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DEPARTMENT OF EDUCATION
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Core Content Connectors (CCCs)

Alternate Academic Achievement Standards
linked to the 2018 SD State Standards for Mathematics

Mathematics

High School: Algebra 1, Geometry, Algebra 2

Updated March 2023

BACKGROUND on Core Content Connectors (CCCs)

To create tests appropriate for students with significant cognitive disabilities that are also aligned to the State Content Standards, South Dakota collaborated with the Multi-State Alternate Assessment (MSAA) to create a "bridge" of derived standards called the Core Content Connectors (CCCs). The CCCs were developed in English Language Arts (ELA) and Mathematics to provide guidance for state alternate assessment test item development.

OVERVIEW of Core Content Connectors (CCCs)

CCCs are only used for students with the most significant cognitive disabilities. They identify the most salient grade-level, core academic content in ELA and Mathematics found in both the South Dakota State Standards and the Learning Progression Framework (LPF). CCCs illustrate the necessary knowledge and skills to reach the learning targets within the LPF and the South Dakota State Standards, focus on the core content, knowledge, and skills needed at each grade to promote success at the next, and identify priorities in each content area to guide the instruction and alternate assessment of students with significant disabilities.

Core Content Connectors in Mathematics address the following strands at each grade level:

- Data, Analysis, Probability, and Statistics
- Geometry
- Measurement
- Numbers and Operations
- Patterns, Relations, and Functions
- Symbolic Expression

IMPLEMENTATION of Core Content Connectors (CCCs)

Teachers and Individual Education Plan (IEP) teams are encouraged to use the CCCs to guide the development of appropriate academic goals and short-term objectives that allow students the maximum engagement with the general curriculum and non-disabled peers as possible, with appropriate adaptations, simplifications, and modifications to grade-level materials and content.

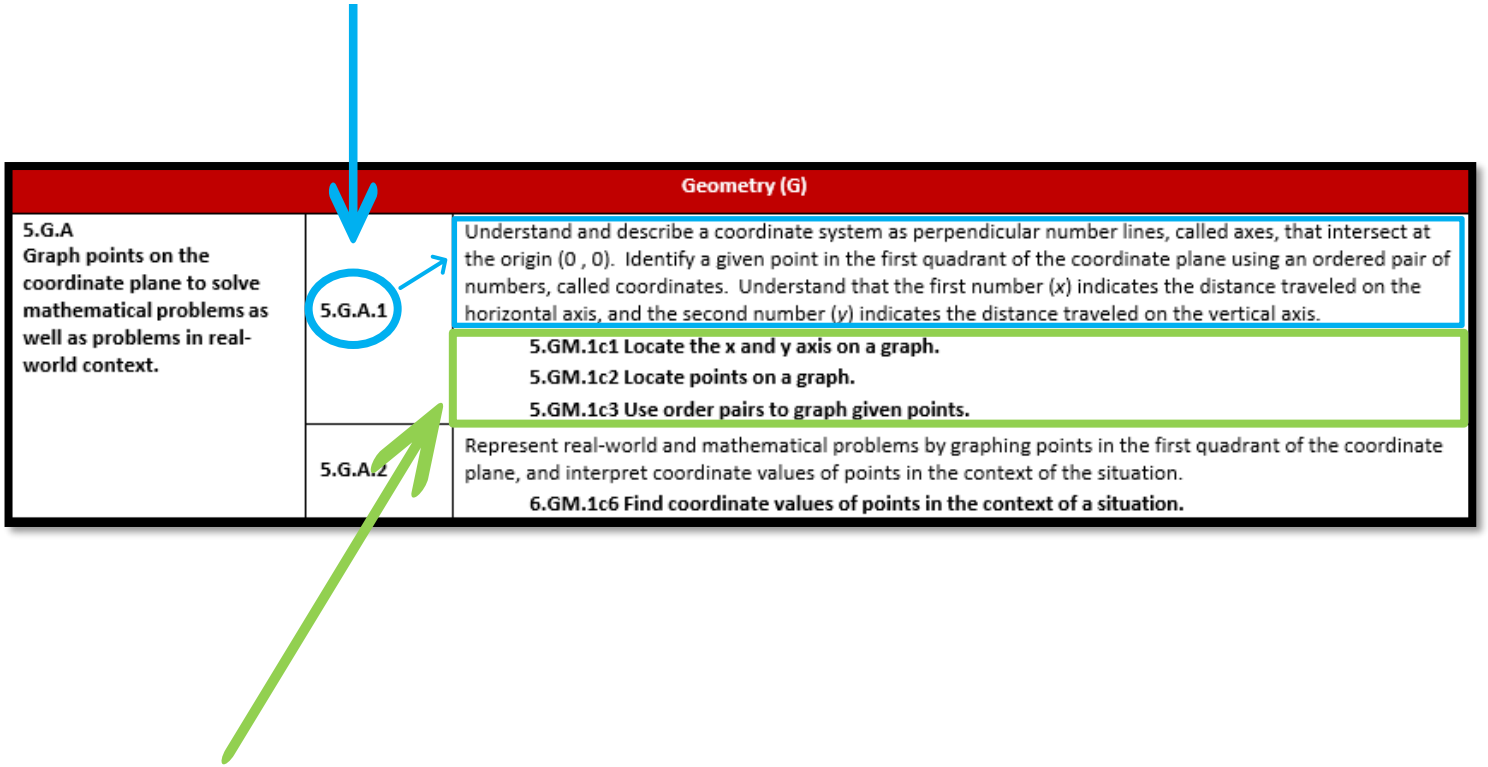
When an IEP team chooses alternate assessment for a student and utilizes CCCs when developing IEP goals and short-term objectives, the IEP team should be aware of the following:

- Participation in the state alternate assessment and the use of CCCs for IEP goals affects the student's potential to obtain a high school diploma.
- CCCs maintain the main goal of each state standard, but CCCs do not fully extend the skills or knowledge. Rather, the CCCs divide the state standards into smaller pieces.
- The state alternate assessment assesses students with significant cognitive disabilities on grade level content that has been reduced in complexity, breadth, and depth. It does not measure the full breadth of the state standards.

