Algebra I

Overview

Algebra I provides a formal development of the algebraic skills and concepts necessary for students to succeed in advanced courses. In particular, the instructional program in this course provides for the use of algebraic skills in a wide range of problem-solving situations. Students will review basic math concepts such as Order of Operations, creating equations from verbal scenarios, and solving general equations for a missing variable. They will also be introduced to linear, quadratic, and exponential equations as well as to the concept of what a function is.

Course Rationale: This course is the foundation for all other math classes and is a pre-requisite for Geometry and Algebra II. It covers material that is tested on the Michigan Merit Exam as well as material for the ACT. The successful completion of this course is a requirement by the State of Michigan as a graduation requirement.

Grades: 8th - 11th grade

Prerequisites: None

Other: 2 Trimesters for complete course. Both trimesters must be completed with a 60% or higher in order to successfully complete the course.

Units of Study

	Unit Title	Length of Study
Algebra 1 A	Unit 1: Intro to Algebra Review	2 to 2.5 weeks
	Unit 2: Solving	3 to 3.5 weeks
	Unit 3: Linear Equations and Relationships	6 – 8 weeks
Algebra I B	Unit 1: Functions and Function Notation	2 - 3 weeks
	Unit 2: Exponent Rules and Exponential Equations	4 weeks
	Unit 3: Quadratic Equations	5 to 6 weeks

Mathematics Core Units

Course Title: Algebra I **Unit Title:** Introduction to Algebra Review **Length of Unit:** 2-2.5 weeks

Grade Level: 8th-11th grades

COMMON CORE STANDARDS COVERED Major topics included in this unit	UNIT BENCHMARKS (I CAN STATEMENTS) What do you want students to know, do, and be like?	Key Vocabulary	SUGGESTED ASSESSMENTS How will you know if benchmarks have been achieved?	POSSIBLE RESOURCES What possible instructional resources could be used?
A.SSE.1 Interpret expressions that represent a quantity in terms of its context. a. Interpret parts of an expression, such as terms, factors, and coefficients. **N.RN.3**: Explain why the sum or product of two rational numbers is rational; and that the product of a nonzero rational and an irrational is irrational. **N.Q.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 origin in graphs and data displays. **A.CED.1**: Create equations and inequalities in one variable and use them to solve. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. **A.REI.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. s.	I Can… … solve problems using PEMDAS …use the distributive property and combining like terms …evaluate expressions …transform verbal scenarios into expressions and equations	Expressions Like terms Order of Operations Inverse operation Sum Product Quotient Difference Equals Expression Equation Distribute	1. Daily Homework 2. Surveys 3. Warm-Up (collected) 4. Exit slips (Post lesson) 5. Quizzes 6. Tests 7. Q & A discussions 8. Writing prompts that have the students explain on how to solve specific problems, how to do a process, or how to apply knowledge to a different problem.	**Technology** • Activities with graphing calculator • Overhead projector for notes **Print Material** • Textbook • Worksheets • ACT Resource book • Notes **Web Resources** http://www.math.com/ http://www.kutasoftware.com/freeia2.html http://www.actstudent.org/sampletest/math/math_01.html

