linear structures that arise as limits of algebraic varieties
35 (Advanced Category Theory)	Higher Topos Theory: Study of higher categories with topological structures	(,1)-Category: Category with weak equivalences and higher morphisms	(,n)-Category: Generalization of (,1)-categories to n-levels	-Topos: Generalization of topoi to -categories	Double Category: Category with two types of morphisms
36 (Advanced Homological Algebra)	Derived Category of Sheaves: Category of complexes of sheaves	Tate Cohomology: Cohomology theory for finite groups	Adams Spectral Sequence: Tool for calculating homotopy groups	Etale Cohomology: Cohomology theory for algebraic varieties	Crystalline Cohomology: Cohomology theory for p-adic varieties
37 (Advanced Representation Theory)	Geometric Representation Theory: Study of representations using geometry	Categorical Representation Theory: Study of representations in higher categories	Quantum Group Representation: Study of representations of quantum groups	Hecke Algebra Representation: Study of representations of Hecke algebras	Affine Lie Algebra Representation: Study of representations of affine Lie algebras
38 (Advanced Algebra)	Symmetric Tensor Category: Category with a symmetric tensor product	Braided Tensor Category: Category with a braided tensor product	Fusion Category: Tensor category with additional properties	Modular Tensor Category: Fusion category satisfying modularity conditions	Factorization Algebra: Algebraic structure used in quantum field theory

39 (Advanced Homotopy Theory)	Homotopy Type Theory: Homotopy theory interpreted in type theory	Stable Homotopy Theory: Study of stable homotopy groups of spheres	Chromatic Homotopy Theory: Study of periodic phenomena in stable homotopy theory	Motivic Homotopy Theory: Homotopy theory for algebraic varieties	Equivariant Homotopy Theory: Homotopy theory considering group actions
40 (Advanced Quantum Structures)	Quantum Field Theory: Study of quantum fields	Conformal Field Theory: Quantum field theory invariant under conformal transformations	Topological Quantum Field Theory: Quantum field theory invariant under topological transformations	String Theory: Theoretical framework in which particles are replaced by one-dimensional strings	M-Theory: Theory unifying the five superstring theories
41 (Higher Order Topological Quantum Structures)	TQFT: Topological Quantum Field Theory	D-brane: Objects in string theory that boundaries of strings attach to	Quantum Cohomology: Cohomology theory using quantum mechanics principles	Seiberg-Witten Theory: Study of 4-manifolds using gauge theory	Floer Theory: Intersection theory for symplectic manifolds
42 (Advanced Lie Structures)	Lie 2-Algebra: Generalization of Lie algebras with 2-categories	Lie Groupoid: Generalization of Lie groups to groupoids	Lie Supergroup: Supergroup structure extending Lie groups	Loop Group: Infinite-dimensional Lie group associated with loops in a Lie group	Virasoro Algebra: Infinite-dimensional Lie algebra related to conformal field theory
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44 (Advanced Algebraic Geometry)	Derived Scheme: Generalization of schemes in derived algebraic geometry	Derived Stack: Generalization of stacks in derived algebraic geometry	Perfectoid Space: Topological space used in p-adic Hodge theory	Berkovich Space: Non-Archimedean analytic space	Tropical Geometry: Study of piecewise linear structures that arise as limits of algebraic varieties
45 (Advanced Category Theory)	Higher Topos Theory: Study of higher categories with topological structures	(,1)-Category: Category with weak equivalences and higher morphisms	(,n)-Category: Generalization of (,1)-categories to n-levels	-Topos: Generalization of topoi to -categories	Double Category: Category with two types of morphisms