CCCs and Guidance Documents for Participation on the Alternate Assessment can be found at: https://doe.sd.gov/assessment/alternate.aspx

How To Identify/Select Core Content Connectors (CCCs)

1. Identify the grade level State Content Standard to guide the student's IEP goal and short-term objectives.



Geometry (G)		
5.G.A **Graph points on the coordinate plane to solve mathematical problems as well as problems in real-world context.**	**5.G.A.1**	Understand and describe a coordinate system as perpendicular number lines, called axes, that intersect at the origin (0 , 0). Identify a given point in the first quadrant of the coordinate plane using an ordered pair of numbers, called coordinates. Understand that the first number (*x*) indicates the distance traveled on the horizontal axis, and the second number (*y*) indicates the distance traveled on the vertical axis. **5.GM.1c1 Locate the x and y axis on a graph.** **5.GM.1c2 Locate points on a graph.** **5.GM.1c3 Use order pairs to graph given points.**
	5.G.A.2	Represent real-world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation. **6.GM.1c6 Find coordinate values of points in the context of a situation.**

2. Select which bolded Core Content Connector(s) to use for the student's IEP goal and short-term objectives.

South Dakota State Standards for Mathematics

The South Dakota State Standards for Mathematics have two components: the Standards for Mathematical Practice and the Standards for Mathematical Content. The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important processes and proficiencies with longstanding importance in mathematics education. The Standards for Mathematical Content are a balanced combination of procedure and understanding. It is important to take advantage of opportunities in the standards and Core Content Connectors to connect the practices to the content.

Standards for Mathematical Practice ***No CCCs developed for Mathematical Practice***
1. Make sense of problems and persevere in solving them. Mathematically proficient students explain to themselves the meaning of a problem, look for entry points to begin work on the problem, and plan and choose a solution pathway. While engaging in productive struggle to solve a problem, they continually ask themselves, “Does this make sense?" to monitor and evaluate their progress and change course if necessary. Once they have a solution, they look back at the problem to determine if the solution is reasonable and accurate. Mathematically proficient students check their solutions to problems using different methods, approaches, or representations. They also compare and understand different representations of problems and different solution pathways, both their own and those of others.
2. Reason abstractly and quantitatively. Mathematically proficient students make sense of quantities and their relationships in problem situations. Students can contextualize and decontextualize problems involving quantitative relationships. They contextualize quantities, operations, and expressions by describing a corresponding situation. They decontextualize a situation by representing it symbolically. As they manipulate the symbols, they can pause as needed to access the meaning of the numbers, the units, and the operations that the symbols represent. Mathematically proficient students know and flexibly use different properties of operations, numbers, and geometric objects and when appropriate they interpret their solution in terms of the context.
3. Construct viable arguments and critique the reasoning of others. Mathematically proficient students construct mathematical arguments (explain the reasoning underlying a strategy, solution, or conjecture) using concrete, pictorial, or symbolic referents. Arguments may also rely on definitions, assumptions, previously established results, properties, or structures. Mathematically proficient students make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and they can recognize and use counterexamples. Mathematically proficient students present their arguments in the form of representations, actions on those representations, and explanations in words (oral or written). Students critique others by affirming or questioning the reasoning of others. They can listen to or read the reasoning of others, decide whether it makes sense, ask questions to clarify or improve the reasoning, and validate or build on it. Mathematically proficient students can communicate their arguments, compare them to others, and reconsider their own arguments in response to the critiques of others.

4. Model with mathematics.

Mathematically proficient students apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. When given a problem in a contextual situation, they identify the mathematical elements of a situation and create a mathematical model that represents those mathematical elements and the relationships among them. Mathematically proficient students use their model to analyze the relationships and draw conclusions. They interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

5. Use appropriate tools strategically.

Mathematically proficient students consider available tools when solving a mathematical problem. They choose tools that are relevant and useful to the problem at hand. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful; recognizing both the insight to be gained and their limitations. Students deepen their understanding of mathematical concepts when using tools to visualize, explore, compare, communicate, make and test predictions, and understand the thinking of others.

6. Attend to precision.

Mathematically proficient students clearly communicate to others using appropriate mathematical terminology, and craft explanations that convey their reasoning. When making mathematical arguments about a solution, strategy, or conjecture, they describe mathematical relationships and connect their words clearly to their representations. Mathematically proficient students understand meanings of symbols used in mathematics, calculate accurately and efficiently, label quantities appropriately, and record their work clearly and concisely.

7. Look for and make use of structure.

Mathematically proficient students use structure and patterns to assist in making connections among mathematical ideas or concepts when making sense of mathematics. Students recognize and apply general mathematical rules to complex situations. They are able to compose and decompose mathematical ideas and notations into familiar relationships. Mathematically proficient students manage their own progress, stepping back for an overview and shifting perspective when needed.

8. Look for and express regularity in repeated reasoning.

Mathematically proficient students look for and describe regularities as they solve multiple related problems. They formulate conjectures about what they notice and communicate observations with precision. While solving problems, students maintain oversight of the process and continually evaluate the reasonableness of their results. This informs and strengthens their understanding of the structure of mathematics which leads to fluency.

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Mathematics

Algebra 1

Algebra 1 Overview

NUMBER AND QUANTITY - N

The Real Number System (N-RN)

- Extend the properties of exponents to rational exponents.
- Use properties of rational and irrational numbers.

Quantities (N-Q)

- Reason quantitatively and use units to solve problems.

ALGEBRA - A

Seeing Structure in Expressions (A-SSE)

- Interpret the structure of expressions.
- Write expressions in equivalent forms to solve problems.

Arithmetic with Polynomials and Rational Expressions (A-APR)

- Perform arithmetic operations on polynomials.

Creating Equations (A-CED)

- Create equations that describe numbers or relationships.

Reasoning with Equations and Inequalities (A-REI)

- Understand solving equations as a process of reasoning and explain the reasoning.
- Solve equations and inequalities in one variable.
- Solve systems of equations.
- Represent and solve equations and inequalities graphically.

FUNCTIONS - F

Interpreting Functions (F-IF)

- Understand the concept of a function and use function notation.
- Interpret functions that arise in applications in terms of context.
- Analyze functions using different representations.

Building Functions (F-BF)

- Build a function that models a relationship between two quantities.
- Build new functions from existing functions.

Linear, Quadratic, and Exponential Models (F-LE)

- Construct and compare linear, quadratic, and exponential models and solve problems.
- Interpret expressions for functions in terms of the situation they model.

