TESSELLATE 2026

Email: tessellate@cmi.ac.in
Chennai Mathematical Institute, H1, SIPCOT IT Park, Siruseri, Kelambakkam, Chennai – 603103

STEMS 2026

Mathematics Syllabus

Section A

- Combinatorics
  - Basic Counting (Rule of Sum, Rule of Product, Combinations, Permutations, Principle of Inclusion-Exclusion)
  - Pigeonhole Principle
  - Induction and Proof by Contradiction
  - Elementary Recurrence Relations and Characteristic Equations
  - Generating Functions and Binomial Theorem
  - Elementary Properties of Graphs
- Algebra
  - Linear Equations, Quadratic Equations
  - Polynomials over Z, Q, R or C.
  - Classical Inequalities (AM-GM, Cauchy-Schwartz, Rearrangement, Schur's Inequality)
  - Exponents, Logarithms and Trigonometric Functions
  - Complex Numbers (De-Moivre, Polar Coordinates, Conjugates, and basic properties)
  - Sequence and Series (Arithmetic Progressions, Geometric Progression, Harmonic Progression etc.)
- Geometry
  - Euclidean Geometry (Triangle Geometry, Cyclic Quadrilaterals, Radical
  - Axis, Geometric Transformations)
  - Coordinate Geometry (Distance Formula, Equations of Straight Lines, Equation of Circles)
  - Trigonometry (Basic properties of trigonometric functions, identities)
- Number Theory
  - Divisibility
  - Modular Congruences (Euler's Theorem, Fermat's Little Theorem, Wilson's Theorem, Chinese Remainder Theorem may be helpful.)
  - Arithmetic Functions (Totient, Divisor, Sum of Divisors, Mobius Function)
  - Diophantine Equations
- Set Theory
  - Basics of Set Theory (Set union, intersection, symmetric difference)
  - Relations
  - Functions
- Probability
  - Basics of Probability (Conditional Probability, Bayes' Theorem, Binomial Trials, Expected Value)

Section B

In addition to the syllabus of section A, the following topics –

- Calculus
  - Limits and Derivatives
  - Continuity and Differentiability
  - Applications of Derivatives
  - Integrals, Applications of Integrals
  - Differential Equations
- Algebra
  - Inverse Trigonometric Functions
  - Vector Algebra
- Geometry
  - Coordinate Geometry (Equations of Conic Sections)
  - Three Dimensional Geometry
- Probability
  - Basics of Linearity of Expectation

Section C

- Advanced knowledge of all concepts mentioned in the high school syllabus.
- Linear Algebra
  - Matrices
  - Linear Transformations
  - Eigenvalues and Eigenvectors
  - Diagonalization
  - Jordan Normal Form
- Calculus, Real Analysis, Basic Complex Analysis
- Abstract Algebra
  - Group Theory (Basics, Cauchy and Sylow Theorems, Cayley's Theorems, Permutations, Isomorphism Theorems)
- Probability Theory
  - Probability Density Function
  - Probability Distribution Function (Bernoulli Distribution, Binomial Distribution, Poisson Distribution, Normal Distribution, Uniform Distribution, etc.)
  - Mean and Variance
  - Joint Probability Distribution