Course Name:

Fundamentals of Algebra

Curriculum Proposal Date:

February 26, 2024

Curriculum Developed by:

Kira Kern, Omar Haddad

Course Description:

The course is designed to introduce students to the fundamentals of Algebra. The course will focus on the development of algebraic concepts while integrating the use of technology. This course will further develop students' mathematical skills, enhance their math proficiency, and teach students the skill set necessary for success in Algebra 1. Note: Students will be placed in this course based on teacher recommendation, previous course grades, and standardized test and benchmark scores that are below proficient. (Fulfills STEM requirement for graduation)

Fundamentals of Algebra

ALGEBRA 1 - NUMBER SYSTEM

STAGE 1 | DESIRED RESULTS
Context and relevance for student learning

Standards	Transfer
CC.2.1.HS.F.2 - Apply properties of rational and irrational numbers to solve real world or mathematical problems. CC.2.1.8.E.1 - Distinguish between rational and irrational numbers using their properties. CC.2.1.8.E.4 - Estimate irrational numbers by comparing them to rational numbers. **CC.2.2.HS.F.1 - Apply and extend the properties of exponents to solve problems with rational exponents.** CC.2.2.8.B.1 - Apply concepts of radicals and integer exponents to generate equivalent expressions.	*Students will be able to independently use their learning to keep considering…* ❏ Model and solve real world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations ❏ Use reasoning to solve equations and justify the solution method ❏ Write expressions in equivalent forms to solve problems

	Meaning	
	UNDERSTANDINGS *Students will understand that…* ❏ Mathematical relationships among numbers can be represented, compared, and communicated. ❏ Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations. ❏ Numerical quantities, calculations, and measurements can be estimated or analyzed by using appropriate strategies and tools. ❏ Patterns exhibit relationships that can be extended, described, and generalized.	ESSENTIAL QUESTIONS *Students will keep considering…* ❏ How is mathematics used to quantify, compare, represent, and model numbers? ❏ How can mathematics support effective communication? ❏ How are relationships represented mathematically? ❏ What does it mean to estimate or analyze numerical quantities? ❏ How can expressions, equations and inequalities be used to quantify, solve, model and/or analyze mathematical situations? ❏ What makes a tool and/or strategy appropriate for a given task? ❏ How can patterns be used to describe relationships in mathematical situations?

Acquisition

Fundamentals of Algebra

	Students will know…	Students will be skilled at…
	❑ Rational numbers ❑ Irrational numbers ❑ Radicals	❑ Determine whether a number is rational or irrational. For rational numbers, show that the decimal expansion terminates or repeats (limit repeating decimals to thousandths). ❑ Estimate the value of irrational numbers without a calculator (limit whole number radicand to less than 144). ❑ Use rational approximations of irrational numbers to compare and order irrational numbers. ❑ Locate/identify rational and irrational numbers at their approximate locations on a number line.

ALGEBRA 1 - FUNCTIONS

STAGE 1 | DESIRED RESULTS
Context and relevance for student learning

Standards	Transfer
CC.2.2.HS.D.7 - Create and graph equations or inequalities to describe numbers or relationships. **CC.2.2.HS.D.8 - Apply inverse operations to solve equations or formulas for a given variable.** **CC.2.2.HS.D.9 - Use reasoning to solve equations and justify the solution needed.** **CC.2.2.HS.C.2 - Graph and analyze functions and use their properties to make connections between the different representations.** CC.2.2.8.B.2 - Understand the	*Students will be able to independently use their learning to keep considering…* ❑ Model and solve real world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations ❑ Use reasoning to solve equations and justify the solution method ❑ Write expressions in equivalent forms to solve problems

	Meaning	
	UNDERSTANDINGS *Students will understand that…* ❑ Mathematical relationships among numbers can be represented, compared, and communicated. ❑ Mathematical relationships can be represented as expressions,	ESSENTIAL QUESTIONS *Students will keep considering…* ❑ How is mathematics used to quantify, compare, represent, and model numbers? ❑ How can mathematics support effective communication? ❑ How can expressions, equations and inequalities be used to quantify, solve, model, and/or analyze

Fundamentals of Algebra

connections between proportional relationships, lines, and linear equations.	equations and inequalities in mathematical situations.	mathematical situations?

