Conceptual Curriculum Map (CCM)

Content Area Math **Course Algebra 1**

Grade Level 8-9

Unit 1 Variable Statistics	**Long-Term Outcomes/Transfer Goals:** ● Analyze and model mathematical relationships in authentic and varied contexts, make informed decisions, and draw conclusions. ● Construct viable arguments, critique the reasoning of others, and communicate ideas precisely using the language of mathematics. ● Share diverse ideas and perspectives, ask questions, and respectfully engage with peers while working towards a common goal. ● Persevere, think strategically/flexibly, and reflect and revise thinking in order to solve complex problems.		
	Standards	**Conceptual Overview**	**Rationale**
Focus & Timeframe … Distribution Shapes How to Use Spreadsheets Manipulating Data Analyzing Data	**Summarize, represent, and interpret data on a single count or measurement variable** HSS-ID.A.1 HSS-ID.A.2 HSS-ID.A.3	In this unit data displays (histograms, dot plots, and box plots) are explored as a way to summarize data with a focus on interpretation and what they reveal about the data in addition to the mechanics of constructing the data displays. Students describe distributions using the appropriate terminology such as “symmetric,” “skewed,” “uniform,” “bimodal,” and “bell-shaped.” They create data displays and calculate summary statistics using technology, then interpret the values in context. They recognize a relationship between the shape of a distribution and the mean and median. Students compare data sets with different measures of variability and interpret data sets with greater MADs or interquartile ranges as having greater variability. They learn that standard deviation is a measure of variability, and they interpret standard deviation in	Students need to be able to analyze and interpret data and information about data in order to be mathematically literate. The need for data analysis skills is increasing to meet workplace and postsecondary education requirements.

		context. Students recognize outliers, investigate their source, make decisions about excluding them from the data set, and understand how the presence of outliers impacts measures of center and measures of variability. They compare measures of center and the standard deviation and the interquartile range for different data sets.	
Unit 2 Linear Equations, Inequalities, and Systems	**Long-Term Outcomes/Transfer Goals:** ● Analyze and model mathematical relationships in authentic and varied contexts, make informed decisions, and draw conclusions. ● Persevere, think strategically/flexibly, and reflect and revise thinking in order to solve complex problems. ● Construct viable arguments, critique the reasoning of others, and communicate ideas precisely using the language of mathematics. ● Share diverse ideas and perspectives, ask questions, and respectfully engage with peers while working towards a common goal.		
	Standards	**Conceptual Overview**	**Rationale**
Focus & Timeframe … Writing and Modeling with Equations Manipulating Equations and Understanding Their Structures Systems of Linear Equations in Two Variables	**Create equations that describe numbers or relationships.** HSA-CED.A.1 HSA-CED.A.2 HSA-CED.A.3 HSA-CED.A.4 **Understand solving equations as a process of reasoning and explain the reasoning.** HSA-REI.A.1 **Solve equations and inequalities in one variable.** HSA-REI.B.3	In this unit, students further develop their capacity to create, manipulate, interpret, and connect different kinds of mathematical representations—algebraic, verbal, tabular, and graphical. Students also use them for modeling. Students learn to think of equations as a way to represent constraints or limitations on quantities. Students understand that when we solve equations, we are looking for values that satisfy the constraints and make the equations true. Students also see that graphs of equations can help us make sense of constraints and identify values that satisfy them. Students identify acceptable moves for solving	Real world situations can be modeled by equations and inequalities. Students need to understand that there is a balanced relationship between the two sides of an equation/inequality. That relationship can be used to solve an equation/inequality in multiple ways. Students need the skills associated with solving equations/inequalities by using inverse operations in order to transfer those skills to models that are not linear.

