School District of Marshfield Course Syllabus

Course Name: Customized Algebra I
Length of Course: 1 Year
Credit: 1

Program Goal:

The School District of Marshfield Mathematics Program will prepare students for college and career in the 21st century by ensuring ***all*** students learn based on skills and knowledge needed to succeed in post-secondary education/training, career, and life. The 4K through High School Mathematics curriculum is designed to support every student in achieving success. Students will be placed in to the driver's seat. Innovative educators will tailor instruction to student need through engaging learning activities and relevant assessment.

Course Description:

Develop the algebraic concepts and skills necessary for further math study in an environment designed to meet the needs of students who benefit from personalized pathways and multiple instructional strategies in the classroom. Students will develop skills in Solving Equations and Inequalities, Linear Equations, Linear Functions, Systems of Linear Equations and Inequalities, Piecewise Functions, Exponents and Exponential Functions, Polynomials and Factoring, Quadratic Functions, Solving Quadratic Functions, and Statistics with the help of tailored instruction, computerized resources, mini-seminars, and a teacher serving the facilitator and coach in a flexible learning environment.

NOTE: A calculator is required for this course. It may be a scientific or graphing calculator.

PREREQUISITE: Grade 8 Math or Pre-Algebra or instructor's consent.

Standards:	
Wisconsin Standards for Mathematical Practices (MP)	
MP: 1, 2, 3, 4, 5, 6, 7, 8	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.
Wisconsin Standards for Mathematics- Number and Quantity	
The Real Number System (N-RN)	
Use properties of rational and irrational numbers. N-RN: 3	3. Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.
Quantities (N-Q)	
Reason quantitatively and use units to solve problems. N-Q: 1, 2, 3	1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. 2. Define appropriate quantities for the purpose of descriptive modeling. 3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
Wisconsin Standards for Mathematics- Algebra	
Seeing Structure in Expressions (A-SSE)	
Interpret the structure of expressions. A-SSE: 1a, 1b, 2	1. Interpret expressions that represent a quantity in terms of its context a. Interpret parts of an expression, such as terms, factors, and coefficients. b. Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret* $P(1+r)^n$ *as the product of P and a factor not depending on P.* 2. Use the structure of an expression to identify ways to rewrite it. *For example, see* $x^4 - y^4$ *as* $(x^2)^2 - (y^2)^2$*, thus recognizing it as a difference of squares that can be factored as* $(x^2 - y^2)(x^2 + y^2)$.
Write expressions in equivalent forms to solve problems. A-SSE: 3a, 3c	3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. a. Factor a quadratic expression to reveal the zeros of the function it defines. c. Use the properties of exponents to transform expressions for exponential functions. *For example, the expression* 1.15^t *can be rewritten as*

	$(1.15^{1/12})12^t \approx 1.012^{12t}$ *to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.*
Arithmetic with Polynomials and Rational Expressions (A-APR)	
Perform arithmetic operations on polynomials. A-APR: 1	1. Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.
Creating Equations (A-CED)	
Create equations that describe numbers or relationships. A-CED: 1, 2, 3, 4	1. Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.* 2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. 3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.* 4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's law V = IR to highlight resistance R.*
Reasoning with Equations and Inequalities (A-REI)	
Understand solving equations as a process of reasoning and explain the reasoning. A-REI: 1	1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
Solve equations and inequalities in one variable. A-REI: 3, 4a, 4b	3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. 4. Solve quadratic equations in one variable. a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x – p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form. b. b. Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives no real solutions.
Solve systems of equations. A-REI: 5, 6	5. Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.

	6. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.
Represent and solve equations and inequalities graphically. A-REI: 10, 11, 12	10. Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). 11. Explain why the *x*-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear. 12. Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.
Wisconsin Standards for Mathematics- Functions	
Interpreting Functions (F-IF)	
Understand the concept of a function and use function notation. F-IF: 1, 2, 3	1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If *f* is a function and *x* is an element of its domain, then $f(x)$ denotes the output of *f* corresponding to the input *x*. The graph of *f* is the graph of the equation $y = f(x)$. 2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. 3. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. *For example, the Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1) for n ≥1.*
Interpret functions that arise in applications in terms of the context. F-IF: 4, 5, 6	4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.* 5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.*

	6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.
Analyze functions using different representations. F-IF: 7a, 8a, 9	7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. a. Graph linear and quadratic functions and show intercepts, maxima, and minima. 8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. 9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.*
Linear, Quadratic and Exponential Models (F-LE)	
Construct and compare linear, quadratic, and exponential models and solve problems. F-LE: 1a, 1b, 1c, 2, 3	1. Distinguish between situations that can be modeled with linear functions. a. Prove that linear functions grow by equal differences over equal intervals. b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. 2. Construct linear functions given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). 3. Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.
Interpret expressions for functions in terms of the situation they model. F-LE: 5	5. Interpret the parameters in a linear function in terms of a context.
Wisconsin Standards for Mathematics- Geometry	
Expressing Geometric Properties with Equations (G-GPE)	
Use coordinates to prove simple geometric theorems algebraically. G-GPE: 5	5. Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).