STATISTICS AND PROBABILITY - S

Interpreting Categorical and Quantitative Data (S-ID)

- Summarize, represent, and interpret data on a single count or measurement variable.
- Summarize, represent, and interpret data on two categorical and quantitative variables.
- Interpret linear models.

Standards for Mathematical Practices (MP)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

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Algebra 1: Critical Areas

For the high school Algebra I course, instructional time should focus on three critical areas:

1. Deepen and extend understanding of linear and exponential relationships.
2. Engage in methods for analyzing, solving, and using quadratic functions.
3. Apply linear models to data that exhibit a linear trend.

(1) In earlier grades, students have learned to solve linear equations in one variable and have applied graphical and algebraic methods to analyze and solve systems of linear equations in two variables. In Algebra I, students analyze and explain the process of solving an equation and justify the process used in solving a system of equations. Students develop fluency writing, interpreting, and translating among various forms of linear equations and inequalities, and use them to solve problems. They can solve linear equations and apply related techniques along with the laws of exponents to solve simple exponential equations. Students expand their experience with functions to include more specialized functions – absolute value, and those that are piecewise – defined.

(2) In Algebra I, students learn function notation and develop the concepts of domain and range. They focus on linear, quadratic, and exponential functions, including sequences, and also explore absolute value, and piecewise-defined functions; they interpret functions given graphically, numerically, symbolically, and verbally; translate between representations; and understand the limitations of various representations. Students build on and extend their understanding of integer exponents to consider exponential functions. Students compare the key characteristics of quadratic functions to those of linear and exponential functions. Students can identify the real solutions of those functions.

(3) Building upon their prior experiences with data, students explore a more formal means of assessing how a model fits data. Students use regression techniques to describe approximately linear relationships between quantities. They use graphical representations and knowledge of context to make judgments about the appropriateness of linear models. With linear models, they look at residuals to analyze the goodness of fit.

South Dakota Mathematics Standards and Core Content Connectors – Algebra 1		
Number and Quantity - N		
The Real Number System (N-RN)		
A1.N-RN.A **Extend the properties of exponents to rational exponents.**	**A1.N-RN.A.1**	Explain how the definition of rational exponents follows from extending the properties of integer exponents, allowing for a notation for radicals in terms of rational exponents. **No CCC developed for this standard.**
	A1.N-RN.A.2	Rewrite expressions involving radicals and rational exponents using the properties of exponents. **No CCC developed for this standard.**
A1.N-RN.B **Use properties of rational and irrational numbers.**	**A1.N-RN.B.3**	Explain why the sum or product of two rational numbers is rational; the sum of a rational number and an irrational number is irrational; and the product of a nonzero rational number and an irrational number is irrational. **HS.NO.2b1 Explain the pattern for the sum or product for combinations of rational and irrational numbers.**
Quantities (N-Q)		
A1.N-Q.A **Reason quantitatively and use units to solve problems.**	**A1.N-Q.A.1**	Use units to understand and guide the process of solving multi-step problems; choose and interpret units consistently in formulas; and choose and interpret the scale and origin in graphs and data displays. **H.ME.1a1 Determine the necessary unit(s) to use to solve real world problems.** **H.ME.1a2 Solve real world problems involving units of measurement.**
	A1.N-Q.A.2	Define appropriate quantities for the purpose of descriptive modeling. **No CCC developed for this standard.**
	A1.N-Q.A.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. **H.ME.2a1 Describe the accuracy of measurement when reporting quantity (you can lessen your limitations by measuring precisely)**
Algebra - A		
Seeing Structure in Expressions (A-SSE)		
A1.A-SSE.A **Interpret the structure of expressions.**	**A1.A-SSE.A.1**	Interpret expressions that represent a quantity in terms of its context. a. Interpret parts of an expression, such as terms, factors, and coefficients. b. Interpret complicated expressions by viewing one or more of their parts as a single entity in context. **H.PRF.2a1 Translate an algebraic expression into a word problem.**

	A1.A-SSE.A.2	Recognize and use the structure of an expression to identify ways to rewrite it. **H.NO.2c1 Simplify expressions that include exponents.** **H.NO.2c2 Rewrite expressions that include rational exponents.**
A1.A-SSE.B **Write expressions in equivalent forms to solve problems.**	**A1.A-SSE.B.3**	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. a. Factor a quadratic expression to reveal the zeros of the function it defines. b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. c. Use the properties of exponents to write equivalent expressions for exponential functions. **H.NO.3a2 Rewrite mathematical statements (e.g., an expression) in multiple forms.**
Arithmetic with Polynomials and Rational Expressions (A-APR)		
A1.A-APR.A **Perform arithmetic operations on polynomials.**	**A1.A-APR.A.1**	Understand that polynomials form a system closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials. **No CCC developed for this standard.**
Creating Equations (A-CED)		
A1.A-CED.A **Create equations that describe numbers or relationships.**	**A1.A-CED.A.1**	Create equations and inequalities in one variable arising from situations in which linear, quadratic, and exponential functions are appropriate and use them to solve problems. **H.PRF.2b1 Translate a real-world problem into a one variable linear equation.**
	A1.A-CED.A.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. **H.PRF.2b2 Solve equations with one or two variables using equations or graphs**
	A1.A-CED.A.3	Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. **No CCC developed for this standard.**
	A1.A-CED.A.4	Rewrite formulas to highlight a quantity of interest, using the same reasoning as in solving equations. **No CCC developed for this standard.**
Reasoning with Equations and Inequalities (A-REI)		
A1.A-REI.A **Understand solving equations as a process of reasoning and explain the reasoning.**	**A1.A-REI.A.1**	Explain each step in solving an equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. **H.PRF.2b2 Solve equations with one or two variables using equations or graphs**