46 (Advanced Homological Algebra)	Derived Category of Sheaves: Category of complexes of sheaves	Tate Cohomology: Cohomology theory for finite groups	Adams Spectral Sequence: Tool for calculating homotopy groups	Etale Cohomology: Cohomology theory for algebraic varieties	Crystalline Cohomology: Cohomology theory for p-adic varieties
47 (Advanced Representation Theory)	Geometric Representation Theory: Study of representations using geometry	Categorical Representation Theory: Study of representations in higher categories	Quantum Group Representation: Study of representations of quantum groups	Hecke Algebra Representation: Study of representations of Hecke algebras	Affine Lie Algebra Representation: Study of representations of affine Lie algebras
48 (Advanced Algebra)	Symmetric Tensor Category: Category with a symmetric tensor product	Braided Tensor Category: Category with a braided tensor product	Fusion Category: Tensor category with additional properties	Modular Tensor Category: Fusion category satisfying modularity conditions	Factorization Algebra: Algebraic structure used in quantum field theory
49 (Advanced Homotopy Theory)	Homotopy Type Theory: Homotopy theory interpreted in type theory	Stable Homotopy Theory: Study of stable homotopy groups of spheres	Chromatic Homotopy Theory: Study of periodic phenomena in stable homotopy theory	Motivic Homotopy Theory: Homotopy theory for algebraic varieties	Equivariant Homotopy Theory: Homotopy theory considering group actions
50 (Advanced Quantum Structures)	Quantum Field Theory: Study of quantum fields	Conformal Field Theory: Quantum field theory invariant under conformal transformations	Topological Quantum Field Theory: Quantum field theory invariant under topological transformations	String Theory: Theoretical framework in which particles are replaced by one-dimensional strings	M-Theory: Theory unifying the five superstring theories
51 (Advanced Geometric Analysis)	Calabi-Yau Manifold: Ricci-flat Kähler manifold	Kähler Geometry: Study of Kähler manifolds	Hermitian Symmetric Space: Symmetric space with Hermitian structure	Teichmüller Space: Space of complex structures on a surface	Moduli Space of Abelian Varieties: Parameter space for Abelian varieties
52 (Higher Order Algebraic Topology)	Loop Space: Space of loops in a topological space	Operad: Abstract structure for operations	PROPs: Generalization of operads	Monoidal Homotopy Theory: Study of homotopy theory with monoidal structures	Higher Bordism Theory: Study of manifolds up to cobordism

53 (Higher Order Symplectic Geometry)	Symplectic Manifold: Manifold with a non-degenerate 2-form	Contact Manifold: Odd-dimensional counterpart to symplectic manifolds	Poisson Manifold: Generalizes symplectic manifolds with Poisson brackets	Hamiltonian Dynamics: Study of dynamical systems governed by Hamiltonian functions	Quantum Symplectic Geometry: Study of symplectic geometry in the quantum context
54 (Advanced Noncommutative Geometry)	Noncommutative Algebraic Geometry: Generalizes algebraic geometry using noncommutative rings	Noncommutative Topology: Study of topological structures in a noncommutative context	Noncommutative Probability: Generalizes probability theory using noncommutative algebras	Quantum Groups: Algebraic structures underlying quantum symmetries	C*-Algebra: Study of Banach algebras with an involution
55 (Advanced Topological Field Theories)	Topological Field Theory: Field theory invariant under topological transformations	Knot Theory: Study of mathematical knots	Quantum Invariants: Invariants of knots and 3-manifolds from quantum field theory	Floer Homology: Homology theory for studying periodic orbits in symplectic geometry	Quantum Topology: Study of topological properties in the quantum context
56 (Higher Order Differential Geometry)	Differential Forms: Generalized functions for integration on manifolds	De Rham Cohomology: Cohomology theory using differential forms	Riemannian Geometry: Study of smooth manifolds with Riemannian metrics	Lorentzian Geometry: Study of manifolds with Lorentzian metrics	Finsler Geometry: Generalizes Riemannian geometry by relaxing the requirement for the metric to be quadratic
57 (Higher Order Algebraic K-Theory)	Algebraic K-Theory: Study of projective modules and vector bundles using homotopy theory	Quillen K-Theory: Quillen's approach to algebraic K-theory	Higher Algebraic K-Theory: Generalizes algebraic K-theory to higher dimensions	Motivic K-Theory: Study of algebraic K-theory in the motivic context	Topological K-Theory: Study of vector bundles on topological spaces
58 (Advanced Functional Analysis)	Banach Space: Complete normed vector space	Hilbert Space: Complete inner product space	Operator Algebras: Study of algebras of operators on a Hilbert space	Spectral Theory: Study of the spectrum of operators	Functional Calculus: Study of functions of operators
59 (Advanced Geometric Representation Theory)	Geometric Langlands Program: Geometric approach to the Langlands program	Derived Categories of Sheaves: Study of derived categories in the context of sheaves	Perverse Sheaves: Special type of sheaves used in representation theory	D-Modules: Modules over the ring of differential operators	Automorphic Forms: Generalization of modular forms to more general groups