Mathematics Core Units

Course Title: Algebra I **Unit Title:** Solving **Length of Unit:** 3-3.5 weeks

Grade Level: 8th-11th grades

COMMON CORE STANDARDS COVERED Major topics included in this unit	UNIT BENCHMARKS (I CAN STATEMENTS) What do you want students to know, do, and be like?	Key Vocabulary	SUGGESTED ASSESSMENTS How will you know if benchmarks have been achieved?	POSSIBLE RESOURCES What possible instructional resources could be used?
N.Q.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 origin in graphs and data displays. **A.REI.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. **A.CED.4**: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations **A.REI.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 **A.CED.1**: Create equations and inequalities in one variable and use them to solve problems the same solutions.	I Can… …solving 1 step equalities …solving 2 step equalities …solving 3 or more steps …solving with variables on both sides of equal sign …solve problems involving absolute values …solving inequalities …solving absolute value inequalities …solve compound inequalities …graphing inequalities on a number line …solve from verbal scenarios	Inverse Operations All Real No Solution Absolute value Greater than Greater than or equal to Less than Less than or equal to	1. Daily Homework 2. Surveys 3. Warm-Up (collected) 4. Exit slips (Post lesson) 5. Quizzes 6. Tests 7. Q & A discussions 8. Writing prompts that have the students explain on how to solve specific problems, how to do a process, or how to apply knowledge to a different problem.	**Technology** • Activities with graphing calculator • Overhead projector for notes **Print Material** • Textbook • Worksheets • ACT Resource book • Notes **Web Resources** http://www.math.com/ http://www.kutasoftware.com/freeia2.html http://www.actstudent.org/sampletest/math/math_01.html

Mathematics Core Units

Course Title: Algebra I **Unit Title:** Linear Equations and Relationships **Length of Unit:** 6–8 weeks

Grade Level: 8th-11th grades

COMMON CORE STANDARDS COVERED Major topics included in this unit	UNIT BENCHMARKS (I CAN STATEMENTS) What do you want students to know, do, and be like?	Key Vocabulary	SUGGESTED ASSESSMENTS How will you know if benchmarks have been achieved?	POSSIBLE RESOURCES What possible instructional resources could be used?
N.Q.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 origin in graphs and data displays. **A.REI.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. **A.REI.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 **N.Q.2**: Define appropriate Quantities for the purpose of descriptive modeling **N.Q.3**: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. **A.SSE.1a**: Interpret parts of an expression such as terms, factors, and coefficients **A.SSE.3**: Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression **A.CED.2:** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales **A.CED.3:** Represent constraints by equations or inequalities, and by systems or equations and/or equalities, and interpret solutions as viable or nonviable options in a modeling context	I Can… … identifying and calculating the slope of a line in multiple forms (2 points, graphically, and looking at equation). …identifying calculating the x and y-intercepts of a line (graphically and algebraically). …create equations of lines using slope-intercept form, standard form, and introduce them to point-slope form. …graph linear equations …working with vertical and horizontal lines …translate between the linear forms (go from Standard to Slope-intercept etc.) …work with parallel and perpendicular lines …solving linear systems …solve real world problems (work with these throughout the entire unit) …solve linear inequalities (If there is time) …systems of linear inequalities (If there is time)	I Slope Intercept Parallel Perpendicular Opposite reciprocal Undefined Rise and run Standard form Slope intercept form Point slope form Inequality Intersection Union Domain Range	1. Daily Homework 2. Surveys 3. Warm-Up (collected) 4. Exit slips (Post lesson) 5. Quizzes 6. Tests 7. Q & A discussions 8. Writing prompts that have the students explain on how to solve specific problems, how to do a process, or how to apply knowledge to a different problem.	**Technology** • Activities with graphing calculator • Overhead projector for notes **Print Material** • Textbook • Worksheets • ACT Resource book • Notes **Web Resources** http://www.math.com/ http://www.kutasoftware.com/freeia2.html http://www.actstudent.org/sampletest/math/math_01.html

A.CED.1: Create equations and inequalities in one variable and use them to solve problems **A.REI.3**: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. **A.REI.6:** Solve systems of linear equations exactly and approximately **A.REI.10:** Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane **A.REI.11**: Explain why the x-coordinates of the points w9xhere the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x). **A.REI.12:** Graph the solutions to a linear inequality in two variables as half a plane and graph the solution set to a system of linear inequalities in two variables as the intersection of two planes **F.IF.4:** For a function that models a relationship between two quantities, interpret key features of the graph and table in terms of quantities, and sketch graphs using key features **F.IF.5:** Relate the domain and range of a function to its graph, and where applicable, to the quantitative relationship it describes **F.IF.6**: Calculate and interpret the average rate of change of a function over a specified interval. Estimate the rate of change from the graph. **F.LE.5**: Interpret the parameters in a linear or exponential function presented symbolically or as a table **F.IF.7a**: Graph linear and quadratic showing intercepts, max and min **F.IF.8:** Write a function defined by and expression in different but equivalent forms to reveal and explain different properties of the function **F.IF.9**: Compare properties of two functions each represented in a different way **F.BF.1:** Write a function that describes a relationship between two quantities. **F.BF.1a:** Determine an explicit or recursive expression or describe the calculation from the context				