Linear Inequalities in One Variable Linear Inequalities in Two Variables Systems of Linear Inequalities in Two Variables	**Solve systems of equations.** HSA-REI.C.5 HSA-REI.C.6 **Represent and solve equations and inequalities graphically.** HSA-REI.D.10 HSA-REI.D.12	equations and explain how these moves keep each subsequent equation true and maintain the solutions of the original equation. Students explore how the form and the parts of a linear equation in two variables are related to the features of its graph. Systems of equations or inequalities are used to find solutions that satisfy multiple constraints simultaneously. Students solve systems of equations by elimination, and inequalities by graphing.	
Unit 3 Two-variable Statistics	**Long-Term Outcomes/Transfer Goals:** ● Analyze and model mathematical relationships in authentic and varied contexts, make informed decisions, and draw conclusions. ● Construct viable arguments, critique the reasoning of others, and communicate ideas precisely using the language of mathematics. ● Share diverse ideas and perspectives, ask questions, and respectfully engage with peers while working towards a common goal. ● Persevere, think strategically/flexibly, and reflect and revise thinking in order to solve complex problems.		
	Standards	**Conceptual Overview**	**Rationale**
Focus & Timeframe … Two-way Tables Scatter Plots Correlation Coefficients	**Summarize, represent, and interpret data on two categorical and quantitative variables** HSS-ID.B.5 HSS-ID.B.6 HSS-ID.B.6.a HSS-ID.B.6.b HSS-ID.B.6.c **Interpret linear models** HSS-ID.C.7 HSS-ID.C.8 HSS-ID.C.9	The unit begins with categorical data arranged in two-way tables that students are asked to analyze. Students then examine the relative frequencies of the combinations of those categorical variables. Students find the relative frequencies for combinations relative to the whole data set, as well as row or column relative frequencies to look at subgroups within categories. The row and column relative frequency tables are ultimately used to find evidence to determine if any associations are present in the data. The unit then transitions to bivariate	Students will be able to justify associations between bivariate data and make predictions using these models. It is important for students to realize that real samples of data will not be “perfect” and that data models have limitations. Students need to understand the difference between correlation and causation.

		numerical data, which are visualized using scatter plots and lines of best fit. Students use technology to compute the lines of best fit and observe how well the linear models match the data. Residuals and correlation coefficients are used to quantify the goodness of fit for linear models. The unit closes with an exploration of the difference between correlation and causal relationships, as well as an opportunity to apply this learning to areas of interest, like anthropology and sports.	
Unit 4 Functions	**Long-Term Outcomes/Transfer Goals:** ● Analyze and model mathematical relationships in authentic and varied contexts, make informed decisions, and draw conclusions. ● Construct viable arguments, critique the reasoning of others, and communicate ideas precisely using the language of mathematics. ● Share diverse ideas and perspectives, ask questions, and respectfully engage with peers while working towards a common goal. ● Persevere, think strategically/flexibly, and reflect and revise thinking in order to solve complex problems.		
	Standards	**Conceptual Overview**	**Rationale**
Focus & Timeframe Functions and Their Representations Analyzing and Creating Graphs of Functions A Closer Look at Inputs and Outputs	**Understand the concept of a function and use function notation.** HSF-IF.A.1 HSF-IF.A.2 **Interpret functions that arise in applications in terms of the context.** HSF-IF.B.4 **Build a function that models a relationship between two quantities.**	In this unit, students expand and deepen their understanding of functions. They develop new knowledge and skills for communicating about functions clearly and precisely, investigate different kinds of functions, and hone their ability to interpret functions. Students also use functions to model a wider variety of mathematical and real-world situations. Students learn that function notation is an efficient way to communicate succinctly about functions and devote some focused time to interpret this new notation and use it.	Function notation is used throughout mathematics to communicate precisely about a variety of functions. Students understand that given a situation, not all solutions are represented by the same rule. A piecewise function can be used to represent all possible solutions. Students understand that functions and inverse functions can be used to model a two-way process.

Inverse Functions	HSF-BF.A.1 **Build new functions from existing functions.** HSF-BF.B.4 **Interpret functions that arise in applications in terms of the context.** HSF-IF.B.5 HSF-IF.B.6 **Analyze functions using different representations.** HSF-IF.C.7 HSF-IF.C.7.b **Summarize, represent, and interpret data on two categorical and quantitative variables** HSS-ID.B.6 HSS-ID.B.6.a	Students interpret features of graphs and relate them to features of situations, using terms such as “maximum,” “minimum,” and “intercepts” to describe their observations. From a graph, students can see intervals where the values of a function increase or decrease. They learn to use average rates of change to more precisely describe how quickly these values rise or fall. Students also sketch graphs to depict qualitative behavior of functions. Students think about possible and reasonable input and output values and learn to identify the domain and range of a function based on contextual and graphical information. Two variations of piecewise functions are studied here: step functions and absolute value functions. Students see that, while an equation that defines a function is useful for finding output values, an equation for its inverse is useful for finding its input values.	
Unit 5 Introduction to Exponential Functions	**Long-Term Outcomes/Transfer Goals:** ● Analyze and model mathematical relationships in authentic and varied contexts, make informed decisions, and draw conclusions. ● Construct viable arguments, critique the reasoning of others, and communicate ideas precisely using the language of mathematics. ● Share diverse ideas and perspectives, ask questions, and respectfully engage with peers while working towards a common goal. ● Persevere, think strategically/flexibly, and reflect and revise thinking in order to solve complex problems		
	Standards	**Conceptual Overview**	**Rationale**