Wisconsin Standards for Mathematics- Statistics and Probability	
Interpreting Categorical and Quantitative Data (S-ID)	
Summarize, represent, and interpret data on a single count or measurement variable. S-ID: 1, 2, 3	1. Represent data with plots on the real number line (dot plots, histograms, and box plots). 2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. 3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).
Summarize, represent, and interpret data on two categorical and quantitative variables. S-ID: 5, 6a, 6b, 6c	5. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. 6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. *Use given functions or choose a function suggested by the context. Emphasize linear models.* b. Informally assess the fit of a function by plotting and analyzing residuals. c. Fit a linear function for a scatter plot that suggests a linear association.
Interpret linear models. S-ID: 7, 8, 9	7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. 8. Compute (using technology) and interpret the correlation coefficient of a linear fit. 9. Distinguish between correlation and causation.

Key Vocabulary:			
Operations on Real Number	Linear Equations	Quadratic	Intercepts
Rational Numbers	Factors	Factor	Coordinate Plane
Irrational Numbers	Coefficients	Factoring	Table/T-Chart
Real Numbers	Equations	Quadratic Formula	Exponents
Expressions	Linear	Slope	Polynomials
Histogram	Variables	Functions	Parallel/Perpendicular
Scatter Plots	Order of Operations	Inequality	Line of Fit
Interquartile Range	Binomials	Absolute Value	Compound Inequalities
Mean	Trinomials	Ratios and Proportions	Absolute Value Inequality

Median	Properties of Numbers	Rate of Change	Systems of Equations
Mode	Distributive Property	Direct Variation	Substitution
Shape, Center, Spread	Relations	Distance Formula	Elimination
Vertex	Line of Symmetry	Pythagorean Theorem	Midpoint Formula
Radical	Perfect Squares	Difference of Squares	Exponents
Compound Inequality	Element of a Set	Formula	Identity
Literal Equation	Set	Subset	Parallel Lines
Perpendicular Lines	Point-Slope Form	Reciprocal	Slope-Intercept Form
Standard Form of Linear Equation	Y-intercept	Arithmetic Sequence	Causation
Common Difference	Continuous	Correlation Coefficient	Discrete
Domain	Explicit Formula	Extrapolation	Function
Function Notation	Interpolation	Line of Best Fit	Linear Function
Linear Regression	Negative Association	Negative Correlation	No Association
One-to-One	Positive Association	Positive Correlation	Range
Recursive Formula	Relation	Residual	Sequence
Term of a Sequence	Transformation	Translation	Trend Line
Linear Inequality in Two Variables	Solution of an Inequality in 2 Var.	Solution of a System of a Linear Inequality	System of Linear Inequalities
Absolute Value Function	Axis of Symmetry	Piecewise Function	Constant Ratio
Vertex	Asymptote	Compound Interest	Exponential Growth
Decay Factor	Exponential Decay	Exponential Function	Monomial
Geometric Sequence	Growth Factor	Rational Exponent	Parabola
Degree of Monomial	Degree of Polynomial	Difference of Squares	Vertex Form of a Quadratic Function
Perfect Square Trinomial	Polynomial	Standard Form of a Polynomial	Linear Quadratic System
Quadratic Parent Function	Quadratic Regression	Standard Form of a Quadratic Function	Root
Vertical Motion Model	Completing the Square	Discriminant	Cube Root Function
Product Property of Square Roots	Quadratic Equation	Quadratic Formula	Joint Frequencies
Standard Form of a Quadratic Equation	Zero Product Property	Zeros of a Function	Normal Distribution
Inverse of a Function	Square Root Function	Conditional Relative Frequency	Variance
Joint Relative Frequency	Marginal Frequency	Marginal Relative Frequency	Standard Deviation

Topics/Content Outline- Units and Themes:

Quarter 1:

- Solving Equations and Inequalities
- Linear Equations
- Linear Functions

Quarter 2:

- Systems of Linear Equations and Inequalities
- Piecewise Functions
- Exponents and Exponential Functions

Quarter 3:

- Polynomials and Factoring
- Quadratic Functions
- Solving Quadratic Equations

Quarter 4:

- Working with Functions
- Statistics

Primary Resource(s):

Renaissance Learning- Accelerated Math & STAR Math Assessment