

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: Arithmetic with Polynomials and Rational Expressions		Grade Level: Algebra I
A1.APR.A Cluster: Perform arithmetic operations on polynomials.		
Add, subtract, and multiply polynomials. Recognize polynomials form a closed system under these operations.		
<p>**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.</p> <p>A1.APR.A.1. Understand that polynomials form a system closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.</p>		
Aspects of Rigor for Student Learning: (Conceptual, Procedural, and/or Application)		
A1.APR.A.1. Understand that polynomials form a system closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.		
Conceptual Understanding	Procedural Fluency	Application
<p>Understand adding and subtracting polynomials is a combination of like terms.</p> <p>Understand you can apply the distributive property to multiply polynomials.</p> <p>Understand the addition, subtraction, or multiplication of polynomials results in another polynomial (this is a closed system).</p>	<p>Add polynomials.</p> <p>Subtract polynomials.</p> <p>Multiply polynomials.</p>	
Enacting the Mathematical Practices - Evidence of Students Engaging in the Practices		
<ol style="list-style-type: none"> 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. <ul style="list-style-type: none"> • Explain how polynomials are closed under addition, subtraction and multiplication, and demonstrate cases that show closure for the operations. 4. Model with mathematics. 5. Use appropriate tools strategically. <ul style="list-style-type: none"> • Use algebra tiles to model polynomial operations. • Use area model to model polynomial multiplication. 6. Attend to precision. 		

7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.
 - Identify and use patterns within polynomial operations.

Vertical and Horizontal Coherence and Learning Progressions

<u>Previous Learning Connections</u>	<u>Current Learning Connections</u>	<u>Future Learning Connections</u>
In middle grades, learners: <ol style="list-style-type: none"> 1. combine like terms and simplify expressions using the distributive property. 	In Algebra 1, learners: <ol style="list-style-type: none"> 1. use the properties of operations to write expressions in different but equivalent forms. 	In future courses, learners will: <ol style="list-style-type: none"> 1. divide polynomials 2. perform operations with rational expressions with apply concepts learned while performing operations with polynomials.

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

- monomial
- binomial
- trinomial
- polynomial
- closed system

Relevance, Explanations, and Examples:

Avoid using FOIL; this is a shortcut strategy with a small shelf life that expires when students begin more in-depth work with polynomials.

Achievement Level Descriptors

Cluster: Perform arithmetic operations on polynomials.

Concepts and Procedures	Level 1: Students should be able to add, subtract, and multiply single-variable polynomials of degree 2 or less.
	Level 2: Students should be able to add, subtract, and multiply multi-variable polynomials made up of monomials of degree 2 or less. They should understand that polynomials are closed under addition.
	Level 3: Students should be able to add, subtract, and multiply multi-variable polynomials of any degree and understand that polynomials are closed under subtraction and multiplication.
	Level 4: Students should understand and be able to explain that polynomials form a system analogous to the integers.