F.BF.1b: Combine standard function types using arithmetic operations **F.BF.4a**: Solve an equation of the form f(x) = c for a simple function **F.LE.1:** Distinguish between situations that can be modeled with linear and exponential models **F.LE.1a:** Prove that linear functions grow by equal differences over equal intervals and that exponential functions grow by equal factors over equal intervals **F.LE.1b:** Recognize situations in which one quantity changes at a constant rate per unit interval relative to one another **F.LE.1c:** Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another **F,LE.2**: Construct a linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or a table of values. **S.ID.6a**: Fit a function to the data, use functions fitted to data to solve problems in the context of the data. **S.ID.7:** Interpret the slope and the intercept of a linear model in the context of the data .				

Mathematics Core Units

Course Title: Algebra I **Unit Title:** Function and Function Notation **Length of Unit:** 2-3 weeks

Grade Level: 8th-11th grades

COMMON CORE STANDARDS COVERED Major topics included in this unit	UNIT BENCHMARKS (I CAN STATEMENTS) What do you want students to know, do, and be like?	Key Vocabulary	SUGGESTED ASSESSMENTS How will you know if benchmarks have been achieved?	POSSIBLE RESOURCES What possible instructional resources could be used?
N.Q.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 origin in graphs and data displays. **A.REI.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. **N.Q.2:** Define appropriate Quantities for the purpose of descriptive modeling **N.Q.3**: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. **A.SSE.1b**: Interpret complicated expressions by viewing one or more of their parts as a single entity **A.CED.2:** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales **A.CED.3:** Represent constraints by equations or inequalities, and by systems or equations and/or equalities, and interpret solutions as viable or nonviable options in a modeling context **A.CED.1:** Create equations and inequalities in one variable and use them to solve problems **F.IF.1:** Understand that a function from one set to another set assigns one element from the	I Can… … identify functions from various forms (graphically, tables, etc.) …work with function notation …working with domain and range of functions (equations and graphically). …understand things that might restrict domain subject matter rational expressions (denominator can't equal zero) even roots cannot equal a negative quantity.	Domain Range Function Vertical line test Asymptote	1. Daily Homework 2. Surveys 3. Warm-Up (collected) 4. Exit slips (Post lesson) 5. Quizzes 6. Tests 7. Q & A discussions 8. Writing prompts that have the students explain on how to solve specific problems, how to do a process, or how to apply knowledge to a different problem	**Technology** • Activities with graphing calculator • Overhead projector for notes **Print Material** • Textbook • Worksheets • ACT Resource book • Notes **Web Resources** http://www.math.com/ http://www.kutasoftware.com/freeia2.html http://www.actstudent.org/sampletest/math/math_01.html

domain to exactly one element in the range **F.IF.2:** Use function notation, evaluate functions for inputs in their domain, and interpret statements that use function notation in terms of context **F.IF.3**: Recognize that sequences are functions, sometimes defined recursively **F.BF.4a:** Solve an equation of the form f(x) = c for a simple function				

Mathematics Core Units

Course Title: Algebra I **Unit Title:** Exponent Rules and Exponential Equations **Length of Unit:** 4 weeks