60 (Higher Order Number Theory)	Arithmetic Geometry: Study of solutions to polynomial equations with integer coefficients	Iwasawa Theory: Study of number fields and Galois representations	Modular Forms: Complex analytic functions with specific transformation properties	Elliptic Curves: Study of cubic curves with a group structure	L-Functions: Complex functions associated with number fields and modular forms
61 (Higher Order Computational Mathematics)	Computational Group Theory: Study of algorithms for groups	Computational Number Theory: Study of algorithms for number theoretic problems	Computational Algebraic Geometry: Study of algorithms for algebraic geometry problems	Symbolic Computation: Study of algorithms for manipulating symbolic expressions	Computational Topology: Study of algorithms for topological problems
62 (Advanced Combinatorial Optimization)	Linear Programming: Optimization of linear functions subject to linear constraints	Integer Programming: Optimization of linear functions with integer variables	Combinatorial Optimization: Study of optimization problems on combinatorial structures	Network Flow: Study of flows in networks	Polyhedral Combinatorics: Study of combinatorial properties of polyhedra
63 (Advanced Algebraic Combinatorics)	Algebraic Graph Theory: Study of graphs using algebraic methods	Combinatorial Design Theory: Study of combinatorial designs	Matroid Theory: Study of matroids and their applications	Symmetric Functions: Study of symmetric functions and their applications	Representation Theory of Symmetric Groups: Study of representations of symmetric groups
64 (Higher Order Homological Algebra)	Homological Algebra: Study of homology and cohomology theories	Derived Functors: Functors constructed to measure the failure of another functor to be exact	Ext and Tor: Derived functors measuring extensions and torsion	Derived Categories: Categories of complexes of objects	Triangulated Categories: Categories equipped with a class of distinguished triangles
65 (Higher Order Differential Topology)	Morse Theory: Study of critical points of smooth functions	Surgery Theory: Study of the modifications of manifolds	Cobordism Theory: Study of manifolds up to cobordism	Differential Structures on Manifolds: Study of different smooth structures on topological manifolds	Exotic Spheres: Study of spheres with exotic smooth structures
66 (Higher Order Ergodic Theory)	Ergodic Theory: Study of dynamical systems with an invariant measure	Measure Theory: Study of measures and their properties	Probability Theory: Study of random events and their probabilities	Dynamical Systems: Study of systems that evolve over time	Statistical Mechanics: Study of large systems by statistical methods

67 (Advanced Set Theory)	Axiomatic Set Theory: Study of sets based on axioms	Large Cardinals: Study of large cardinal numbers	Descriptive Set Theory: Study of sets in descriptive terms	Forcing: Technique to prove consistency and independence results	Inner Models: Study of models of set theory inside other models
68 (Advanced Model Theory)	Model Theory: Study of models of formal theories	O-Minimal Structures: Study of structures with a well-behaved definable set	Stability Theory: Study of stable theories and their models	NIP Theories: Study of theories without the independence property	Categoricity: Study of categorical theories
69 (Advanced Proof Theory)	Proof Theory: Study of the structure of mathematical proofs	Sequent Calculus: A logic system for proving validity	Natural Deduction: A method for deriving logical conclusions	Type Theory: Study of types in programming languages and logic	Automated Theorem Proving: Study of algorithms for proving theorems
70 (Higher Order Algebraic Geometry)	Derived Algebraic Geometry: Study of derived categories in algebraic geometry	Noncommutative Algebraic Geometry: Study of algebraic geometry using noncommutative rings	Logarithmic Geometry: Study of log schemes and their applications	Tropical Geometry: Study of piecewise linear structures that arise as limits of algebraic varieties	Homotopical Algebraic Geometry: Study of algebraic geometry using homotopical methods
71 (Higher Order Representation Theory)	Geometric Representation Theory: Study of representations using geometry	Categorical Representation Theory: Study of representations in higher categories	Quantum Group Representation: Study of representations of quantum groups	Hecke Algebra Representation: Study of representations of Hecke algebras	Affine Lie Algebra Representation: Study of representations of affine Lie algebras
72 (Advanced Quantum Mechanics)	Quantum Mechanics: Study of the behavior of particles at the quantum level	Quantum Field Theory: Study of quantum fields	Quantum Gravity: Study of gravity in the context of quantum mechanics	Quantum Computing: Study of computation using quantum-mechanical phenomena	Quantum Cryptography: Study of cryptographic systems using quantum mechanics
73 (Advanced Combinatorial Structures)	Graph Theory: Study of graphs and their properties	Hypergraph Theory: Study of hypergraphs and their properties	Matroid Theory: Study of matroids and their applications	Combinatorial Design Theory: Study of combinatorial designs	Finite Geometry: Study of finite geometric structures

