Unit 1: Rational Numbers & Exponents

Real numbers
This topic explores the set of real numbers by investigating the idea that some numbers are not rational. The number line and the coordinate grid are used as models. Areas of squares that are drawn on grid or dot paper form the first set of key images in this topic. Students discover the relationship between a square's side length and area to estimate irrational numbers. Analogously, students study the relationship between a cube's volume and edge length to learn about cube roots.

Laws of exponents and scientific notation
This topic introduces laws of exponents, including principles for multiplying and dividing exponential expressions with common bases. It also uses explorations of number patterns to develop the meanings of positive and negative exponents and zero as an exponent. Students then expand their understanding of exponents to represent numbers in scientific notation and to perform operations with numbers expressed in scientific notation.

Pythagorean Theorem
This topic explores proofs of the Pythagorean Theorem and its converse, using concrete models and algebraic representations. Students then solve real-world problems using the Pythagorean Theorem and its converse. Students also apply the Pythagorean Theorem to calculate distance between two points in the coordinate plane.

Unit 2: Graphs, Slope, and Linear Relationships

Analyzing graphs
This topic is designed to enable students to understand clearly what is happening on a graph and to develop their ability to interpret information from axis labels and axis scales and, depending on the information desired, a graph's direction or graph intersections.

Exploring rate of change in motion problems
Understanding the rate at which one quantity changes with respect to another is key to understanding how the two quantities are related. In this topic, students explore the concept of rate by analyzing motion over time. Students investigate the rate at which distance changes numerically and graphically.

Linear patterns and functions
In this topic, students explore patterns through problems, using multiple representations, such as tables, graphs, models, and algebraic rules, and develop the formal definition of a function. They generate algebraic rules and make predictions based on the situations. Additionally, students connect how a function rule relates to a physical model.

Understand slope and y-intercept
This topic solidifies students' understanding of the concepts of slope and y-intercept. It connects the constant rate of change of a linear function, the slope of the line that is the linear function's graph, and the slope-intercept form for the equation of a line, $y = mx + b$.

Exploring bivariate data
This topic revisits analyzing rate of change to determine whether using a linear model to represent data is appropriate. It also introduces the use of residuals to informally assess the fit of a linear function. Students learn that correlation does not imply causation.

Unit 3: Solving Linear Equations and Systems of Equations

Nonlinear relationships
This topic provides opportunities for students to investigate the relationship between input and output values for linear and nonlinear functions. They also explore the characteristics of linear, quadratic, and exponential functions so they can identify and differentiate between these types of functions.

Solving linear equations
In this topic, students learn how linear equations are related to functions. The topic explores how different representations of a function lead to techniques to solve linear equations, including tables, graphs, concrete models, algebraic operations, and "undoing" (reasoning backwards). Students will also investigate situations in which there are no solutions or infinitely many solutions.

Formulating and solving systems
Systems of linear equations and inequalities, in which two conditions apply to a situation, are introduced in this topic. Students review how to set up a system of linear equations, solve it using graphs and tables, and check the solution for reasonableness.

Other methods for solving systems
Continuing with the exploration of systems of two linear equations, this topic introduces two algebraic methods for solving systems: the substitution method and the linear combination method. Students begin to understand when to use each method, and how to interpret the results each method yields.

Unit 4: Creating, Comparing, and Analyzing Geometric Figures

Transformational geometry and similarity
This topic introduces coordinate geometry as a tool for exploring transformations. Using ordered pairs to describe reflections, translations, and scaling, students become more adept at solving problems in the coordinate plane.

Exploring geometric relationships
This topic explores lines, transversals, and special angles associated with them. Students learn about properties of corresponding angles, alternate interior angles, and consecutive interior angles formed when parallel lines are cut by a transversal. Students also learn how to use angle congruence to establish that two lines are parallel.

Cylinders, cones, and spheres
This topic builds on students' work with surface area of cylinders and prisms to develop formulas for area, lateral area, surface area, and volume of three-dimensional shapes with curved surfaces, including cones and spheres. By connecting models of cylinders, cones, and spheres to the derivation of these formulas, students deepen their understanding of three-dimensional shapes, and the relationships among these shapes.