Grade Level: 8th-11th grades

COMMON CORE STANDARDS COVERED Major topics included in this unit	UNIT BENCHMARKS (I CAN STATEMENTS) What do you want students to know, do, and be like?	Key Vocabulary	SUGGESTED ASSESSMENTS How will you know if benchmarks have been achieved?	POSSIBLE RESOURCES What possible instructional resources could be used?
N.Q.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 origin in graphs and data displays. **A.REI.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. **N.Q.2:** Define appropriate Quantities for the purpose of descriptive modeling **N.Q.3**: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. **N.RN.1**: Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals, in terms of rational exponents **N.RN.2**: Rewrite expressions involving radicals and rational exponents using the properties of exponents **A.SSE.1a:** Interpret parts of an expression such as terms, factors, and coefficients **A.SSE.1b**: Interpret complicated expressions by viewing one or more of their parts as a single entity **A.SSE.3:** Choose and produce an equivalent form of an expression to reveal and explain properties	I Can… …understand and apply the 5 rules of exponents (scientific notation) …solve exponential data and story problems (identifying the common ratio) …create exponential equations from story problems …identify growth or decay situations and sketch graphs …work with growths and decays that occur over nonsingular units of time …solve money problems where interest is compounded more than once a year …identify the annual change from data and equations …use exponential modeling	Ratio Growth Decay Annual Change Horizontal asymptote Reciprocal power	1. Daily Homework 2. Surveys 3. Warm-Up (collected) 4. Exit slips (Post lesson) 5. Quizzes 6. Tests 7. Q & A discussions 8. Writing prompts that have the students explain on how to solve specific problems, how to do a process, or how to apply knowledge to a different problem	**Technology** • Activities with graphing calculator • Overhead projector for notes **Print Material** • Textbook • Worksheets • ACT Resource book • Notes **Web Resources** http://www.math.com/ http://www.kutasoftware.com/freeia2.html http://www.actstudent.org/sampletest/math/math_01.html

of the quantity represented by the expression **A.CED.2**: Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales **A.CED.3:** Represent constraints by equations or inequalities, and by systems or equations and/or equalities, and interpret solutions as viable or nonviable options in a modeling context **A.CED.1:** Create equations and inequalities in one variable and use them to solve problems **A.REI.4a**: Solve quadratic equations using completing the square. Derive the quadratic formula from this method. **A.REI.4b:** Solve quadratic equations by inspection, taking square roots, quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions **A.REI.10:** Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane **A.REI.11:** Explain why the x-coordinates of the points w9xhere the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x). **F.IF.4:** For a function that models a relationship between two quantities, interpret key features of the graph and table in terms of quantities, and sketch graphs using key features **F.IF.5**: Relate the domain and range of a function to its graph, and where applicable, to the quantitative relationship it describes **F.IF.6:** Calculate and interpret the average rate of change of a function over a specified interval. Estimate the rate of change from the graph. **F.LE.5**: Interpret the parameters in a linear or exponential function presented symbolically or as a table **F.IF.7e**: Graph exponential and logarithmic functions showing intercepts and end behavior **F.IF.8b**: Use the properties of exponents to				

interpret expressions for exponential functions **F.IF.9**: Compare properties of two functions each represented in a different way **F.BF.1**: Write a function that describes a relationship between two quantities. F.BF.1a: Determine an explicit or recursive expression or describe the calculation from the context **F.BF.1b:** Combine standard function types using arithmetic operations **F.BF.4a:** Solve an equation of the form f(x) = c for a simple function **F.LE.1**: Distinguish between situations that can be modeled with linear and exponential models **F.LE.1a**: Prove that linear functions grow by equal differences over equal intervals and that exponential functions grow by equal factors over equal intervals **F.LE.1b:** Recognize situations in which one quantity changes at a constant rate per unit interval relative to one another **F.LE.1c**: Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another **F,LE.2:** Construct a linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or a table of values. **S.ID.6a:** Fit a function to the data, use functions fitted to data to solve problems in the context of the data.				