74 (Advanced Algebraic Number Theory)	Algebraic Number Theory: Study of algebraic structures related to algebraic numbers	Class Field Theory: Study of abelian extensions of number fields	Iwasawa Theory: Study of number fields and Galois representations	Modular Forms: Complex analytic functions with specific transformation properties	L-Functions: Complex functions associated with number fields and modular forms
75 (Advanced Nonlinear Dynamics)	Nonlinear Dynamics: Study of systems governed by nonlinear equations	Chaos Theory: Study of chaotic systems and their properties	Bifurcation Theory: Study of changes in the structure of dynamical systems	Fractal Geometry: Study of fractals and their properties	Soliton Theory: Study of solitons and their interactions
76 (Advanced Topological Data Analysis)	Topological Data Analysis: Study of the shape of data using topology	Persistent Homology: Study of homology over varying scales	Mapper Algorithm: Technique for topological data analysis	Sheaf Theory: Study of sheaves and their applications	Discrete Morse Theory: Study of discrete analogs of Morse theory
77 (Advanced Mathematical Physics)	Mathematical Physics: Study of mathematical methods in physics	Statistical Mechanics: Study of large systems by statistical methods	Quantum Mechanics: Study of the behavior of particles at the quantum level	General Relativity: Study of gravitation in the context of relativity	String Theory: Theoretical framework in which particles are replaced by one-dimensional strings
78 (Advanced Computational Geometry)	Computational Geometry: Study of algorithms for geometric problems	Geometric Modeling: Study of the representation of geometric shapes	Mesh Generation: Study of algorithms for generating meshes	Voronoi Diagrams: Study of Voronoi diagrams and their applications	Convex Hulls: Study of convex hulls and their properties
79 (Advanced Geometric Group Theory)	Geometric Group Theory: Study of groups using geometric methods	Hyperbolic Geometry: Study of hyperbolic spaces and their properties	CAT(0) Spaces: Study of spaces with non-positive curvature	Teichmüller Theory: Study of the Teichmüller space of a surface	Geometric Invariant Theory: Study of group actions on algebraic varieties
80 (Advanced Homotopical Methods)	Homotopy Theory: Study of homotopies and their properties	Stable Homotopy Theory: Study of stable homotopy groups of spheres	Chromatic Homotopy Theory: Study of periodic phenomena in stable homotopy theory	Motivic Homotopy Theory: Homotopy theory for algebraic varieties	Equivariant Homotopy Theory: Homotopy theory considering group actions

81 (Advanced Algebraic Topology)	Algebraic Topology: Study of topological spaces with algebraic methods	Homology Theory: Study of homology and cohomology theories	Cohomology Theory: Study of cohomology theories	Spectral Sequences: Tools for computing homology and cohomology groups	Higher Homotopy Groups: Study of higher homotopy groups
82 (Advanced Probabilistic Methods)	Probability Theory: Study of random events and their probabilities	Stochastic Processes: Study of processes that evolve randomly over time	Martingales: Study of martingales and their properties	Markov Chains: Study of Markov chains and their properties	Brownian Motion: Study of Brownian motion and its properties
83 (Advanced Differential Geometry)	Riemannian Geometry: Study of smooth manifolds with Riemannian metrics	Lorentzian Geometry: Study of manifolds with Lorentzian metrics	Symplectic Geometry: Study of manifolds with a symplectic structure	Finsler Geometry: Generalizes Riemannian geometry by relaxing the requirement for the metric to be quadratic	Complex Geometry: Study of complex manifolds and their properties
84 (Advanced Topological Methods)	Topological Groups: Study of groups with a topology	Topological Vector Spaces: Study of vector spaces with a topology	Fiber Bundles: Study of bundles with fibers over a base space	Principal Bundles: Study of bundles with a group action	Sheaf Theory: Study of sheaves and their applications
85 (Advanced Noncommutative Structures)	Noncommutative Geometry: Study of geometric structures arising from noncommutative algebras	Noncommutative Algebraic Geometry: Generalizes algebraic geometry using noncommutative rings	Noncommutative Topology: Study of topological structures in a noncommutative context	Noncommutative Probability: Generalizes probability theory using noncommutative algebras	Quantum Groups: Algebraic structures underlying quantum symmetries
86 (Advanced Ergodic Theory)	Ergodic Theory: Study of dynamical systems with an invariant measure	Measure Theory: Study of measures and their properties	Probability Theory: Study of random events and their probabilities	Dynamical Systems: Study of systems that evolve over time	Statistical Mechanics: Study of large systems by statistical methods
87 (Advanced Set Theory)	Axiomatic Set Theory: Study of sets based on axioms	Large Cardinals: Study of large cardinal numbers	Descriptive Set Theory: Study of sets in descriptive terms	Forcing: Technique to prove consistency and independence results	Inner Models: Study of models of set theory inside other models
88 (Advanced Model Theory)	Model Theory: Study of models of formal theories	O-Minimal Structures: Study of structures with a well-behaved definable set	Stability Theory: Study of stable theories and their models	NIP Theories: Study of theories without the independence property	Categoricity: Study of categorical theories

