University at Buffalo
Gifted Math Program
Graduate School of Education

Course I Curriculum

TEXTBOOKS: *GMP I – Operational Systems, Logic, Number Theory, Probability and Statistics*; *Mathematics 1*, Mathematics Department of Phillips Exeter Academy

SETS, SUBSETS, AND OPERATIONS WITH SETS

- SETS AND SUBSETS: equality, membership, singleton sets, the empty set, venn diagrams, subsets, power sets, number of elements of a power set, number of *k*-element subsets of a set with *m* elements (Pascal's formula)
- OPERATIONS WITH SETS: intersection, union, difference, symmetric difference

MAPPINGS

- MAPPINGS: Mappings from A to B, Mappings from A onto B, One-to-one mappings, Permutations on a set, The image of an element under a mapping, Composition of mappings

MATHEMATICS 1 (Phillips Exeter Curriculum)

- COORDINATE GEOMETRY: connecting graphs to tables, equations, and contexts; slope as a rate, intercepts, graphs of lines
- ALGEBRA MECHANICS: operations on fractions, simplifying linear expressions, distributive property, solving linear and rational equations and inequalities, percent
- GEOMETRY: congruence angles, congruent triangle theorems, parallel lines as related to angles

OPERATIONAL SYSTEMS

- MODULAR ARITHMETIC: addition, subtraction, multiplication, division, multi-operational
- APPLICATIONS OF MODULAR ARITHMETIC

INTRODUCTORY LOGIC

- THE FORMAL LANGUAGE: introduction, negation, conjunction, disjunction, sentences and well-formed formulas, truth tables, implication, equivalence

ABSTRACT ALGEBRA

- GROUPS, RINGS, AND FIELDS: inverses, identities, homomorphisms, isomorphisms, products, polynomial rings, permutation groups, higher dimensions

NUMBER THEORY

- MULTIPLES AND DIVISORS OF NATURAL NUMBERS: primes, composites, relatively prime, unique factorization, Euler Phi function (if time allows)
- LEAST COMMON MULTIPLES AND GREATEST COMMON DIVISORS
- NUMBER BASES

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PROBABILITY AND STATISTICS

- PROBABILITY: basic definitions, basic counting techniques, compound probability
- STATISTICS: sampling, 5 number summary, box and whisker plots, mean absolute deviation, dot plot

SURVEYS IN OTHER TOPICS

- GAME THEORY: Nash equilibrium, solvability, games of chance
- GRAPH THEORY: seven bridges of Konigsburg, trees, circuits, five color problem, traveling salesman