9-12 Instructional Schema **(Integrated):** Math Skills per Grade Level

(Schema serves as the Tier 1, high-quality academic support for mathematics)

	Ninth Grade (Integrated Math I) 20 skills to learn in ninth grade	Tenth Grade (Integrated Math II) 22 skills to learn in tenth grade	Eleventh Grade (Integrated Math III) 19 skills to learn in eleventh grade	Twelfth Grade Skills Dependent on Course Choice
Number and Quantity	• Reason Quantitatively & Use Units: Define appropriate quantities for modeling and choose levels of precision.	• Identify, rewrite, and extend properties of exponents to rational exponents • Explain the closure properties of rational and irrational numbers under addition and multiplication.	• Use commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.	• Represent and model with vector quantities • Perform operations on vectors • Perform operations on matrices and use matrices in applications • Model change using calculus concepts: Limits, Derivatives, and Integrals on complex numbers
Algebra	• Interpret parts of linear and exponential expressions (factors, terms, and coefficients) • Represent constraints by equations or inequalities • Create and solve equations/inequalities in one or two variables. • Solve systems of linear equations in two variables exactly and approximately (graphing, substitution, elimination).	• Perform addition, subtraction, and multiplication of polynomials. • Factor polynomials (primarily quadratic trinomials) • Solve quadratic equations (factoring, taking square roots, completing the square, quadratic formula) • Solve system of equations consisting of a linear and a quadratic equation	• Interpret the structure of expressions - Polynomial & rational • Perform arithmetic operations with complex numbers (addition, subtraction, multiplication, and division by non-zero complex numbers) • Understand and apply the Remainder and Factor Theorems to find zeros and factors of polynomials. • Create and solve rational and radical equations in one variable. • Recognize & manipulate the structure of expressions, factor & rewrite expressions to support problem-solving and interpretation. • Represent and solve equations and inequalities graphically (polynomial, rational, radical, absolute value, and exponential)	• Explore and compute advanced algebraic structures • Solve systems of functions (3 or more)
Functions	• Calculate slope & the rate of change • Interpret linear functions and write function notation • Understand function notation, domain, and range, and distinguish between functions and non-functions. • Interpret key features of functions (intercepts, intervals, long-term behavior) • Analyze functions and interpret key features using different representations from tables, graphs, and contexts • Build a function that models a relationship between two quantities: linear and exponential (integer inputs) • Build new functions from existing functions (linear and Exponential) • Construct and compare linear (constant rate of change) and exponential (constant ratio) models • Interpret the parameters of a linear or exponential function in context	• Interpret and analyze transformations of quadratic functions • Identify the effect of transformations on quadratic and other functions (e.g., f(x+k), kf(x). • Build a function to model a relationship between 2 quantities: Quadratic and exponential • Build new functions from existing functions (quadratic and absolute value) • Construct and compare linear, quadratic, and exponential models	• Graph and analyze key features (including asymptotes, intercepts, domain/range) of rational and radical functions. • Build a function to model a relationship between 2 quantities • Build a new function from existing functions - Simple, radical, rational, and exponential functions. • Find inverse functions (including rational and simple radical) and verify the relationship using composition • Construct and compare the properties of linear, quadratic, and exponential models • Understand that logarithms are the inverse of exponentials and use them to solve exponential equations	• Explore transformations of complex functions • Extend the domain of trigonometric functions using the unit circle
Statistics and Probability	• Interpret differences in shape, center, and spread in context • Create a two-way frequency table to summarize categorical data and interpret data for any possible trends • Create a scatter plot to represent numerical data and interpret the data • Interpret the slope and intercept of linear models in context	• Identify events as unions, intersections, and complements • Understand and calculate conditional probability • Use two-way tables to assess independence and calculate conditional probability • Apply the Addition Rule and the Multiplication Rule • Use simulation to evaluate experimental vs. theoretical probability	• Assess the fit of a linear or quadratic function to bivariate data using residuals and interpret the correlation coefficient (r). • Compute and reason about conditional probability, use probability rules, probability models, & tree diagrams • Use probability models to make decisions, compare theoretical and empirical results, and simulate phenomena • Explain statistical inference and confidence intervals	• Interpret large data sets and apply inferential statistical methods • Calculate expected values and use them to solve problems
Geometry	• Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment • Apply transformations of 2D shapes • Use transformations to explain and prove triangle congruence • Make geometric constructions of 2D shapes	• Use geometric transformations to define similarity • Define and use trigonometric ratios (SOH CAH TOA) • Prove and apply theorems about circles, including inscribed angles, central angles, chords, secants, and tangents. • Derive the equation of a circle and derive the equation of a parabola • Use distance, slope, and midpoint to prove theorems on the coordinate plane • Use theorems on parallel lines and angles to prove relationships in triangles (e.g., the line connecting midpoints).	• Derive the equations of ellipses and hyperbolas given foci and directrices, and complete the square to identify conic sections. • Compute distance, slope, collinearity, midpoint of lines, and circles • Apply the laws of sines and cosines to find unknown measurements in right and non-right triangles • Use scaling and Cavalieri's Principle to explain volume formulas for cylinders, pyramids, and cones.	• Apply 3D geometry and advanced trigonometry in real-world contexts • Explain the volume formula and use it to solve problems • Translate between the geometric description and the equation for a conic section

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