

Course IV Curriculum

TEXTBOOKS: *The Art of Problem Solving Volume 2: and Beyond* by Richard Rusczyk and Sandor Lehoczky chapters 1-5, 8-12, 18, 22-25; *eMathInstruction, Common Core Algebra II*, <https://emathinstruction.com/common-core-algebra-i/>

FUNDAMENTAL CONCEPTS OF ALGEBRA

algebraic expressions and real numbers; exponents; radicals and rational exponents; polynomials; factoring polynomials; rational expressions; equations; modeling with equations; linear inequalities and absolute value inequalities

FUNCTIONS AND GRAPHS

graphs and graphing utilities; basics of functions and their graphs; transformations of functions; combinations of functions; composite functions; inverse functions; circles; modeling with functions

LINEAR FUNCTIONS

direct variation; rate of change; forms of a line; linear modeling; inverses; piecewise linear functions; systems of equations

POLYNOMIAL AND RATIONAL FUNCTIONS

complex numbers; quadratic functions; polynomial functions and their graphs; dividing polynomials; remainder; zeros of polynomial functions; rational functions and their graphs; polynomial and rational inequalities; modeling using variation; power functions; modeling with polynomial and rational functions

EXPONENTIAL AND LOGARITHMIC FUNCTIONS

exponential functions; logarithmic functions; properties of logarithms; exponential and logarithmic equations and graphs; exponential growth and decay; modeling with exponential functions

TRIGONOMETRIC FUNCTIONS

angles and radian measure; trigonometric functions; the unit circle; right triangle trigonometry; trigonometric functions of any angle; graphs of sine and cosine functions; graphs of other trigonometric functions; applications of trigonometric functions

STATISTICS

probability review; variability and sampling; population parameters; normal distribution; z-scores; sample means and proportions; difference in sample means; distribution of sample means; distribution of sample proportions; margin of error; linear regression; other types of regression

SEQUENCES AND SERIES

arithmetic and geometric sequences; summation notation; arithmetic series; geometric series;

LIMITS

definitions; continuity; asymptotes; trigonometric limits; *Euler's constant*

POLAR COORDINATES AND COMPLEX NUMBERS

polar coordinates; graphs of polar equations; complex numbers in polar form; Demoivre's theorem; graphs of complex numbers; complex powers and geometry; roots of unity

VECTORS AND MATRICES

vector representations; dot product and cross product; parametric equations; determinants; higher dimension matrices; vector geometry problems

NUMBER THEORY

divisibility; linear and quadratic congruences; sums of divisors; Fermat's thm; phi; Wilson's theorem; Diophantine equations; the Pell equation

GRAPH THEORY

planar graphs; Platonic solids; Euler trails; colorings