A1.REI.B **Solve equations and inequalities in one variable.**	**A1.A-REI.B.3**	Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. **H.PRF.2b2 Solve equations with one or two variables using equations or graphs** **H.ME.1b2 Solve a linear equation to find a missing attribute given the area, surface area, or volume and the other attribute.**
	A1.A-REI.B.4	Solve quadratic equations in one variable. a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x – p)^2 = q$ that has the same solutions. b. Derive the quadratic formula from completing the square. c. Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula, and factoring, as appropriate to the initial form of the equation. **No CCC developed for this standard.**
A1.A-REI.C **Solve systems of equations.**	**A1.A-REI.C.5**	Understand the principles of the elimination method. **No CCC developed for this standard.**
	A1.A-REI.C.6	Solve systems of linear equations exactly and approximately by graphing, focusing on pairs of linear equations in two variables. **No CCC developed for this standard.**
	A1.A-REI.C.7	Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. **No CCC developed for this standard.**
A1.A-REI.D **Represent and solve equations and inequalities graphically.**	**A1.A-REI.D.10**	Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). **No CCC developed for this standard.**
	A1.A-REI.D.11	Explain why the x-coordinates of the points where the graphs of the equations $y=f(x)$ and $y=g(x)$ intersect are the solutions of the equation $f(x) =g(x)$; find the solutions approximately, including but not limited to using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, quadratic and exponential. **No CCC developed for this standard.**
	A1.A-REI.D.12	Graph a linear inequality (strict or inclusive) in two variables; graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes. **No CCC developed for this standard.**

Functions - F		
Interpreting Functions (F-IF)		
A1.F-IF.A **Understand the concept of a function and use function notation.**	**A1.F-IF.A.1**	Understand that a function maps each element of the domain to exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x). **No CCC developed for this standard.**
	A1.F-IF.A.2	Use function notation, evaluate functions, and interpret statements that use function notation in terms of a context. **No CCC developed for this standard.**
	A1.F-IF.A.3	Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. **No CCC developed for this standard.**
A1.F-IF.B **Interpret functions that arise in applications in terms of the context.**	**A1.F-IF.B.4**	For functions, including linear, quadratic, and exponential, that model a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing or decreasing, including using interval notation; maximums and minimums; symmetries. **No CCC developed for this standard.**
	A1.F-IF.B.5	Relate the domain of a function to its graph and find an appropriate domain in the context of the problem. **No CCC developed for this standard.**
A1.F-IF.C **Analyze functions using different representations.**	**A1.F-IF.C.7**	Graph parent functions and their transformations expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. a. Graph linear, exponential, and quadratic functions and show intercepts, maxima, and minima. **No CCC developed for this standard.**
	A1.F-IF.C.8	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. a. Use the process of graphing, factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. b. Interpret expressions for exponential growth and decay. **No CCC developed for this standard.**
	A1.F-IF.C.9	Compare properties of two functions (linear, quadratic and exponential) each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). **No CCC developed for this standard.**
Building Functions (F-BF)		
A1.F-BF.A **Build a function that models a**		Write a function (linear, quadratic, and exponential) that describes a relationship between two quantities. a. Determine an explicit expression, a recursive process, or steps for calculation from a context.

relationship between two quantities.	**A1.F-BF.A.1**	b. Determine an explicit expression from a graph. c. Combine standard function types using arithmetic operations. **No CCC developed for this standard.**
A1.F-BF.B **Build new functions from existing functions.**	**A1.F-BF.B.3**	Identify the effect on the graph of f(x) (linear, exponential, quadratic) replaced with f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with contrasting cases and illustrate an explanation of the effects on the graph using technology. **No CCC developed for this standard.**
Linear, Quadratic, and Exponential Models (F-LE)		
A1.F-LE.A **Construct and compare linear and exponential models and solve problems.**	**A1.F-LE.A.1**	Distinguish between situations that can be modeled with linear functions and with exponential functions. a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. b. Recognize situations in which one quantity changes at constant rate per unit interval relative to another. c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another **H.PRF.1c1 Select the appropriate graphical representation of a linear model based on real world events.** **H.PRF.1b1 In a linear situation using graphs or numbers, predicts the change in rate based on a given change in one variable (e.g., If I have been adding sugar at a rate of 1T per cup of water, what happens to my rate if I switch to 2T of sugar for every cup of water?).**
	A1.F-LE.A.2	Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). **No CCC developed for this standard.**
	A1.F-LE.A.3	Recognize, using graphs and tables, that a quantity increasing exponentially eventually exceeds a quantity increasing linearly or quadratically. **No CCC developed for this standard.**
A1.F-LE.B **Interpret expressions for functions in terms of the situation they model.**	**A1.F-LE.B.5**	Interpret the parameters in a linear or exponential function in terms of a context. **No CCC developed for this standard.**
Statistics and Probability - S		
Interpreting Categorical and Quantitative Data (S-ID)		
A1.S-ID.A **Summarize, represent, and interpret data on a single count or measurement**	**A1.S-ID.A.1**	Represent data with plots on the real number line (dot plots, histograms, and box plots). **H.DPS.1b1 Complete a graph given the data, using dot plots, histograms, or box plots.**
	A1.S-ID.A.2	Use statistics appropriate to the shape and context of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

variable		**H.DPS.1c2 Compare means, median, and range of 2 sets of data.**
	A1.S-ID.A.3	Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). **No CCC developed for this standard.**
A1.S-ID.B **Summarize, represent, and interpret data on two categorical and quantitative variables.**	**A1.S-ID.B.5**	Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. **H.DPS.1a1 Design study using categorical and continuous data, including creating a question, identifying a sample, and making a plan for data collection.** **H.DPS.1c1 Use descriptive statistics: range, median, mode, mean, outliers/gaps to describe the data set.**
	A1.S-ID.B.6	Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. a. Determine the function (linear, quadratic, or exponential model) that best fits a set of data and use that function fitted to data to solve problems within context. b. Informally and using technology assess the fit of a function by plotting and analyzing residuals. c. Fit a linear function for a scatter plot that suggests a linear association. **H.DPS.1a1 Design study using categorical and continuous data, including creating a question, identifying a sample, and making a plan for data collection.** **H.DPS.1c1 Use descriptive statistics: range, median, mode, mean, outliers/gaps to describe the data set.**
A1.S-ID.C **Interpret linear models.**	**A1.S-ID.C.7**	Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. **H.PRF.1a1 Interpret the rate of change using graphical representations**.
	A1.S-ID.C.8	Compute (using technology) and interpret the correlation coefficient of a linear fit. **No CCC developed for this standard.**
	A1.S-ID.C.9	Distinguish between correlation and causation. **No CCC developed for this standard.**

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Mathematics

Geometry

Geometry Overview

GEOMETRY - G

Congruence (G-CO)

- Experiment with transformations in the plane.
- Understand congruence in terms of rigid motions.
- Prove geometric theorems.
- Make geometric constructions.

Similarity, Right Triangles, and Trigonometry (G-SRT)

- Understand similarity in terms of similarity transformations.
- Prove theorems involving similarity.
- Define trigonometric ratios and solve problems involving right triangles.
- Apply trigonometry to general triangles.

Circles (G-C)

- Understand and apply theorems about circles.
- Find arc lengths and areas of sectors of circles.

Expressing Geometric Properties with Equations (G-GPE)

- Translate between the geometric description and the equation for a circle.
- Use coordinates to prove geometric theorems algebraically.

Geometric Measurement and Dimension (G-GMD)

- Explain volume and surface area formulas and use them to solve problems.
- Visualize relationships between two-dimensional and three-dimensional objects.

Modeling with Geometry (G-MG)

- Apply geometric concepts in modeling situations.

STATISTICS AND PROBABILITY - S

Conditional Probability and the Rules of Probability (S-CP)

- Understand independence and conditional probability and use them to interpret data.
- Use the rules of probability to compute probabilities of compound events in a uniform probability model.

Standards for Mathematical Practices (MP)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

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Geometry: Critical Areas

For the high school Geometry course, instructional time should focus on five critical areas:

1. Establishing criteria for congruence of geometric figures based on rigid motions.
2. Establishing criteria for similarity of geometric figures based on dilations and proportional reasoning.
3. Develop understanding of informal explanations of circumference, area, and volume formulas.
4. Proving geometric theorems.
5. Solve problems involving right triangles.

(1) Students have prior experience with drawing triangles based on given measurements and performing rigid motions including translations, reflections, and rotations. They have used these to develop notions about what it means for two objects to be congruent. Students establish triangle congruence criteria, based on analyses of rigid motions and formal constructions. They use triangle congruence as a familiar foundation for the development of formal proof. They apply reasoning to complete geometric constructions throughout the course and explain why these constructions work.

(2) Students apply their earlier experience with dilations and proportional reasoning to build a formal understanding of similarity. They identify criteria for similarity of geometric figures, use similarity to solve problems (including utilizing real-world contexts), and apply similarity in right triangles to understand right triangle trigonometry. When studying properties of circles, students develop relationships among segments on chords, secants, and tangents as an application of similarity.

(3) Students' experience with three-dimensional objects is extended to developing informal explanations of circumference, area, and volume formulas. Radians are introduced for the first time as a unit of measure – which prepares students for work done with the Unit Circle in the Algebra II course. Students have opportunities to apply their understanding of volume formulas to real-world modeling contexts. Additionally, students apply their knowledge of two- dimensional shapes to consider the shapes of cross-sections and the result of rotating a two-dimensional object about a line.

(4) Students prove theorems—using a variety of formats including deductive and inductive reasoning and proof by contradiction—and solve problems about triangles, quadrilaterals, circles, and other polygons. Relating back to work in previous courses, students apply the Pythagorean Theorem in the Cartesian coordinate system to prove geometric relationships and slopes of parallel and perpendicular lines. Continuing in the Cartesian coordinate system, students graph circles by manipulating their algebraic equations and apply techniques for solving quadratic equations – all of which relates back to work done in the Algebra I course.

(5) Students define the trigonometric ratios of sine, cosine, and tangent for acute angles using the foundation of right triangle similarity. Students use these trigonometric ratios with the Pythagorean Theorem to find missing measurements in right triangles and solve problems in real-world contexts – which prepares students for work done with trigonometric functions in the Algebra II course.

South Dakota Mathematics Standards and Core Content Connectors – Geometry		
Geometry - G		
Congruence (G-CO)		
G.G-CO.A **Experiment with transformations in the plane.**	**G.G-CO.A.1**	State and apply precise definitions of angle, circle, perpendicular, parallel, ray, line segment, and distance based on the undefined notions of point, line, and plane. **No CCC developed for this standard.**
	G.G-CO.A.2	Represent transformations in the plane. (e.g., using transparencies and/or geometry software); a. Describe transformations as functions that take points in the plane as inputs and give other points as outputs. b. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus dilation). **No CCC developed for this standard.**
	G.G-CO.A.3	Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and/or reflections that map the figure onto itself. **H.GM.1c1 Construct, draw or recognize a figure after its rotation, reflection, or translation.**
	G.G-CO.A.4	Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments. **No CCC developed for this standard.**
	G.G-CO.A.5	Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure, (e.g., using graph paper, tracing paper, or geometry software). Specify a sequence of transformations that will map a given figure onto another. **H.GM.1c1 Construct, draw or recognize a figure after its rotation, reflection, or translation.**
G.G-CO.B **Understand congruence in terms of rigid motions.**	**G.G-CO.B.6**	Use geometric descriptions of rigid motions to transform figures. a. Predict the effect of a given rigid motion on a given figure. b. Given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent. **No CCC developed for this standard.**
	G.G-CO.B.7	Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent. **H.GM.1b1 Use definitions to demonstrate congruency and similarity in figures.**
	G.G-CO.B.8	Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions. **No CCC developed for this standard.**

