Unpacked South Dakota State Mathematics Standards

Purpose: *In order for students to have the best chance of success, standards, assessment, curriculum resources, and instruction must be aligned in focus, coherence, and rigor. Unpacked standards documents are intended to help align instruction to the focus, coherence, and rigor of the South Dakota State Mathematics Standards. The standards have been organized in clusters as they are not so much built from topics, but rather woven out of progressions. Not all content in a given grade is emphasized equally in the mathematics standards. Some clusters require greater emphasis than others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. To say that some things have greater emphasis is not to say that anything in the standards can safely be neglected in instruction. Neglecting standards will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade.*

Domain: Algebra	Grade Level: Algebra 2

A2.A.CED.A Cluster: Create Equations that Describe Numbers or Relationships

Learners model with equations and inequalities. That includes describing numeric patterns, representing the relationship between two variables, and interpreting solutions as reasonable or not in the context from which they arose.

**This is a MAJOR cluster. *Students should spend the large majority of their time (65-85%) on the major work of the grade. Supporting work and, where appropriate, additional work should be connected to and engage students in the major work of the grade.*

A2.A.CED.A.1 Create equations and inequalities in one variable and use them to solve problems. *(Uses Modeling)*
A2.A.CED.A.2 (ii) Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. *(Uses Modeling)*
A2.A.CED.A.3 (ii) 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. *(Uses Modeling)*
A2.A.CED.A.4 (ii) Rewrite formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *(Uses Modeling)*

Aspects of Rigor for Students: (Conceptual, Procedural, and/or Application)

A2.A.CED.A.1 Create equations and inequalities in one variable and use them to solve problems. **(Uses Modeling)**

Conceptual Understanding	*Procedural Fluency*	*Application*
Learners will create non-linear equations and inequalities representative of the information given.	Learners will solve equations and inequalities for one unknown variable.	Learners will create and solve non-linear equations and inequalities to model real life situations.

A2.A.CED.A.2 (ii) Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. **(Uses Modeling)**

Conceptual Understanding	*Procedural Fluency*	*Application*
Learners are able to identify patterns and types of relationships amongst data represented in a multitude of ways (i.e. tables, graphs, etc.) and use those patterns to write non-linear equations.	Learners will graph non-linear equations and identify types of relationships from bivariate data (i.e. tables).	Learners will use real-life data to create equations that model that data. Example: regression

A2.A.CED.A.3 (ii) 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. **(Uses Modeling)**

Conceptual Understanding	*Procedural Fluency*	*Application*
Learners understand what makes sense for a solution in a given context. For example, considering domain and range constraints and discrete vs. continuous values.	Learners will solve systems (by graphing and algebraically) and check solutions to determine their viability.	Learners are able to graph, solve, and explain the solution(s) of systems of equations and inequalities and their constraints involving real world situations. See example below in **Relevance, Explanations, and Examples**

A2.A.CED.A.4 (ii) Rewrite formulas to highlight a quantity of interest, using the same reasoning as in solving equations. **(Uses Modeling)**

Conceptual Understanding	*Procedural Fluency*	*Application*
	Learners can use mathematical operations and properties to rewrite formulas to highlight a quantity of interest.	Learners can rewrite a formula that models a real-life situation for the purpose of solving for a specific unknown quantity.

Enacting the Mathematical Practices - Evidence of Students Engaging in the Practices

1. **Make sense of problems and persevere in solving them.**
   - Students determine when solutions make sense (given constraints and context).
2. **Reason abstractly and quantitatively.**
   - Students create equations and inequalities.
3. **Construct viable arguments and critique the reasoning of others.**
   - Students can explain their reason as to why a solution is viable or not (emphasis on continuous and discrete answers).
4. **Model with mathematics.**
   - Students use equations and inequalities to model different situations.
5. **Use appropriate tools strategically.**
6. **Attend to precision.**
   - Students need to use signs and symbols accurately/appropriately (ie - equal sign vs. inequality).
   - Students need to label and appropriately use labels and scales on a graph.
7. **Look for and make use of structure.**
8. **Look for and express regularity in repeated reasoning.**

Vertical and Horizontal Coherence and Learning Progressions

Previous Learning Connections	*Current Learning Connections*	*Future Learning Connections*
In Algebra 1, students write linear, exponential, and quadratic equations, linear systems, and linear inequalities. Students also learn about constraints (in terms of domain) and viable solutions.	*Students extend their knowledge of systems and inequalities to include nonlinear. Students also learn about range.*	*The complexity of the equations and inequalities increases in subsequent math courses.*

Vocabulary (key terms and definitions)

- Constraints
- Continuous

- Discrete
- Domain
- Range
- Systems of Equations

Relevance, Explanations, and Examples:

Example:

A box has a volume of 20 cubic inches. To create this box, squares were cut from the corners of a piece of cardboard that was 6 inches by 10 inches. Make an equation to find the lengths of the sides for the box.

$$X(10-2x)(6-2x)=20$$
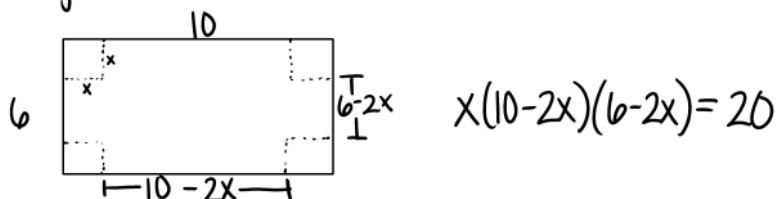
* sides lengths cannot be greater than or equal to 3 inches because 1 side of cardboard is ONLY 6 inches (all 6 inches taken by squares — won't form a box)

* X values cannot be less than or equal to zero (talking about lengths)

* with the constraint $0 < X < 3$ there is only 1 solution for X that would work.

Achievement Level Descriptors

Cluster: Create Equations that Describe Numbers or Relationships

Concepts and Procedures	**Level 1:** Students should be able to create and use one-step linear equations in one variable to model a familiar situation and to solve a familiar problem.
	Level 2: Students should be able to create and use quadratic equations, linear equations, and linear inequalities in one and two variables to model a familiar situation and to solve a familiar problem. They should be able to graph a linear or a quadratic equation in two variables and be able to rearrange a familiar formula or an unfamiliar linear formula in one or two variables for a particular given quantity.
	Level 3: Students should be able to create and use linear, quadratic, and rational equations and inequalities and exponential equations with an integer base and a polynomial exponent in multiple variables to model an unfamiliar situation and to solve an unfamiliar problem. They should be able to graph an equation in two variables and be able to rearrange a linear, a quadratic, an absolute, a rational, or a cubic multi-variable formula for a particular given quantity

	Level 4: Students should be able to rearrange polynomial, logarithmic, exponential, or trigonometric formulas with one or more variables to highlight a quantity of interest and be able to analyze in context to determine which quantity is of interest.