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: Quantities		**Grade Level: Algebra 1**
A1.N.Q.A Cluster: Reason quantitatively and use units to solve problems. Students choose units and a level of accuracy that fits the context of a situation.		
****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.* **A1.N.Q.1.** Use unit analysis 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. **A1.N.Q.2.** Define appropriate quantities for the purpose of descriptive modeling. **A1.N.Q.3.** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.		
Aspects of Rigor for Students: (Conceptual, Procedural, and/or Application)		
A1.N.Q.1. Use unit analysis 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.		
Conceptual Understanding	***Procedural Fluency***	***Application***
Understand the process of unit analysis.	Solve contextual and multi-step problems using units as a guide. Convert measurements in both standard and metric units. Determine the correct units in a multi-step problem. Create a graph with appropriate scales and labels.	Solve real world problems involving units and use those units to determine the validity of the answers.
A1.N.Q.2. Define appropriate quantities for the purpose of descriptive modeling.		
Conceptual Understanding	***Procedural Fluency***	***Application***
Understand and analyze the context of a problem to determine the appropriate units.		Using real world data, select or create appropriate quantities based on relevant units. Example: Kasey wants to measure how busy his coffee shop is at lunch time on weekdays versus weekends.

		Which units could he use to model this?

A1.N.Q.3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Conceptual Understanding	***Procedural Fluency***	***Application***
Understand when to find an exact answer or an estimate based on the context of the problem. Understand the appropriate levels of measurement precision when using digital and concrete tools. (ex: calculators, rulers, protractors)		Choose the appropriate level of accuracy used to report values with real world problems. Example: Determine when it's appropriate to give nearest hour versus nearest minute.

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

1. **Make sense of problems and persevere in solving them.**
   - Analyze problems to identify unit analysis as an appropriate strategy and find a solution.
2. **Reason abstractly and quantitatively.**
   - Decide the appropriate units and level of precision based on the meaning of the quantities.
3. **Construct viable arguments and critique the reasoning of others.**
4. **Model with mathematics.**
   - Construct accurate graphs based on the problem given (use appropriate axis labels and scales).
5. **Use appropriate tools strategically.**
   - Use unit analysis as a means to solve problems.
   - Use appropriate tools to calculate, measure, and display information based on the context of the problem.
6. **Attend to precision.**
   - Write solutions using appropriate units and rounding techniques based on the context of the problem.
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 elementary, learners 1. rounded. In middle school, learners 1. found unit rates, 2. labeled x- and y-axes with appropriate scales and units.	In Algebra 1, learners 1. are exposed to different application problems using linear, quadratic, and exponential models.	In future math courses, learners: 1. will continue to use and expand upon the use of units to make sense of problems and use the context of a problem to create and label graphs using appropriate scales.

Vocabulary *(Key Terms Used by Teachers and Students in this Cluster):*

- Unit Analysis
- Unit Conversion
- Accuracy
- Precision

Relevance, Explanations, and Examples:	
A1.N.Q.A.1: Unit Analysis is used extensively in Science classes. Connect with your science teacher to discuss consistency with strategies and to support each other's work.	
Achievement Level Descriptors	
Cluster: Reason quantitatively and use units to solve problems.	
Concepts and Procedures	***Level 1:*** Students should be able to choose the units in a formula, correctly scale a graph with unit increments, and identify a quantity from a graph with a scale in unit increments of a specified measurement.
	Level 2: Students should be able to reason quantitatively to choose and interpret the units in a formula given in a familiar context, including making measurement conversions between simple units and identifying a quantity from a graph with the scale in increments of various sizes. They should be able to use units to guide the solution of a familiar multi-step problem with scaffolding.
	Level 3: Students should be able to reason quantitatively to choose and interpret the units in a formula given in an unfamiliar context, including making measurement conversions between compound units, and to define appropriate quantities or measurements in familiar contexts with some scaffolding to construct a model. They should be able to identify appropriate levels of measurement precision in context and to choose and interpret the scale and origin of a graph or data display. They should be able to use units to guide the solution of an unfamiliar multi-step problem without scaffolding.
	Level 4: Students should be able to define appropriate quantities or measurements in unfamiliar contexts with little to no scaffolding to construct a model.