G.G-CO.C **Prove geometric theorems.**	**G.G-CO.C.9**	Prove theorems about lines and angles. Theorems must include but not limited to: vertical angles are congruent; when a transversal intersects parallel lines, alternate interior angles are congruent and same side interior angles are supplementary (using corresponding angles postulate); points on a perpendicular bisector of a line segment are equidistant from the segment's endpoints. **No CCC developed for this standard.**
	G.G-CO.C.10	Prove theorems about triangles. Theorems must include but not limited to: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the mid segment of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point. **No CCC developed for this standard.**
	G.G-CO.C.11	Prove theorems about parallelograms. Theorems must include but not limited to: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals. **No CCC developed for this standard.**
G.G-CO.D **Make geometric constructions.**	**G.G-CO.D.12**	Perform geometric constructions with a compass and straightedge. including copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines/segments, constructing a line parallel to a given line through a point not on the line. **H.GM.1e1 Make formal geometric constructions with a variety of tools and methods.**
	G.G-CO.D.13	Construct an equilateral triangle, a square, and a regular hexagon. **No CCC developed for this standard.**
Similarity, Right Triangles, and Trigonometry (G-SRT)		
G.G-SRT.A **Understand similarity in terms of similarity transformations.**	**G.G-SRT.A.1**	Verify experimentally and apply the properties of dilations as determined by a center and a scale factor. **H.ME.2b1 Determine the dimensions of a figure after dilation**
	G.G-SRT.A.2	Determine whether figures are similar, using the definition of similarity and using similarity transformations. **H.ME.2b2 Determine if two figures are similar.** **H.ME.2b3 Describe or select why two figures are or are not similar.** **H.GM.1b1 Use definitions to demonstrate congruency and similarity in figures.** **H.GM.1d1 Use the reflections, rotations, or translations in the coordinate plane to solve problems with right angles.**
	G.G-SRT.A.3	Use the properties of similarity transformations to establish similarity theorems. Theorems must include AA, SAS, and SSS. **No CCC developed for this standard.**
G.G-SRT.B **Prove theorems involving similarity.**	**G.G-SRT.B.4**	Prove theorems about triangles involving similarity. Theorems must include but not limited to: a line parallel to one side of a triangle divides the other two proportionally, and its converse; the Pythagorean Theorem proved using triangle similarity. **No CCC developed for this standard.**

	G.G-SRT.B.5	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. **No CCC developed for this standard.**
G.G-SRT.C **Define trigonometric ratios and solve problems involving right triangles.**	**G.G-SRT.C.6**	Define, using similarity, that side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios (sine, cosine, and tangent) for acute angles. **No CCC developed for this standard.**
	G.G-SRT.C.7	Explain and use the relationship between the sine and cosine of complementary angles. **No CCC developed for this standard.**
	G.G-SRT.C.8	Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. **No CCC developed for this standard.**
Circles (G-C)		
G.G-C.A **Understand and apply theorems about circles.**	**G.G-C.A.1**	Prove that all circles are similar. **No CCC developed for this standard.**
	G.G-C.A.2	Identify and describe relationships among central angles, inscribed angles, circumscribed angles, radii, and chords. **No CCC developed for this standard.**
	G.G-C.A.3	Construct, using a compass and straight edge, the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle. **No CCC developed for this standard.**
	G.G-C.A.4	Construct a tangent line from a point outside a given circle to the circle. **No CCC developed for this standard.**
G.G-C.B **Find arc lengths and areas of sectors of circles.**	**G.G-C.B.5**	Derive using similarity the length of the arc intercepted by an angle is proportional to the radius. a. Define the radian measure of the angle as the constant of proportionality; b. Derive and apply the formula for the area of a sector. **H.ME.2b4 Apply the formula to the area of a sector (e.g., area of a slice of pie).**
Expressing Geometric Properties with Equations (G-GPE)		
G.G-GPE.A **Translate between the geometric description and the equation for a circle.**	**G.G-GPE.A.1**	Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation. **No CCC developed for this standard.**
G.G-GPE.B **Use coordinates to prove geometric theorems algebraically.**	**G.G-GPE.B.4**	Use coordinates to prove geometric relationships algebraically. For example, determine whether a figure defined by four given points in the coordinate plane is a rectangle; determine whether the point (1, √3) lies on the circle centered at the origin and containing the point (0, 2). **No CCC developed for this standard.**

	G.G-GPE.B.5	Define and use the slope criteria for parallel and perpendicular lines. (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point). **No CCC developed for this standard.**
	G.G-GPE.B.6	Find the point on a directed line segment between two given points that partitions the segment in a given ratio. e.g. Determine the point(s) that divide the segment with endpoints of (-4, 7) and (6, 3) into the ratio 2:3. **No CCC developed for this standard.**
	G.G-GPE.B.7	Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula. **No CCC developed for this standard.**
Geometric Measurement and Dimension (G-GMD)		
G.G-GMD.A **Explain volume and surface area formulas and use them to solve problems.**	**G.G-GMD.A.1**	Give an informal argument for the formulas for the volume of a cylinder, pyramid, sphere, and cone. Use dissection arguments, and informal limit arguments. **No CCC developed for this standard.**
	G.G-GMD.A.2	Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures. **No CCC developed for this standard.**
	G.G-GMD.A.3	Know and apply volume and surface area formulas for cylinders, pyramids, cones, and spheres for composite figures to solve problems. **No CCC developed for this standard.**
G.G-GMD.B **Visualize relationships between two-dimensional and three-dimensional objects.**	**G.G-GMD.B.4**	Identify two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects. **No CCC developed for this standard.**
Modeling with Geometry (G-MG)		
G.G-MG.A **Apply geometric concepts in modeling situations.**	**G.G-MG.A.1**	Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). **H.ME.1b1 Describe the relationship between the attributes of a figure and the changes in the area or volume when 1 attribute is changed.**
	G.G-MG.A.2	Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). **No CCC developed for this standard.**

	G.G-MG.A.3	Apply geometric concepts to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). **H.ME.2b5 Apply the formula of geometric figures to solve design problems (e.g., designing an object or structure to satisfy physical restraints or minimize cost).**
Statistics and Probability - S		
Conditional Probability and the Rules of Probability (S-CP)		
G.S-CP.A **Understand independence and conditional probability and use them to interpret data.**	**G.S-CP.A.1**	Describe events as subsets of a sample space or as unions, intersections, or complements of other events. **No CCC developed for this standard.**
	G.S-CP.A.2	Determine whether two events A and B are independent. **No CCC developed for this standard.**
	G.S-CP.A.3	Determine conditional probabilities and interpret independence by analyzing conditional probability. **No CCC developed for this standard.**
	G.S-CP.A.4	Construct and interpret two-way frequency tables of data. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results. **No CCC developed for this standard.**
	G.S-CP.A.5	Recognize and explain the concepts of conditional probability and independence in everyday language and situations. For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer. **No CCC developed for this standard.**
G.S-CP.B **Use the rules of probability to compute probabilities of compound events in a uniform probability model.**	**G.S-CP.B.6**	Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the result. **No CCC developed for this standard.**
	G.S-CP.B.7	Apply the Addition Rule, P(A or B), and interpret the result. **No CCC developed for this standard.**
	G.S-CP.B.8	Apply the general Multiplication Rule, P(A and B), and interpret the result. **No CCC developed for this standard.**

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DEPARTMENT OF EDUCATION
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Core Content Connectors (CCCs)

Alternate Academic Achievement Standards
linked to the 2018 SD State Standards for Mathematics

Mathematics

Algebra 2

Algebra 2 Overview

NUMBER AND QUANTITY -N

The Complex Number System (N-CN)

- Perform arithmetic operations with complex numbers.
- Use complex numbers in polynomial identities and equations.