Acquisition		
CC.2.2.HS.C.1 - Use the concept and notation of functions to interpret and apply them in terms of their context. **CC.2.2.HS.C.2 - Graph and analyze functions and use their properties to make connections between the different representations.** **CC.2.2.HS.C.5 - Construct and compare linear, quadratic, and exponential models to solve problems.** CC.2.2.8.C.1 - Define, evaluate, and compare functions. CC.2.2.8.C.2 - Use concepts of functions to model relationships between quantities.	*Students will know...* ❏ Unit rate ❏ Ordered Pairs ❏ Slope ❏ Rate of Change ❏ Slope-Intercept Form ❏ Y-intercepts ❏ X-Intercepts ❏ Initial Value ❏ Relations ❏ Functions ❏ Vertical Line Test ❏ Inputs ❏ Outputs ❏ Domain ❏ Range	*Students will be skilled at...* ❏ Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. ❏ Use similar right triangles to show and explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane. ❏ Derive the equation y = mx for a line through the origin and the equation y = mx + b for a line intercepting the vertical axis at b. ❏ Determine whether a relation is a function. ❏ Compare properties of two functions, each represented in a different way (i.e., algebraically, graphically, numerically in tables, or by verbal descriptions). ❏ Interpret the equation y = mx + b as defining a linear function whose graph is a straight line; give examples of functions that are not linear. ❏ Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models and in terms of its graph or a table of values.

Fundamentals of Algebra

		❑ Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch or determine a graph that exhibits the qualitative features of a function that has been described verbally.

ALGEBRA 1 - SOLVING EQUATIONS AND INEQUALITIES

STAGE 1 | DESIRED RESULTS
Context and relevance for student learning

Standards	Transfer	
CC.2.2.HS.D.7 - Create and graph equations or inequalities to describe numbers or relationships. **CC.2.2.HS.D.8 - Apply inverse operations to solve equations or formulas for a given variable.** **CC.2.2.HS.D.9 - Use reasoning to solve equations and justify the solution needed.** **CC.2.2.HS.C.2 - Graph and analyze functions and use their properties to make connections between the different representations.** CC.2.2.8.B.2 - Understand the connections between proportional relationships, lines, and linear equations. **HS.2.2.HS.D.10 - Represent, solve, and interpret equations/inequalities and systems**	*Students will be able to independently use their learning to keep considering…* ❑ Model and solve real world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations ❑ Use reasoning to solve equations and justify the solution method ❑ Write expressions in equivalent forms to solve problems	
	Meaning	
	UNDERSTANDINGS *Students will understand that…* ❑ Mathematical relationships among numbers can be represented, compared, and communicated. ❑ Mathematical relationships can be represented as expressions, equations and inequalities in mathematical situations.	ESSENTIAL QUESTIONS *Students will keep considering…* ❑ How is mathematics used to quantify, compare, represent, and model numbers? ❑ How can mathematics support effective communication? ❑ How can expressions, equations and inequalities be used to quantify, solve, model, and/or analyze mathematical situations?
	Acquisition	
	Students will know… ❑ Inverse Operations	*Students will be skilled at…*

| of equations/inequalities algebraically and graphically.
CC.2.2.8.B.3 - Analyze and solve linear equations and pairs of simultaneous linear equations. | ❑ Terms
❑ Expressions
❑ Coefficients
❑ Constants
❑ Addition Property of Equality
❑ Subtraction Property of Equality
❑ Multiplication Property of Equality
❑ Division Property of Equality
❑ Distributive Property
❑ Linear Equations
❑ Linear Inequalities | ❑ Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.
❑ Use similar right triangles to show and explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane.
❑ Derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b.
❑ Solve linear equations that have rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. |

ALGEBRA 1 - PROBABILITY AND STATISTICS

STAGE 1 | DESIRED RESULTS
Context and relevance for student learning

Standards	Transfer
CC.2.4.HS.B.1 - Summarize, represent, and interpret data on a single count or measurement variable. **CC.2.4.HS.B.2 - Summarize, represent, and interpret data on two categorical and quantitative variables.** **CC.2.4.HS.B.3 - Analyze linear models to make interpretations based on the data.**	*Students will be able to independently use their learning to keep considering...* ❑ Model and solve real world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations ❑ Use reasoning to solve equations and justify the solution method ❑ Write expressions in equivalent forms to solve problems

	Meaning	
	UNDERSTANDINGS *Students will understand that...* ❑ Numerical quantities, calculations, and measurements can be	ESSENTIAL QUESTIONS *Students will keep considering...* ❑ In what ways are the mathematical attributes of objects or processes measured, calculated and/or interpreted?