89 (Advanced Proof Theory)	Proof Theory: Study of the structure of mathematical proofs	Sequent Calculus: A logic system for proving validity	Natural Deduction: A method for deriving logical conclusions	Type Theory: Study of types in programming languages and logic	Automated Theorem Proving: Study of algorithms for proving theorems
90 (Advanced Homological Methods)	Homological Algebra: Study of homology and cohomology theories	Derived Functors: Functors constructed to measure the failure of another functor to be exact	Ext and Tor: Derived functors measuring extensions and torsion	Derived Categories: Categories of complexes of objects	Triangulated Categories: Categories equipped with a class of distinguished triangles
91 (Advanced Mathematical Logic)	Mathematical Logic: Study of formal logical systems	Set Theory: Study of sets and their properties	Model Theory: Study of models of formal theories	Proof Theory: Study of the structure of mathematical proofs	Recursion Theory: Study of computable functions and Turing degrees
92 (Advanced Algebraic Methods)	Algebraic Geometry: Study of solutions to polynomial equations	Commutative Algebra: Study of commutative rings and their ideals	Homological Algebra: Study of homology and cohomology theories	Representation Theory: Study of algebraic structures through their representations	Category Theory: Study of mathematical structures through categories
93 (Advanced Geometric Methods)	Differential Geometry: Study of geometry using differential calculus	Algebraic Geometry: Study of solutions to polynomial equations	Riemannian Geometry: Study of smooth manifolds with Riemannian metrics	Symplectic Geometry: Study of manifolds with a symplectic structure	Topology: Study of topological spaces and continuous functions
94 (Advanced Combinatorial Methods)	Combinatorics: Study of counting, arrangement, and combination	Graph Theory: Study of graphs and their properties	Matroid Theory: Study of matroids and their applications	Design Theory: Study of combinatorial designs	Finite Geometry: Study of finite geometric structures
95 (Advanced Computational Methods)	Numerical Analysis: Study of algorithms for numerical approximation	Computational Geometry: Study of algorithms for geometric problems	Symbolic Computation: Study of algorithms for manipulating symbolic expressions	Cryptography: Study of secure communication techniques	Complexity Theory: Study of the complexity of algorithms
96 (Advanced Analytical Methods)	Real Analysis: Study of real-valued functions and sequences	Complex Analysis: Study of complex-valued functions and sequences	Functional Analysis: Study of vector spaces with infinite dimensions	Harmonic Analysis: Study of functions and signals using Fourier series	Nonlinear Analysis: Study of nonlinear equations and their solutions

97 (Advanced Probabilistic Methods)	Probability Theory: Study of random events and their probabilities	Stochastic Processes: Study of processes that evolve randomly over time	Martingales: Study of martingales and their properties	Markov Chains: Study of Markov chains and their properties	Brownian Motion: Study of Brownian motion and its properties
98 (Advanced Theoretical Physics)	Quantum Mechanics: Study of the behavior of particles at the quantum level	General Relativity: Study of gravitation in the context of relativity	String Theory: Theoretical framework in which particles are replaced by one-dimensional strings	Quantum Field Theory: Study of quantum fields	Statistical Mechanics: Study of large systems by statistical methods
99 (Advanced Applied Mathematics)	Applied Mathematics: Application of mathematical methods to other fields	Mathematical Biology: Application of mathematics to biological problems	Mathematical Physics: Application of mathematics to physical problems	Financial Mathematics: Application of mathematics to financial problems	Computational Mathematics: Application of computational methods to mathematical problems
100 (Advanced Interdisciplinary Methods)	Mathematical Neuroscience: Application of mathematics to neuroscience	Mathematical Epidemiology: Application of mathematics to the study of epidemics	Mathematical Ecology: Application of mathematics to ecological problems	Mathematical Economics: Application of mathematics to economic problems	Mathematical Psychology: Application of mathematics to psychological problems