Unpacked South Dakota State Mathematics Standards DONE

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: Geometry	**Grade Level: 8**

8.G.C Cluster: Solve real-world and mathematical problems involving volume of cylinders, cones and spheres.

Know and apply the volume formulas of a cylinder, cone, and a sphere.

****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.*

8.G.9 Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

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

Conceptual Understanding	***Procedural Fluency***	***Application***
Understand the relationship between the volumes of cylinders, cones, and spheres. **(8.G.9)** **Note:** To "know" the formulas means to have an understanding of why the formula works and how the formula relates to the measure (volume) and the figure.	Find the volume of cylinders, cones, and spheres. **(8.G.9)**	Solve real-world problems involving the volumes of cylinders, cones, and spheres. **(8.G.9)**

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

1. **Make sense of problems and persevere in solving them.**
    - Find volume of composite shapes (ex: Ice cream cone composed of a hemi-sphere of ice cream on top of a cone)
2. **Reason abstractly and quantitatively.**
3. **Construct viable arguments and critique the reasoning of others.**
    - Convince classmates of the relationship between the cylinder, cone, and sphere.
    - Determine the shapes that construct a composite shape.
4. **Model with mathematics.**
5. **Use appropriate tools strategically.**
6. **Attend to precision.**
    - Label volumes with units cubed and areas as units squared.
    - Approximate a precise volume working with pi.
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 and 6th grade, learners 1. find volumes of right rectangular prisms. In 7th grade, learners 1. find the area of a circle. 2. solve real-world problems involving area and volume.	In 8th grade, learners 1. use square root and cube root symbols.	In high school, learners 1. Use geometric shapes and their measurements to describe objects and solve design problems.

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

- Volume
- Cylinder
- Cone
- Sphere
- Radius
- Diameter
- Area of a Circle
- Base
- Height
- pi

Relevance, Explanations, and Examples:

Achievement Level Descriptors

Cluster: Solve real-world and mathematical problems involving volume of cylinders, cones and spheres.

Concepts and Procedures	***Level 1:*** Students should be able to identify the key dimensions (i.e.,radii, heights, circumferences,and diameters) of cones, cylinders, and spheres.
	Level 2: Students should be able to identify the appropriate formula for the volumes of a cone, a cylinder,and a sphere and should be able to connect the key dimensions to the appropriate locations in the formula.
	Level 3: Students should be able to calculate the volumes of cones, cylinders, and spheres in direct and familiar mathematical and real-world problems.
	Level 4: Students should be able to solve unfamiliar or multi-step problems involving volumes of cones, cylinders, and spheres.