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: Functions	**Grade Level: Algebra 2**

A2.F.LE.A Cluster: Construct and compare linear and exponential models and solve

Learners will be able to go back and forth between an exponential model and logarithmic model and know when one model may be more useful than another one to solve problems in context.

****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.*

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. *(Uses modeling)*

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

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Conceptual Understanding	***Procedural Fluency***	***Application***
Learners understand how an exponential model and logarithmic model relate (are inverses and can be rewritten in the other form).	Learners are able to: ● evaluate logarithmic expressions (both with and without technology). ● rewrite exponential models in logarithmic form.	Learners can apply the concept of logarithms to solve contextual problems Examples: pH Scale, decibels, etc.

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.**
3. **Construct viable arguments and critique the reasoning of others.**
4. **Model with mathematics.**
    - Students will be able to apply concepts of logarithms to problems in context.
5. **Use appropriate tools strategically.**
6. **Attend to precision.**
7. **Look for and make use of structure.**
    - Students will be able to write a logarithmic model given an exponential model and vice versa.
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 8th grade and Algebra 1, students learn about exponential models.	*Students will use this knowledge to solve more complex logarithmic problems that include the use of logarithmic properties.*	*Students will build on this knowledge of exponents and logarithms in future math courses.*

Vocabulary (key terms and definitions)

- Base
- Common Logarithm
- Euler's number
- Natural logarithm

Relevance, Explanations, and Examples:

Achievement Level Descriptors

Cluster: Construct and compare linear and exponential models and solve

Concepts and Procedures	***Level 1:*** Students should be able to apply mathematics to solve familiar problems arising in everyday life, society, and the workplace by identifying important quantities and by beginning to develop a model.
	Level 2: Students should be able to apply mathematics to propose solutions by identifying important quantities, locating missing information from relevant external resources, beginning to construct chains of reasoning to connect with a model, producing partial justification and interpretations, and beginning to state logical assumptions.
	Level 3: Students should be able to apply mathematics to solve unfamiliar problems arising in everyday life, society, and the workplace by identifying important quantities and mapping, displaying, explaining, or applying their relationship and by locating missing information from relevant external resources. They should be able to construct chains of reasoning to justify a model used, produce justification of interpretations, state logical assumptions, and compare and contrast multiple plausible solutions.
	Level 4: students should be able to apply mathematics to solve unfamiliar problems by constructing chains of reasoning to analyze a model, producing and analyzing justification of interpretations, stating logical assumptions, and constructing and comparing/contrasting multiple plausible solutions and approaches.