Fundamentals of Algebra

CC.2.4.HS.B.4 - Recognize and evaluate random processes underlying statistical experiments. CC.2.4.HS.B.5 - Make inferences and justify conclusions based on sample surveys, experiments, and observational studies.	❏ estimated or analyzed by using appropriate strategies and tools. ❏ Measurement attributes can be quantified, and estimated using customary and noncustomary units of measure. ❏ Patterns exhibit relationships that can be extended, described, and generalized. ❏ Mathematical relations and functions can be modeled through multiple representations and analyzed to raise and answer questions. ❏ Data can be modeled and used to make inferences.	❏ How precise do measurements and calculations need to be? ❏ How can patterns be used to describe relationships in mathematical situations? ❏ How can recognizing repetition or regularity assist in solving problems more efficiently? ❏ How can data be organized and represented to provide insight into the relationship between quantities? ❏ How does the type of data influence the choice of display? ❏ How can probability and data analysis be used to make predictions?
	Acquisition	
	Students will know... ❏ Measures of Central Tendencies ❏ Scatter Plots ❏ Stem-and-Leaf Plots ❏ Bar Graphs ❏ Circle Graphs ❏ Correlations ❏ Probability ❏ Outcomes ❏ Compound Events	*Students will be skilled at...* ❏ Calculate and/or interpret the range, quartiles, and interquartile range of data. ❏ Estimate or calculate to make predictions based on a circle, line, bar graph, measure of central tendency, or other representation. ❏ Analyze data, make predictions, and/or answer questions based on displayed data (box-and whisker plots, stem-and-leaf plots, scatter plots, measures of central tendency, or other representations). ❏ Make predictions using the equations or graphs of best-fit lines of scatter plots. ❏ Find probabilities for compound events (e.g., find probability of red and blue, find probability of red

Fundamentals of Algebra

		or blue) and represent as a fraction, decimal, or percent.
		❑ Draw, identify, find, and/or write an equation for a line of best fit for a scatter plot.

ALGEBRA 1 - GEOMETRY		
STAGE 1 | DESIRED RESULTS Context and relevance for student learning		
Standards	**Transfer**	
CC.2.3.HS.A.12 - Explain volume formulas and use them to solve problems. CC.2.3.8.A.1 - Apply the concepts of volume of cylinders, cones, and spheres to solve real-world and mathematical problems. **CC.2.3.HS.A.6 - Verify and apply theorems involving similarity as they relate to plane figures** **CC.2.3.HS.A.7 - Apply trigonometric ratios to solve problems involving right triangles.** **CC.2.3.HS.A.11 - Apply coordinate geometry to prove simple geometric theorems algebraically.** CC.2.3.8.A.3 - Understand and apply the Pythagorean Theorem to solve problems.	*Students will be able to independently use their learning to keep considering...* ❑ Model and solve real world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations ❑ Use reasoning to solve equations and justify the solution method ❑ Write expressions in equivalent forms to solve problems	
	Meaning	
	UNDERSTANDINGS *Students will understand that...* ❑ Geometric relationships can be described, analyzed, and classified based on spatial reasoning and/or visualization. ❑ Patterns exhibit relationships that can be extended, described, and generalized. ❑ Geometric relationships can be described, analyzed, and classified based on spatial reasoning and/or visualization.	ESSENTIAL QUESTIONS *Students will keep considering...* ❑ How are spatial relationships, including shape and dimension, used to draw, construct, model, and represent real situations or solve problems? ❑ How can the application of the attributes of geometric shapes support mathematical reasoning and problem solving? ❑ How can patterns be used to describe relationships in mathematical situations? ❑ How can recognizing repetition or regularity assist in solving problems more efficiently? ❑ How are spatial relationships, including shape and dimension, used to draw, construct, model, and represent real situations or solve problems?

Fundamentals of Algebra

	Acquisition	
	Students will know...	*Students will be skilled at...*
	❑ Area ❑ Volume ❑ Circumference ❑ Radius ❑ Polygons ❑ Cones ❑ Cylinders ❑ Spheres ❑ Right Triangles ❑ Legs ❑ Hypotenuse ❑ Pythagorean Theorem	❑ Apply formulas for the volumes of cones, cylinders, and spheres to solve real-world and mathematical problems. ❑ Apply the converse of the Pythagorean theorem to show a triangle is a right triangle. ❑ Apply the Pythagorean theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. ❑ Apply the Pythagorean theorem to find the distance between two points in a coordinate system.