ALGEBRA - A

Seeing Structure in Expressions (A-SSE)

- Interpret the structure of expressions.

Arithmetic with Polynomials and Rational Expressions (A-APR)

- Understand the relationship between zeros and factors of polynomials.
- Rewrite rational expressions.

Creating Equations (A-CED)

- Create equations that describe numbers or relationships.

Reasoning with Equations and Inequalities (A-REI)

- Understand solving equations as a process of reasoning and explain the reasoning.
- Solve equations and inequalities in one variable.
- Represent and solve equations and inequalities graphically.

FUNCTIONS - F

Interpreting Functions (F-IF)

- Interpret functions that arise in applications in terms of context.
- Analyze functions using different representations.

Building Functions (F-BF)

- Build a function that models a relationship between two quantities.
- Build new functions from existing functions.

Linear, Quadratic, and Exponential Models (F-LE)

- Construct and compare linear, quadratic, and exponential models and solve problems.

Trigonometric Functions (F-TF)

- Extend the domain of trigonometric functions using the unit circle.
- Model periodic phenomena with trigonometric functions.
- Prove and apply trigonometric identities.

STATISTICS AND PROBABILITY - S

Interpreting Categorical and Quantitative Data (S-ID)

- Summarize, represent, and interpret data on a single count or measurement variable.

Making Inferences and Justifying Conclusions (S-IC)

- Understand and evaluate random processes underlying statistical experiments.
- Make inferences and justify conclusions from experiments, and observational studies.

Standards for Mathematical Practices (MP)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Algebra 2: Critical Areas

For the high school Algebra 2 course, instructional time should focus on four critical areas:

1. **Extending the real number system to the complex number system, representing radicals with rational exponents.**
2. **Solving and interpreting solutions to a variety of equations, inequalities, and systems of equations.**
3. **Demonstrate competency graphing and interpreting functions extending from linear, quadratic, and exponential with integer exponents to polynomial, radical, rational, exponential with real exponents, logarithmic, trigonometric functions, and piece-wise defined functions.**
4. **Extend simple and compound probability calculations to conditional probability.**

(1) Algebra 2 students extend their knowledge of the real number system by working with complex solutions and factors of polynomials. Students expand their experience with polynomial functions, finding complex zeros and interpreting solutions. Students extend properties of exponents to using rational exponents when factoring, solving, and evaluating.

(2) Connections are made between multiplication of polynomials with multiplication of multi-digit integers and division of polynomials with long division of integers. Students identify zeros of polynomials, including complex zeros of quadratic polynomials, and make connections between zeros of polynomials and solutions of polynomial equations. The Fundamental Theorem of Algebra is examined. Students extend their understanding of solving linear equations, inequalities, and systems to include all the different function types mentioned in the standards.

(3) Students synthesize and generalize what they have learned about a variety of function families. They extend their work with exponential functions to include solving exponential equations with logarithms. They explore the effects of transformations on graphs of diverse functions, including functions arising in an application, in order to abstract the general principle that transformations on a graph always have the same effect regardless of the type of the underlying function. They identify appropriate types of functions to model a situation, they adjust parameters to improve the model, and they compare models by analyzing appropriateness of fit and making judgments about the domain over which a model is a good fit. Building on their previous work with functions and on knowledge of trigonometric ratios and circles, students now use the coordinate plane to extend trigonometry to model periodic phenomena. Students examine data on two quantitative variables to choose functions and make conclusions in context of the data.

(4) Algebra 2 students build on their foundational probability skills from middle school extending to conditional probability. Students determine independence of events and are able to apply conditional probability to everyday situations.

Core Content Connectors (CCCs): CCCs are only used for students with the most significant cognitive disabilities. They identify the most salient grade-level, core academic content in ELA and Mathematics found in both the South Dakota State Standards and the Learning Progression Framework (LPF). CCCs illustrate the necessary knowledge and skills to reach the learning targets within the LPF and the South Dakota State Standards, focus on the core content, knowledge, and skills needed at each grade to promote success at the next, and identify priorities in each content area to guide the instruction and alternate assessment of students with significant disabilities.

South Dakota Mathematics Standards and Core Content Connectors – Algebra 2		
Number and Quantity - N		
The Complex Number System (N-CN)		
A2.N-CN.A **Perform arithmetic operations with complex numbers.**	**A2.N-CN.A.1**	Know there is a complex number i such that $i^2 = -1$, and every complex number has the form a + bi where a and b are real numbers. **No CCC developed for this standard.**
	A2.N-CN.A.2	Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers. **No CCC developed for this standard.**
A2.N-CN.C **Use complex numbers in polynomial identities and equations**	**A2.N-CN.C.7**	Solve quadratic equations with real coefficients that have complex solutions. **No CCC developed for this standard.**
Algebra - A		
Seeing Structure in Expressions (A-SSE)		
A2.A-SSE.A **Interpret the structure of expressions.**	**A2.A-SSE.A.1**	Interpret expressions that represent a quantity in terms of its context. a. Interpret parts of an expression, such as terms, factors, and coefficients. b. Interpret complicated expressions by viewing one or more of their parts as a single entity in context. **H.NO.2c1 Simplify expressions that include exponents.** **H.NO.2c2 Rewrite expressions that include rational exponents.**
	A2.A-SSE.A.2	Recognize and use the structure of an expression to identify ways to rewrite it. **H.NO.1a1 Simplify expressions that include exponents.**
Arithmetic with Polynomials and Rational Expressions (A-APR)		
A2.A-APR.B **Understand the relationship between zeros and factors of polynomials.**	**A2.A-APR.B.2**	Know and apply the Remainder Theorem. **No CCC developed for this standard.**
	A2.A-APR.B.3	Identify zeros of polynomials by factoring. a. When suitable factorizations are available, use the zeros to construct a rough graph of the related function. b. When given a graph, use the zeros to construct a possible factorization of a polynomial. **No CCC developed for this standard.**

