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: Precalculus		**Grade Level: 4th Year**
HS4.PC.PC.A Cluster: Define polar coordinates and the relationship between polar coordinates and Cartesian coordinates. Students learn the polar coordinate system as an alternative to the more familiar rectangular coordinate system. .		
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.* **PC.PC.1** Define polar coordinates and the relationship between polar coordinates and Cartesian coordinates with and without the use of technology. **PC.PC.2** Use polar equations to model and solve problems using graphs and algebraic properties.		
Aspects of Rigor of Student Learning: (Conceptual, Procedural, and/or Application)		
PC.PC.1 Define polar coordinates and the relationship between polar coordinates and Cartesian coordinates with and without the use of technology.		
Conceptual Understanding	***Procedural Fluency***	***Application***
Students understand that a coordinate point can be represented in polar form as the distance from the origin and the standard angle.	Students can represent a point using both polar and rectangular coordinates. Students can change a point from polar to rectangular and from rectangular to polar.	
PC.PC.2 Use polar equations to model and solve problems using graphs and algebraic properties.		
Conceptual Understanding	***Procedural Fluency***	***Application***
Students can represent a graph using polar equations.	Students should be able to find the intersection point(s) of two polar graphs.	
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.**
5. **Use appropriate tools strategically.**
    - Students should look for applications in which polar coordinates are more helpful than rectangular coordinates.
6. **Attend to precision.**
7. **Look for and make use of structure.**
    - Students comparison between rectangular and polar coordinates allows them to explore alternative structures of mathematics.
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 prior classes, students have worked extensively with rectangular coordinates. In trigonometry, students learned to find the measure of an acute angle in a right triangle given the leg lengths. In Geometry, students learned to use the Pythagorean Theorem to find the length of the hypotenuse of a right triangle given the length of the legs.	Students learn the polar coordinate system as an alternative to the more familiar rectangular coordinate system.	Students will use polar coordinates equations and graphs in Calculus to find areas and volumes of circular shapes.

Vocabulary (key terms and definitions)

- Polar coordinates
- Polar equations
- Cartesian (Rectangular) coordinates

Relevance, Explanations, and Examples: