Grade 8 Math

Major Content	Mathematical Practices
Formulating and reasoning about expressions and equations, including modeling an association in bivariate data with a linear equation, and solving linear equations and systems of linear equations	Make sense of problems and persevere in solving them
	Reason abstractly and quantitatively
Applying the concept of a function and using functions to describe quantitative relationships	Construct viable arguments and critique the reasoning of others
Analyzing two- and three-dimensional space and figures using distance, angle, similarity, and congruence, and understanding and applying the Pythagorean Theorem	Model with mathematics
	Use appropriate tools strategically
Required Fluencies	Attend to precision
Solve Linear Equations (distributive property, rational numbers, and variables on both sides of the equation)	Look for and make use of structure
Major Content	Look for and express regularity in repeated reasoning
Supporting Content	
Additional Content	

Unit 1 Rigid Transformations and Congruence	
Essential Learning	**Standards**
In this unit, students learn to understand and use the terms "reflection," "rotation," "translation," recognizing what determines each type of transformation, e.g., two points determine a translation. They learn to understand and use the terms "transformation" and "rigid transformation." Students identify and describe translations, rotations, and reflections. They learn the definition of "congruent": two figures are said to be congruent if there is a rigid transformation that takes one figure to the other.	8.G Understand congruence and similarity using physical models, transparencies, or geometry software.
	8.G.A.1 Verify experimentally the properties of rotations, reflections, and translations.
	8.G.A.1.A Lines are taken to lines, and line segments to line segments of the same length.
	8.G.A.1.B Angles are taken to angles of the same measure.
	8.G.A.1.C Parallel lines are taken to parallel lines.
	8.G.A.2 Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.
	8.G.A.3 Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.
	8.G.A.5 Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles.

Unit 2 Dilations, Similarity, and Introducing Slope	
Essential Learning	**Standards**
In this unit, students draw images of figures under dilations on and off square grids and the coordinate plane. Students learn that angle measures are preserved under a dilation, but lengths in the image are multiplied by the scale factor. Students use the definition of "similar" and properties of similar figures to justify claims of similarity or non-similarity and to reason about similar figures. Students learn the terms "slope" and "slope triangle," and use the similarity of slope triangles on the same line to understand that any two distinct points on a line determine the same	8.G.A.4 Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.
	8.EE.B.6 Use similar triangles to 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.

slope.	
Unit 3 Linear Relationships	
Essential Learning	**Standards**
In this unit, students learn to understand and use the terms “rate of change,” “linear relationship,” and “vertical intercept.” They deepen their understanding of slope, and they learn to recognize connections among rate of change, slope, and constant of proportionality, and between linear and proportional relationships.	8.EE Understand the connections between proportional relationships, lines, and linear equations.
	8.EE.B.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.
	8.EE.B.6 Use similar triangles to 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.
	8FB4 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.
Unit 4 Linear Equations and Linear Systems	
Essential Learning	**Standards**
In this unit, students write and solve linear equations in one variable. These include equations in which the variable occurs on both sides of the equal sign, and equations with no solutions, exactly one solution, and infinitely many solutions. Students categorize pairs of linear equations graphed on the same axes, noting that there are three categories: no intersection (lines distinct and parallel, no solution), exactly one intersection (lines not parallel, exactly one solution), and same line (infinitely many solutions).	8.EE.C.7 Solve linear equations in one variable.
	8.EE.C.7.A Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form x = a, a = a, or a = b results (where a and b are different numbers).
	8.EE.C.7.B Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.
	8.EE.C.8.A Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.
	8.EE.C.8.B Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection.
	8.EE.C.8.C Solve real-world and mathematical problems leading to two linear equations in two variables. For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.
Unit 5 Functions and Volume	
Essential Learning	**Standards**
In this unit, students are introduced to the concept of a function as a relationship between “inputs” and “outputs” in which each allowable input determines exactly one output. Students learn formulas for volumes of cylinders, cones, and spheres. Students express functional relationships described by these formulas as equations. They use these relationships to reason about how the volume of a figure changes as another of its measurements changes, transforming algebraic expressions to get the information they need.	8.FA Define, evaluate, and compare functions.
	8.F.A.1 Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.
	8.F.A.2 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.
	8.FA .B 2Use functions to model relationships between quantities.
	8.F.B.4 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.
	8.F.B.5 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 a graph that exhibits the qualitative features of a function that has been described verbally. Function notation is not required for Grade 8.
	8.G.C.9 Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.
Unit 6 Exponents and Scientific Notation	
Essential Learning	**Standards**
In this unit,students extend the	8.EE.A.1 Know and apply the properties of integer exponents to generate equivalent numerical expressions.

In this unit, students extend the definition of exponents to include all integers, and in the process codify the properties of exponents. They apply these concepts to the base-ten system, and learn about orders of magnitude and scientific notation in order to represent and compute with very large and very small quantities.	8.EE.A.3 Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other.
	8.EE.A.4 Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.

Unit 7 Pythagorean Theorem and Irrational Numbers	
Essential Learning	**Standards**
In this unit, students work with geometric and symbolic representations of square and cube roots. They understand and use notation such as and for square and cube roots. They understand the terms "rational number" and "irrational number," using long division to express fractions as decimals. Students use the Pythagorean Theorem in two and three dimensions, e.g., to determine lengths of diagonals of rectangles and right rectangular prisms and to estimate distances between points in the coordinate plane.	8.NS.A.1 Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.
	8.NS.A.2 Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions.
	8.EE.A.1 Use square root and cube root symbols to represent solutions to equations of the form x2 = p and x3 = p, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational.
	8.G.B.6 Explain a proof of the Pythagorean Theorem and its converse.
	8.G.B.7 Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.
	8.G.B.8 Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

Unit 8 Associations in Data	
Essential Learning	**Standards**
In this unit, students generate and work with bivariate data sets that has more variability than in previous units. They learn to understand and use the terms "scatter plot" and "association," and describe associations as "positive" or "negative" and "linear" or "non-linear."	8.SP.A.1 Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.
	8.S.P.A.2 Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.
	8.S.P.A.3 Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.
	8.S.P.A.4 Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?

Social and Emotional Standards		**ISTE Standards**	
Self-Awareness and Self-Management	SEL.8.1C.1 Set a goal that you could achieve in a month or two related to an area of interest (eg, a sport, hobby, musical instrument, etc).	**Empowered Learner**	Students leverage technology to take an active role in choosing, achieving and demonstrating competency in their learning goals, informed by the learning sciences.
	SEL.8.1C.2 Establish action steps and timeframes toward achievement of this goal.	**Creative Communicator**	Students communicate clearly and express themselves creatively for a variety of purposes using the platforms, tools, styles, formats and digital media appropriate to their goals.
	SEL.8.1C.3 Identify people who can help you achieve your goal and ask for help.		
	SEL.8.1C.4 Monitor progress on achieving your goal and make adjustments in your plan as needed.	**Computational Thinker**	Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions.
	SEL.8.1C.5 Evaluate your level of goal achievement, identifying factors that contribute or detract from it.		
Social Awareness	SEL.8.2A.1 Analyze why both parties in a conflict feel as they do.	**Knowledge Constructor**	Students critically curate a variety of resources using digital tools to construct knowledge, produce creative artifacts and make meaningful learning experiences for themselves and others.
	SEL.8.2A.2 Recognize actions that hurt others.		

Social-Awareness and Relationship Skills	SEL.8.2A.3 Acknowledge the contributions of others.	**Digital Citizen**	Students recognize the rights, responsibilities and opportunities of living, learning and working in an interconnected digital world, and they act and model in ways that are safe, legal and ethical.
	SEL.8.2A.4 Provide support to others who are experiencing problems.		
	SEL.8.2B.1 Analyze the consequences of ignoring the rights of other people.	**Global Collaborator**	Students use digital tools to broaden their perspectives and enrich their learning by collaborating with others and working effectively in teams locally and globally.
Responsible Decision-Making	SEL.8.3B.1 Recognize the influence of peers on your social success.	**Innovative Designer**	Students use a variety of technologies within a design process to identify and solve problems by creating new, useful or imaginative solutions.