A2.A-APR.D **Rewrite rational expressions.**	**A2.A-APR.D.6**	Rewrite simple rational expressions in different forms; using inspection, synthetic division, long division, box method or, for the more complicated examples, a computer algebra system. **No CCC developed for this standard.**
Creating Equations (A-CED)		
A2.A-CED.A **Create equations that describe numbers or relationships.**	**A2.A-CED.A.1**	Create equations and inequalities in one variable and use them to solve problems. **H.PRF.2b1 Translate a real-world problem into a one variable linear equation.**
	A2.A-CED.A.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. **No CCC developed for this standard.**
	A2.A-CED.A.3	Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. **No CCC developed for this standard.**
	A2.A-CED.A.4	Rewrite formulas to highlight a quantity of interest, using the same reasoning as in solving equations. **No CCC developed for this standard.**
Reasoning with Equations and Inequalities (A-REI)		
A2.A-REI.A **Understand solving equations as a process of reasoning and explain the reasoning.**	**A2.A-REI.A.2**	Solve rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. Rational functions are limited to those whose numerators are of degree at most 1 and denominators of degree at most 2. Radical functions are limited to square roots or cube roots of at most quadratic polynomials. **H.NO.2a1 Solve simple equations using rational numbers with one or more variable.**
A2.A-REI.B **Solve equations and inequalities in one variable.**	**A2.A-REI.B.4**	Select, justify, and apply appropriate methods to solve quadratic equations in one variable. Recognize complex solutions and write them as a +/- bi for real numbers a and b. **H.PRF.2b2 Solve equations with one or two variables using equations or graphs.**
A2.A-REI.D **Represent and solve equations and inequalities graphically.**	**A2.A-REI.D.11**	Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, including but not limited to using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions. **No CCC developed for this standard.**

Functions - F		
Interpreting Functions (F-IF)		
A2.F-IF.B **Interpret functions that arise in applications in terms of the context.**	**A2.F-IF.B.4**	For functions that model a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries (including even, odd, or neither); end behavior; and periodicity**.** **No CCC developed for this standard.**
	A2.F-IF.B.5	Relate the domain of a function to its graph and find an appropriate domain in the context of the problem. **No CCC developed for this standard.**
	A2.F-IF.B.6	Calculate and interpret the average rate of change of a function, both symbolically and from a table over a specified interval. Estimate the rate of change from a graph. **No CCC developed for this standard.**
A2.F-IF.C **Analyze functions using different representations.**	**A2.F-IF.C.7**	Graph parent functions and their transformations expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available and showing end behavior. e. Graph logarithmic functions, showing intercepts and end behavior. f. Graph trigonometric functions (sine and cosine), showing period, midline, and amplitude. **No CCC developed for this standard.**
	A2.F-IF.C.9	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). **No CCC developed for this standard.**

Building Functions (F-BF)		
A2.F-BF.A **Build a function that models a relationship between two quantities.**	**A2.F-BF.A.1**	Write a function that describes a relationship between two quantities. a. Determine an explicit expression, a recursive process, or steps for calculation from a context. b. Determine an explicit expression from a graph. c. Combine standard function types using arithmetic operations. d. Compose functions. **No CCC developed for this standard.**
A2.F-BF.B **Build new functions from existing functions.**	**A2.F-BF.B.3**	Identify the effect on the graph of f(x) replaced with f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with contrasting cases and illustrate an explanation of the effects on the graph using technology. **No CCC developed for this standard.**
	A2.F-BF.B.4	Find inverse functions. a. Solve an equation for the independent variable of a function f that has an inverse function and write an expression for the inverse. b. Verify by composition that one function is the inverse of another. c. Read values of an inverse function from a graph or a table, given that the function has an inverse. **No CCC developed for this standard.**
	A2.F-BF.B.5	Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents. **No CCC developed for this standard.**
Linear, Quadratic, and Exponential Models (F-LE)		
A2.F-LE.A **Construct and compare linear and exponential models and solve problems.**	**A2.F-LE.A.4**	For exponential models, express as a logarithm the solution to ab(ct) = d where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology. **No CCC developed for this standard.**
Trigonometric Functions (F-TF)		
A2.F-TF.A **Extend the domain of trigonometric functions using the unit circle.**	**A2.F-TF.A.1**	Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. **No CCC developed for this standard.**
	A2.F-TF.A.2	Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions (sine and cosine) to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle. **No CCC developed for this standard.**

A2.F-TF.B **Model periodic phenomena with trigonometric functions.**	**A2.F-TF.B.5**	Choose trigonometric functions (sine and cosine) to model periodic phenomena with specified amplitude, frequency, and midline. **No CCC developed for this standard.**
A2.F-TF.C **Apply trigonometric identities.**	**A2.F-TF.C.8**	Prove the Pythagorean identity $\sin^2(A) + \cos^2(A) = 1$ and use it to calculate trigonometric ratios. **No CCC developed for this standard.**
Statistics and Probability - S		
Interpreting Categorical and Quantitative Data (S-ID)		
A2.S-ID.A **Summarize, represent, and interpret data on a single count or measurement variable.**	**A2.S-ID.A.4**	Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. **H.DPS.1c1 Use descriptive stats; range, median, mode, mean, outliers/gaps to describe the data set.**
Making Inferences and Justifying Conclusions (S-IC)		
A2.S-IC.A **Understand and evaluate random processes underlying statistical experiments.**	**A2.S-IC.A.1**	Understand statistics as a process for making inferences about population parameters based on a random sample from that population. **H.DPS.1c3 Determine what inferences can be made from statistics**
	A2.S-IC.A.2	Determine whether a specified model is consistent with results from a given data-generating process. **No CCC developed for this standard.**
A2.S-IC.B **Make inferences and justify conclusions from sample surveys, experiments, and observational studies.**	**A2.S-IC.B.3**	Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each. **No CCC developed for this standard.**
	A2.S-IC.B.4	Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling. **No CCC developed for this standard.**
	A2.S-IC.B.5	Use data from a randomized experiment to compare two treatment groups; use simulations to decide if differences between parameters are significant. **No CCC developed for this standard.**
	A2.S-IC.B.6	Evaluate reports based on data. **No CCC developed for this standard.**