Oral Qualifying Exam Syllabus – Andrew Baxter

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MAJOR TOPIC: ENUMERATIVE COMBINATORICS

1. **Basic Enumeration**: counting arguments, generating functions, recurrence relations, inclusion-exclusion, pigeonhole principle, Stirling numbers, Bell numbers, Catalan numbers, Eulerian numbers, Fibonacci numbers

2. **Partition Theory**: Graphical representations, application of generating functions to partition theory, restricted partitions and permutations, application of Gaussian polynomials to partition theory, Identities of the Rogers-Ramanujan type. Standard Young Tableaux.

3. **Lattices and Posets**: Distributive Lattices and Geometric Lattices, Fundamental Theorem of Finite Distributive Lattices (Birkhoff Representation Theorem), Dilworth’s Theorem, Möbius Inversion, Weisner’s Theorem, Binomial Posets.

4. **Hypergeometric identities**: fundamental theorem; Fasenmyer’s algorithm; Zeilberger’s algorithm; Wilf-Zeilberger pairs; companion identity and dual identities

5. **Computer algebra**: Maple programming.

References:


5. Zeilberger, *Three recitations on holonomic systems and hypergeometric series*.

MINOR TOPIC: ALGEBRAIC TOPOLOGY


Reference: Allen Hatcher, *Algebraic Topology*