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 Number System	**Grade Level: 8th**
8.NS.A Cluster: Know that there are numbers that are not rational, and approximate them by rational numbers. Expand knowledge of numbers to include irrational numbers. Convert decimals to rational numbers. Use a number line to approximate, compare, and order rational and irrational numbers.	
****This is a SUPPORTING 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.* **8.NS.1.** Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats or terminates. Convert a decimal expansion which repeats or terminates into a rational number. **8.NS.2.** Use rational approximations of irrational numbers to compare the size of irrational numbers. Locate irrational numbers approximately on a number line diagram, and estimate the value of expressions such as (π^2). For example, by truncating the decimal expansion of $\sqrt{2}$, show that $\sqrt{2}$ is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.	
Aspects of Rigor: (Conceptual, Procedural, and/or Application)	

Conceptual Understanding	***Procedural Fluency***	***Application***
Understand difference between rational and irrational numbers. **(8.NS.1)** Understand that every number has a decimal expansion. **(8.NS.1)**	Convert **(8.NS.1)** 1. a rational number into a decimal that repeats or terminates. 2. repeating decimals to a rational number. 3. terminating decimals to a rational number.	
Understand where to place rational and irrational numbers on a number line. **(8.NS.2)**	Estimate irrational numbers without technology. **(8.NS.2)** Compare the size of rational and irrational numbers. **(8.NS.2)** Place any rational and irrational number on a number line. **(8.NS.2)**	

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.**
   - Estimate rational and irrational numbers using a number line.
3. **Construct viable arguments and critique the reasoning of others.**
   - Defend/critique the placement of rational and irrational numbers on a number line.
   - Use the definition of rational numbers to explain why a number is irrational.
4. **Model with mathematics.**
   - Approximate rational and irrational numbers using a physical model.
5. **Use appropriate tools strategically.**
   - Construct a number line.
6. **Attend to precision.**
   - Create a number line with the appropriate scale.
   - Use rational approximations of irrational numbers to compare and locate irrational numbers on a number line.
   - Express numerical answers with a degree of precision appropriate for the problem context.
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 5th grade, learners 1. round decimals to any place value. In 6th grade, learners 1. place rational numbers on a number line. In 7th grade, learners 1. convert rational numbers to decimals using long division. 2. know that a decimal form of a rational number terminates in zero, or eventually repeats.	In 8th grade, learners 1. Use square root and cube root symbols to encounter irrational numbers.	In high school, learners 1. extend knowledge of irrational numbers to complex numbers. 2. use rational exponents.

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

- rational number
- irrational number
- repeating decimal
- terminating decimal
- square root
- pi (π)

Relevance, Explanations, and Examples:

Achievement Level Descriptors	
Cluster: **Know that there are numbers that are not rational, and approximate them by rational numbers.**	
Concepts and Procedures	***Level 1:*** Students should be able to identify square roots of numbers less than 100; identify pi as not rational; and understand that every rational number has a decimal expansion.
	Level 2: Students should be able to identify approximate locations of familiar irrational numbers on a number line; identify numbers as rational or irrational; and convert between fractions and terminating decimals.
	Level 3: Students should be able to use rational approximations of irrational numbers to locate them on a number line and to make numerical comparisons; convert between fractions and repeating decimals; and compare rational numbers.
	Level 4: Students should be able to approximate irrational numbers to a specified level of precision and should be able to use the approximations to solve problems or estimate the value of an expression.