

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: Number and Quantity		Grade Level: 12
HS4.N.VM.A Cluster: Represent and model with vector quantities. Students perform operations on vectors and work with vectors in contextual situations.		
<p>**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.</p> <p>N.VM.1 Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes.</p> <p>N.VM.2 Write a vector in component form.</p> <p>N.VM.3 Solve problems involving velocity and other quantities that can be represented by vectors.</p>		
Aspects of Rigor for Student Learning: (Conceptual, Procedural, and/or Application)		
N.VM.1 Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes.		
Conceptual Understanding	Procedural Fluency	Application
Students understand that the magnitude of a vector is equal to its absolute value.	Students can draw a line segment with appropriate symbolization, to represent a vector quantities.	Students should be exposed to real world quantities that are represented by vectors, such as velocity.
N.VM.2 Write a vector in component form.		
Conceptual Understanding	Procedural Fluency	Application
Students can connect the components of a vector with the concept of slope and distance.	Students identify the initial point and terminal point of a vector. Students can find the x and y components of a vector.	
N.VM.3 Solve problems involving velocity and other quantities that can be represented by vectors.		
Conceptual Understanding	Procedural Fluency	Application
		Students apply their knowledge of

trigonometry and vectors to solve real world problems.

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

- 1. Make sense of problems and persevere in solving them.**
 - Students will solve problems from contextual situations with the use of vectors, matrices, and their associated operations.
- 2. Reason abstractly and quantitatively.**
 - Students will use quantitative reasoning to define magnitudes from previous ideas related to the distance formula and Pythagorean Theorem.
- 3. Construct viable arguments and critique the reasoning of others.**
- 4. Model with mathematics.**
- 5. Use appropriate tools strategically.**
 - Students use these different tools to help represent and solve problems related to both magnitude and direction.
- 6. Attend to precision.**
- 7. Look for and make use of structure.**
- 8. Look for and express regularity in repeated reasoning.**

Vertical and Horizontal Coherence and Learning Progressions

<i>Previous Learning Connections</i>	<i>Current Learning Connections</i>	<i>Future Learning Connections</i>
In Geometry, students have learned to find the distance given two points. Students have also learned how to use trigonometry to find missing side lengths or angles in a right triangle.	Students work with vectors in contextual situations. Students are performing operations on vectors.	Vectors are important in both Calculus and Linear Algebra courses.

Vocabulary (key terms and definitions)

- Vector
- Initial point
- Terminal point
- Magnitude

Relevance, Explanations, and Examples:

Some real-world examples may include force, momentum, gravity, electric fields, and fluid mechanics.