

Course II Curriculum

TEXTBOOKS: *eMathInstruction*, Common Core Algebra I, <https://emathinstruction.com/common-core-algebra-i/>; *Manifest Microcourses: Exponential Functions*; *Manifest Microcourses: Derivatives*; *Manifest Microcourses: Integral Functions*; *Manifest Microcourses: Systems of Functions*; *AoPS Volume 1: the Basics* by Sandor Lehoczky and Richard Rusczyk

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;
- FUNCTIONAL PROGRAMMING: definitions and calls; parameters; scope
- LIBRARIES: general use of modules and packages; turtle, NLTK, and other examples
- DATA STRUCTURES: lists, dictionaries, sets, tuples

COMPUTATIONAL MATHEMATICS

- COMMON MULTIPLES: finding and summing
- FIBONACCI NUMBERS: generating, filtering, and summing
- PRIME FACTORS: finding and filtering
- PALINDROMES: finding and filtering
- DIVISIBILITY: finding divisors of large numbers and finding numbers with certain divisor constraints
- LARGE PRIME FINDING: finding and indexing
- SUM OF SQUARES: finding and comparing
- LARGE NUMBER MANIPULATION: parsing, manipulating, and comparing digits

FUNCTIONS AND THEIR MEANING*

- EXPONENTIAL FUNCTIONS: Students learn to read, write, and model with exponential functions
- DERIVATIVES: Students learn the meaning of a function's derivative in context. They learn to read, write, and model situations with functions when those contexts are described with their derivatives.
- INTEGRAL FUNCTIONS AND THE FUNDAMENTAL THEOREM OF CALCULUS: Students learn to read, write, and model situations with integral functions using the fundamental theorem of calculus as the central conceptual idea.
- SYSTEMS OF FUNCTIONS: Students learn to read, write, and model with systems of functions composed of sine, exponential, linear, quadratic, cubic, or polynomial functions of any degree, or any derivative or integral of any of these function types.

*Time permitting. This is the first year we are teaching this content. Not all topics may be able to be covered. Of the topics that will be covered, they may not be covered in the exact way they are described above.

ALGEBRA I with EMATH INSTRUCTION

- LINEAR EXPRESSIONS, EQUATIONS, AND INEQUALITIES: solving linear equations; linear applications; linear equations with unspecified constants; solving linear inequalities; compound inequalities; interval notation; modeling with inequalities



- FUNCTIONS: function notation; graphs of functions; graph features; graphing calculator use; average rate of change; domain and range
- LINEAR FUNCTIONS AND ARITHMETIC SEQUENCES: proportional relationships; conversions; non-proportional linear relationships; slope-intercept form; modeling; horizontal and vertical lines; absolute value and step functions; graphs of linear inequalities; arithmetic sequences
- SYSTEMS OF LINEAR EQUATIONS AND INEQUALITIES: methods of solving; properties of systems; modeling
- EXPONENTS: simplifying expressions; zero and negative exponents; exponential growth and decay; exponential functions; percent review; exponential models; linear vs exponential; geometric sequences
- POLYNOMIALS: operations on polynomials; factoring polynomials
- QUADRATIC FUNCTIONS: parabolas; transformations of parabolas; completing the square; zeros of quadratic functions; applications
- ROOTS AND IRRATIONAL NUMBERS: square roots; irrational numbers; square root function and transformations; solving quadratics using inverse operations and completing the square; quadratic formula; cube roots
- STATISTICS: graphical displays of data; quartiles and box plots; measures of central tendency; variation; frequency tables; bivariate data analysis; linear regression; other types of regression; quantifying prediction; residuals
- FUNCTIONS AND MODELING: general function transformations; discrete functions; linear and exponential models; step functions; piecewise linear functions; quadratic models; limits on the accuracy of models

THE ART OF PROBLEM SOLVING

- EXPONENTS AND LOGARITHMS: the meaning of exponents, laws of exponents, fractional exponents, solving exponential equations using logarithms
- COMPLEX NUMBERS: the meaning of complex numbers, powers of i , conjugates, rationalizing denominators
- LINEAR EQUATIONS: varied solution methods, applications