Mathematics Core Units

Course Title: Algebra I **Unit Title:** Quadratic Equations **Length of Unit:** 5-6 weeks

Grade Level: 8th-11th grades

COMMON CORE STANDARDS COVERED Major topics included in this unit	UNIT BENCHMARKS (I CAN STATEMENTS) What do you want students to know, do, and be like?	Key Vocabulary	SUGGESTED ASSESSMENTS How will you know if benchmarks have been achieved?	POSSIBLE RESOURCES What possible instructional resources could be used?
N.Q.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 origin in graphs and data displays. **A.REI.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. **A.REI.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 **A.SSE.1a:** Interpret parts of an expression such as terms, factors, and coefficients **A.SSE.1b**: Interpret complicated expressions by viewing one or more of their parts as a single entity **A.SSE.2:** Use the structure of an expression to identify ways to rewrite it **A.SSE.3a**: Factor a quadratic expression to identify the zeroes **A.SSE.3b**: Complete the square in a quadratic expression to reveal the maximum or minimum value of the function **A.CED.2:** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales	I Can… …work with vertex form (identifying the vertex, range, line of symmetry, calculating the x and y intercept(s), and sketching the graphs). …expand vertex form into standard form (FOIL) …work with standard form (identifying the vertex (complete the square), solving from standard form (using quadratic formula, completing the square, and factoring) …solve physics problem and other applied quadratic scenarios …simplify square roots …use quadratic modeling (using both vertex and standard form. Using the second difference).	Second difference Vertex Max/Min X and y intercepts Line of symmetry Range FOIL Complete the square Quadratic Formula Factoring Velocity Perfect roots Imaginary roots	1. Daily Homework 2. Surveys 3. Warm-Up (collected) 4. Exit slips (Post lesson) 5. Quizzes 6. Tests 7. Q & A discussions 8. Writing prompts that have the students explain on how to solve specific problems, how to do a process, or how to apply knowledge to a different problem	**Technology** • Activities with graphing calculator • Overhead projector for notes **Print Material** • Textbook • Worksheets • ACT Resource book • Notes **Web Resources** http://www.math.com/ http://www.kutasoftware.com/freeia2.html http://www.actstudent.org/sampletest/math/math_01.html

A.CED.3: Represent constraints by equations or inequalities, and by systems or equations and/or equalities, and interpret solutions as viable or nonviable options in a modeling context **A.CED.1:** Create equations and inequalities in one variable and use them to solve problems **A.REI.7**: Solve a simple system consisting a linear and quadratic equation algebraically and graphically **A.REI.10**: Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane **A.REI.11**: Explain why the x-coordinates of the points w9xhere the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x). **F.IF.4:** For a function that models a relationship between two quantities, interpret key features of the graph and table in terms of quantities, and sketch graphs using key features **F.IF.5:** Relate the domain and range of a function to its graph, and where applicable, to the quantitative relationship it describes **F.IF.6**: Calculate and interpret the average rate of change of a function over a specified interval. Estimate the rate of change from the graph. **F.IF.7a:** Graph linear and quadratic showing intercepts, max and min **F.IF.8a**: Use factoring and complete the square to identify a parabola's zeroes and vertex **F.BF.3:** Identify the effect on the graph of replacing f(x) by F(x) + k, kf(x), f(kx), and f(x +k) for specific values of k. **F.IF.9**: Compare properties of two functions each represented in a different way **F.BF.1**: Write a function that describes a relationship between two quantities. **F.BF.1a**: Determine an explicit or recursive expression or describe the calculation from the context				

F.BF.1b: Combine standard function types using arithmetic operations **F.BF.4a**: Solve an equation of the form f(x) = c for a simple function **F.LE.1**: Distinguish between situations that can be modeled with linear and exponential models **F.LE.1a**: Prove that linear functions grow by equal differences over equal intervals and that exponential functions grow by equal factors over equal intervals **F.LE.1b:** Recognize situations in which one quantity changes at a constant rate per unit interval relative to one another **F.LE.1c**: Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another **F,LE.2**: Construct a linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or a table of values. **F.LE.3**: Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or as a polynomial function **S.ID.6a**: Fit a function to the data, use functions fitted to data to solve problems in the context of the data.				