Name of Course: Algebra I

Course Overview:
Students are introduced to nonlinear equations and their graphs. Students formalize their understanding of equivalent algebraic expressions and begin their study of polynomial expressions. Further, they learn that there are some actions that, when applied to the expressions on both sides of an equal sign, will not result in an equation with the same solution set as the original equation. Finally, they encounter problems that induce the full modeling cycle, as it is described in the Common Core Learning Standards for Mathematics. There is variability in data, and this variability often makes learning from data challenging. Students develop a set of tools for understanding and interpreting variability in data and begin to make more informed decisions from data. Students work with data distributions of various shapes, centers, and spreads. Measures of center and measures of spread are developed as ways of describing distributions. The choice of appropriate measures of center and spread is tied to distribution shape. Symmetric data distributions are summarized by the mean and mean absolute deviation, or standard deviation. The median and the interquartile range summarize data distributions that are skewed. Students calculate and interpret measures of center and spread and compare data distributions using numerical measures and visual representations. They expand their understanding of linear relationships by connecting the data distribution to a model and informally assessing the selected model using residuals and residual plots. Students explore positive and negative linear relationships and use the correlation coefficient to describe the strength and direction of linear relationships. Students also analyze bivariate categorical data using two-way frequency tables and relative frequency tables. The possible association between two categorical variables is explored by using data summarized in a table to analyze differences in conditional relative frequencies. This module sets the stage for more extensive work with sampling and inference in later grades. Students extend their study of functions to include function notation and the concepts of domain and range. They explore many examples of functions and their graphs, focusing on the contrast between linear and exponential functions. They interpret functions given graphically, numerically, symbolically, and verbally; translate between representations; and understand the limitations of various representations. Students continue to interpret expressions, create equations, rewrite equations and functions in different but equivalent forms, and graph and interpret functions using polynomial functions—more specifically quadratic functions as well as square root and cube root functions.

Unit of Study	Essential Question(s)	Content/Skill/Concept	Instructional Strategies
Module !: Relationships Between Quantities and Reasoning with Equations and their Graphs	1. How do the operations: addition, subtraction, and multiplication apply to polynomials? 2. What does it mean for two expressions to be equivalent? 3. What is the solution set to an equation/inequality in one/two variables? 4. How can the solution set to an equation/inequality in one/two variables be represented? 5. How can one determine the solution set to a compound statement (system combining equations/inequalities with and/or)?	1. Add, subtract, and multiply polynomials expressions. 2. Determine if expressions are equivalent. 3. Solve equations/inequalities in one/two variables. 4. Represent solution sets in a variety of ways. 5. Solve compound equations/ inequalities (systems) in one/two variables.	1. Direct Instruction will include introduction to new content,, worked examples with explanations and connections between content. 2. Guided practice will provide ample practice questions during class to assess understanding and identify misconceptions. Practice questions are carefully selected to build a climbable "ladder" in which difficulty and content complexity increases at a learnable rate. Questions are designed to encourage logical thinking skills and deductive reasoning. 3. Content is connected to real-world contexts to help students grasp concepts, and see the relevance of their learning. 4. Some content is introduced through exploratory activities which increase engagement and encourage a deep understanding of the concepts. 5.Diagnostic questions are carefully written and used to gauge understanding and inform future instruction. DIagnostic questions are given at critical moments to quickly and efficiently assess student mastery, and learn about student misconceptions. ***<u>Below are more practices that will be incorporated throughout the course</u>*** **Worked-Examples with student self-explanation**. *<u>(Concrete Examples)</u>* Give students a completely worked out solution, ask for reflection *<u>(Elaboration)</u>*, and then students try a
Module 2: Descriptive Statistics	1. What are appropriate measures of center and variability for symmetric vs skewed distributions? 2.How do you compare and contrast distributions? 3.How do you analyze the relationship between numerical and categorical variables?	1. Calculate/estimate/interpret measures of center. 2. Calculate/estimate/interpret measure of variability. 3. Represent 1-variable statistics in a variety of ways (different graphs). 4. Interpret/compare/contrast graphs of 1-variable statistics. 5. Interpret 2-way frequency charts which contain bivariate categorical data. 6. Create scatter plots and calculate/estimate/interpret correlation coefficients.	
Module 3: Linear and Exponential Functions	1. How do arithmetic sequences represent linear functions with an integer domain? 2. How do geometric sequences represent exponential functions with an integer domain? 3. How do functions represent a relationship between two quantities? 4. How does exponential growth compare with	1. Write and solve problems involving arithmetic sequences 2. Write and solve problems involving geometric sequences 3. Understand the definition of a function and the relationship between the domain and range. 4. Write and solve linear equations that represent	

	linear growth over different intervals of the domain? 5. How do graphs represent the relationships modeled by functions? 6. How can functions (exponential, linear, piecewise, and others) model and solve problems encountered in the world?	relationships between two quantities 5. Write and solve exponential equations that represent relationships between two quantities 6. Compare rates of growth for linear and exponential models and determine which is greater over a given interval 7. Graph linear functions over the domain of real numbers 8. Graph exponential functions over the domain of real numbers 9. Perform transformations on the graphs of functions 10. Write exponential, linear, and other function types that model real world relationships 11. Interpret the solutions of functions in context of the problems they represent	similar problem. **Diagnostic Questions -** Multiple choice problem stems are created with common misconceptions as the distractors. Get responses of all students and have a predetermined plan of action. **Retrieval Practice -** regularly *(Distributive Practice)* ask students to recall all they know about a topic. Important to implement before complete forgetting in order to avoid the need to re-teach. (Distributive Practice and Pre-Tests) **Interleaved Practice -** Provide mixed problem types so that students must choose a strategy as well as use a strategy. **Purposeful Practice -** Differentiation is achieved with carefully designed sequence of practice problems. a. First problems should ensure early success. b. Opportunity to build fluency in key procedures c. The practice should feel different from prior practice sets. d. Problem selection should provide opportunities to make connections and think deeply. e. Focus is always on the practice. **Multiple Representations -** Regularly use an infographic for all four ways of "seeing" mathematical ideas; Function, Graph, Table, Words *(Dual Coding)*
Module 4: Polynomial and Quadratic Expressions, Equations, and Functions	1. What are equivalent forms of quadratic / polynomial relations? 2. How can we solve quadratic equations using various methods? 3. What are the properties and basic shape of a quadratic graph? 4. How do quadratic relationships model relationships that occur in the real world?	1. Multiplying quadratic / polynomial expressions 2. Factoring quadratic / polynomial expressions 3. Solve quadratic equations by factoring and using the zero product property 4. Write quadratic equations that represent the relationship between two quantities 5. Graph quadratic equations in factored form 6. Write quadratic equations in vertex form by completing the square 7. Graph quadratic equations in vertex form 8. Derive and use the quadratic formula to solve quadratic equations 9. Graph standard form quadratic equations 10. Translate graphs of functions using basic transformations, reflections, and scaling 11. Solve quadratic equations that model relationships between quantities and interpret the solutions in context	