Focus & Timeframe … Looking at Growth A New Kind of Relationship Exponential Functions Percent Growth and Decay Comparing Linear and Exponential Functions	**Interpret the structure of expressions.** HSA-SSE.A.1 **Analyze functions using different representations.** HSF-IF.C.7 HSF-IF.C.7.e HSF-IF.C.8 HSF-IF.C.8.b **Construct and compare linear, quadratic, and exponential models and solve problems.** HSF-LE.A.1 HSF-LE.A.1.b HSF-LE.A.1.c HSF-LE.A.2 HSF-LE.A.3 I**nterpret expressions for functions in terms of the situation they model.** HSF-LE.B.5	In this unit, students are introduced to exponential relationships. Students learn that exponential relationships are characterized by a constant quotient over equal intervals, and compare them to linear relationships which are characterized by a constant difference over equal intervals. Students construct equations and use them to model situations and solve problems. Students learn that the output of an increasing exponential function is eventually greater than the output of an increasing linear function for the same input. Students study graphs of exponential functions both in terms of contexts they represent and abstract functions that don't represent a particular context, observing the effect of different values of *a* and *b* on the graph of the function *f* represented by $f(x) = ab^x$. Students learn that the output of an increasing exponential function is eventually greater than the output of an increasing linear function for the same input.	There are many quantities that grow or decay exponentially. Some examples are population, compound interest, charge in a capacitor, and radioactive decay. Students need to broaden their understanding of mathematical models to include functions that are not linear.
Unit 6 Introduction to Quadratic Functions	**Long-Term Outcomes/Transfer Goals:** … ● Analyze and model mathematical relationships in authentic and varied contexts, make informed decisions, and draw conclusions. ● Construct viable arguments, critique the reasoning of others, and communicate ideas precisely using the language of mathematics. ● Share diverse ideas and perspectives, ask questions, and respectfully engage with peers while working towards a common goal. ● Persevere, think strategically/flexibly, and reflect and revise thinking in order to solve complex problems		

	Standards	Conceptual Overview	Rationale
Focus & Timeframe … A Different Kind of Change Quadratic Functions Working with Quadratic Expressions Features of Graphs of Quadratic Functions	**Interpret the structure of expressions.** HSA-SSE.A.1 HSA-SSE.A.2 **Write expressions in equivalent forms to solve problems.** HSA-SSE.B.3 **Interpret functions that arise in applications in terms of the context.** HSF-IF.B.4 HSF-IF.B.5 **Analyze functions using different representations.** HSF-IF.C.7 HSF-IF.C.7.a HSF-IF.C.8 HSF-IF.C.8.a HSF-IF.C.9 **Construct and compare linear, quadratic, and exponential models and solve problems.** HSF-LE.A.2 HSF-LE.A.3	In this unit, students begin by looking at some patterns that grow quadratically. They contrast this growth with linear and exponential growth. Students examine the important example of free-falling objects whose height over time can be modeled with quadratic functions. They use tables, graphs, and equations to describe the movement of these objects. Through this investigation, students also begin to appreciate how the different coefficients in a quadratic function influence the shape of the graph. In addition to projectile motion, students examine other situations represented by quadratic functions including area and revenue. Next, students examine the standard and factored forms of quadratic expressions. They investigate how each form is useful for understanding the graph of the function defined by these equivalent forms. Finally, students investigate the vertex form of a quadratic function and understand how the parameters in the vertex form influence the graph.	Quadratic functions are used to model projectile motion, area and revenue. Furthermore, quadratic models are used to determine how safe products are and the life expectancy of products. Students need to recognize equivalent forms of an expression and utilize algebraic methods to convert between forms. Quadratic functions are the foundation of multiple mathematical areas of study such as polynomials, rational and radical functions and conic sections.