Name of Course: Pre- Algebra

Course Overview:
Students' knowledge of operations on numbers is expanded to include operations on numbers in integer exponents. Module 1 also builds on students' understanding from previous grades with regard to transforming expressions. In module 2, students learn about translations, reflections, and rotations in the plane and, more importantly, how to use them to precisely define the concept of congruence. Up to this point, congruence has been taken to mean, intuitively, same size and same shape. Because this module begins with a serious study of geometry, this intuitive definition must be replaced by a precise definition. This module is a first step; its goal is to provide the needed intuitive background for the precise definitions that are introduced in this module for the first time. In Module 3, students learn about dilation and similarity and apply that knowledge to a proof of the Pythagorean theorem based on the angle-angle criterion for similar triangles. The module begins with the definition of dilation, properties of dilations, and compositions of dilations. The instruction regarding dilation in Module 3 is structured similarly to the instruction regarding concepts of basic rigid motions in Module 2. One overarching goal of this module is to replace the common idea of "same shape, different sizes" with a definition of similarity that can be applied to geometric shapes that are not. In Module 4, students extend what they already know about unit rates and proportional relationships to linear equations and their graphs. Students understand the connections between proportional relationships, lines, and linear equations in this module. Also, students learn to apply the skills they acquired in Grades 6 and 7 with respect to symbolic notation and properties of equality to transcribe and solve equations in one variable and then in two variables. In Module 5, students learn the concept of a function and why functions are necessary for describing geometric concepts and occurrences in everyday life. The module begins by explaining the important role functions play in making predictions. To this point, student work has relied on assumptions of constant rates; here, students are given data that show that objects do not always travel at a constant speed. Module 6 introduces students to bivariate data. Students are introduced to a function as a rule that assigns exactly one value to each input. Students use their understanding of functions to model the relationships of bivariate data. This module is important in setting a foundation for students' work in Algebra I. Module 7 begins with work related to the Pythagorean theorem and right triangles. In cases where the side length was an integer, students computed the length. When the side length was not an integer, students left the answer in the form of $x^2=c$, where c was not a perfect square number.

Unit of Study	Essential Question(s)	Content/Skill/Concept	Instructional Strategies

Integer Exponents and Scientific Notation	1. How do you carry out algebraic operations containing integer exponents? 2. Can scientific notation be used to describe very large and very small quantities?	1. Apply properties of integer exponents to generate equivalent numerical expressions. 2. Express numbers in the form of a single digit times an integer power of 10 to estimate very large or very small quantities. 3. Use scientific notation and appropriate units in the solving of problems involving very large or very small quantities.	1. Lessons have a "ladder" to scaffold students through increasingly challenging concepts, while connecting to previously learned concepts. 2. Lessons include questions which inspire conversation between students, and higher order thinking. 3. Questions are designed to encourage logical thinking skills and deductive reasoning. 4. Content is connected to real-world contexts to help students grasp concepts, and see the relevance of their learning. 5. Some content is introduced through exploratory activities which increase engagement and encourage a deep understanding of the concepts.
The Concept of Congruence	1.What is the meaning of congruence? 2.How do you solve for a missing side in two or three dimensional triangle?	1.Verify experimentally the properties of rotations, reflections, and translations. 2.Describe congruence in terms of rigid transformations. 3.Explain a proof of the Pythagorean's theorem and its converse. 4.Apply Pythagorean's theorem.	
Similarity	1. How does a dilation affect a 2D figure? 2. What does it mean for 2 figures to be similar? 3. Why is it easier to determine whether triangles are similar than it is to determine when polygons with 4 or more sides are similar?	1. Describe the effect of dilations on 2D figures in general and in the coordinate plane. 2. Understand that 2 figures are similar if a composition of rigid motions and dilations can map one figure onto another. 3. Understand that triangles can more quickly be determined to be similar than polygons with 4 or more sides. 4. Prove and apply the Pythagorean Theorem and its converse.	
Linear Equations	1. How can I create an equation to model a situation? 2. What is the connection between proportional relationships, lines, and linear equations? 3. How can I classify different types of solutions? 4. How do I solve equations with one or two variables?	1. Writing equations using symbols 2. Identify expressions as linear or non-linear 3. Solve linear equations 4. Classify solutions 5. Graph linear equations (including vertical and horizontal lines) 6. Determine the slope of a line. 7. Find the equation of a line given 2 points or a point and the slope.	

		8. Solving systems of linear equations using different methods.	
Examples of Functions from Geometry	1. What is a function. 2. Why are functions necessary for describing certain relationships or occurrences? 3. What is the relationship between the volume of cones, cylinders, and spheres?	1. Students understand the formal definition of a function: each input value has exactly 1 output value. 2. Graph linear functions and interpret the slope and y-intercept. 3. Determine appropriate input and output values for functions which represent real-life scenarios.. 4. Represent volumes of geometric figures using functions.	
Linear Functions	1. How do linear functions represent the relationships between two quantities? 2. How do linear and non-linear functions compare to each other? (similarities and differences) 3. How can data (linear and non-linear) be represented using a scatter plot? 4. What patterns can be observed when data is represented by a scatter plot? 5. How can linear equations be used to approximate data sets? 6. How can data be represented in a two way data table? 7. What patterns can be observed when data is represented by a two way data table?	1. Be able to write and solve linear equations 2. Be able to graph linear equations 3. Understand and define the role of slope and y - intercept in the context of a linear function 4. Be able to find the average rate of change for a linear or non-linear function 5. Be able to determine if a function is linear or non-linear by examining aspects such as rate of change 6. Write linear equations that model the relationship between two quantities 7. Be able to describe a linear relationship 8. Be able to construct a line of best fit for a set of data 9. Be able to interpret the solutions of linear equations in context 10. Be able to represent data using a scatter plot 11. Be able to identify key aspects of data such as outliers, increasing relationship, decreasing relationship 12. Be able to compare relative frequencies for data using a two way table and draw conclusions from the data	
Introduction to Irrational	1.What is the difference between rational and	1.Approximate irrationals with rationals and use	

Numbers Using Geometry	irrational numbers? 2.How do find the distance between two points?	estimates to compare different irrational numbers. 2..Solve simple square and cube root equations. 3.Apply Pythagoreans theorem to solve right triangles. 4.Solve problems involving cones, cylinders and spheres.	