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: The Real Number System	Grade Level: Algebra 1

A1.N.RN.B Cluster: Use properties of rational and irrational numbers.

Explain why the sum or product of two rational numbers is always rational. Explain why the sum and product of a nonzero rational and an irrational number is always irrational.

**This is an ADDITIONAL 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.RN.B. 3 Explain why the sum or product of two rational numbers is rational; the sum of a rational and an irrational number is irrational; and the product of a nonzero rational and an irrational number is irrational.

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

A1.N.RN.B. 3 Explain why the sum or product of two rational numbers is rational; the sum of a rational and an irrational number is irrational; and the product of a nonzero rational and an irrational number is irrational.

Conceptual Understanding	*Procedural Fluency*	*Application*
Understand the difference between rational and irrational numbers. Understand how to add and multiply rational and irrational numbers.	Provide an example showing the sum or product of two rational numbers is rational. Provide an example showing the sum of a rational and an irrational number is irrational. Provide an example showing the product of a nonzero rational number and an irrational number is irrational.	

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

1. **Make sense of problems and persevere in solving them.**
2. **Reason abstractly and quantitatively.**
   - Identify the final classification of the sum or product of rational and irrational numbers.
3. **Construct viable arguments and critique the reasoning of others.**
   - Explain the result of computations with rational and irrational numbers by providing examples and counterexamples as justification and explain why their conjectures work.
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.
  ● Students work with symbolic forms of rational and irrational numbers to make conclusions about their sum and products.

Vertical and Horizontal Coherence and Learning Progressions

Previous Learning Connections	*Current Learning Connections*	*Future Learning Connections*
In middle school, learners: 1. identify and compare rational and irrational numbers 2. compute values of rational and irrational values when working with volume, surface area, and circles.		In future courses, learners will: 1. rationalize denominators using an understanding of products of irrational numbers 2. work with irrational numbers when solving equations 3. simplify radicals using an understanding of irrational numbers 4. calculate and interpret measurements using irrational numbers.

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

Relevance, Explanations, and Examples:

Achievement Level Descriptors

Cluster: Use properties of rational and irrational numbers.

Concepts and Procedures	*Level 1:* Students should be able to identify the difference between a rational and an irrational number.
	Level 2: Students should be able to perform operations on rational and irrational numbers and should be able to look for and use repeated reasoning to understand that the rational numbers are closed under addition and multiplication.
	Level 3: Students should be able to look for and use repeated reasoning to understand and explain that the sum and product of a rational number and a nonzero irrational number are irrational.
	Level 4: Students should be able to provide a specific example given a generalization statement, such as the sum of a rational number and an irrational number is irrational.