

Syllabus for the Discrete Mathematics Proficiency Examination

Note: The chapters/sections mentioned below are with respect to the text Kenneth H. Rosen, "Discrete Mathematics and its Applications", Seventh Edition, McGraw-Hill, 2012.

1. The Foundations -- Logic and Proofs: Propositional logic and applications, propositional equivalence, predicates and quantifiers, nested quantifiers, rules of inference, introduction to proofs, proof methods and strategy.

Ref: Sections 1.1 through 1.8.

2. Basic Structures: Sets, Functions, Sequences, Sums and Matrices. Sets operations on sets, functions, sequences summation, cardinality of sets, basic operations on matrices.

Ref: Sections 2.1 through 2.6.

3. Induction and Recursion: Mathematical induction, strong induction, recursive definitions and structural induction.

Ref: Sections 5.1, 5.2 and 5.3.

4. Counting: Basics of counting, permutations combinations, binomial coefficients and identities, generalized permutations & combinations and pigeonhole principle & applications.

Ref: Sections 6.1 through 6.5.

5. Advanced counting techniques: Inclusion-exclusion principle and its applications.

Ref: Sections 8.5 and 8.6.

6. Relations: Relations their properties, applications, representing relations, closures of relations, equivalence relations and partial orders.

Ref: Sections 9.1 through 9.6.