University at Buffalo
Gifted Math Program
Graduate School of Education

Course I Curriculum

TEXTBOOKS: *Manifest Microcourses: Linear Functions*; *Manifest Microcourses: Quadratic Functions; Manifest Microcourses: Cubic Functions; Manifest Microcourses: Polynomial Functions; Manifest Microcourses: Trigonometric Functions; Mathematics 1,* Mathematics Department of Phillips Exeter Academy

COMPUTER PROGRAMMING with PYTHON

- TYPES: string, integer, float, bool, file, tuple; slicing and indexing; operators and built in functions by type
- LOOPS: for, while; nested loops; control flow with break, continue; branching
- CONDITIONALS: if, elif, else; logic and comparison operators;
- LIBRARIES: general use of modules and packages; turtle, NLTK, and other examples
- DATA STRUCTURES: lists, tuples

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

FUNCTIONS AND THEIR MEANING

- LINEAR FUNCTIONS: Students learn to read, write, and model with addition and subtraction functions, multiplication and division functions, and linear functions
- POLYNOMIAL FUNCTIONS: Students learn to read, write, and model with quadratic functions, cubic functions, and polynomial functions of any degree.
- THE SINE FUNCTION: Students learn to read, write, and model with simple sine functions and full sine functions.
- SYSTEMS OF FUNCTIONS: Students learn to read, write, and model with systems of functions composed of sine, linear, quadratic, cubic, or polynomial functions of any degree.

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

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OPERATIONAL SYSTEMS

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

ABSTRACT ALGEBRA

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

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