

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: Seeing Structure in Expression		Grade Level: Algebra I
A1.A.SSE.B Cluster: Write expressions in equivalent forms to solve problems		
Rewrite quadratic functions in different forms to show the zeros or maximum/minimum value by factoring or completing the square. Rewrite exponential functions using properties of exponents.		
<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>A.SSE.B.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.</p> <ol style="list-style-type: none"> Factor a quadratic expression to reveal the zeros of the function it defines. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. Use the properties of exponents to write equivalent expressions for exponential functions. 		
Aspects of Rigor for Student Learning: (Conceptual, Procedural, and/or Application)		
<p>A.SSE.B.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.</p> <ol style="list-style-type: none"> Factor a quadratic expression to reveal the zeros of the function it defines. 		
Conceptual Understanding	Procedural Fluency	Application
Understand a quadratic function can be factored to find zeros.	Factor a quadratic expression. Identify the zeros of a quadratic function. Note: This standard pairs with F.IF.8a	
<p>A.SSE.B.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.</p> <ol style="list-style-type: none"> Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. 		
Conceptual Understanding	Procedural Fluency	Application
Understand a quadratic function can be written in vertex form (completing the square) to find the maximum or minimum value.	Rewrite a quadratic function in vertex form by completing the square. Identify the maximum or minimum of a quadratic function.	

		Note: This standard pairs with F.IF.8a	
A.SSE.B.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. c. Use the properties of exponents to write equivalent expressions for exponential functions.			
Conceptual Understanding		Procedural Fluency	Application
Understand the properties of exponents can be applied to exponential functions.		Rewrite exponential functions using properties of exponents.	
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. <ul style="list-style-type: none"> • Transform quadratic or exponential functions to find key features. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. <ul style="list-style-type: none"> • Use technology to verify key features of a function to compare with equations. 6. Attend to precision. 7. Look for and make use of structure. <ul style="list-style-type: none"> • Use the structure of an expression to determine a procedure to rewrite the function. 8. Look for and express regularity in repeated reasoning. 			
Vertical and Horizontal Coherence and Learning Progressions			
<u>Previous Learning Connections</u>		<u>Current Learning Connections</u>	<u>Future Learning Connections</u>
In middle school, learners: <ol style="list-style-type: none"> 1. know and apply the properties of integer exponents to generate equivalent, simplified numerical expressions using the properties of exponents. 		In Algebra 1, learners: <ol style="list-style-type: none"> 1. recognize and flexibly write expressions (or rewrite) to use that expression and solve the problem at hand. 	In future math courses, learners: <ol style="list-style-type: none"> 1. factor polynomial functions of varying degrees. 2. complete the square to solve quadratic equations with imaginary solutions. 3. rewrite exponential equations as logarithmic equations.
Vocabulary (Key Terms Used by Teachers and Students in this Cluster):			
<ul style="list-style-type: none"> • vertex form • zeros of a function 			
Relevance, Explanations, and Examples:			
A1.A.SSE.B.3c: Examples			
<ol style="list-style-type: none"> 1. Classify $f(x) = 2^{-x}$ as growth or decay. 2. Determine the approximate monthly growth factor of the exponential function $f(x) = 1.07^x$. 			
Achievement Level Descriptors			

Cluster: Write expressions in equivalent forms to solve problems

Concepts and Procedures

Level 1:

Students should be able to write a quadratic expression with integer coefficients and a leading coefficient of 1 in an equivalent form by factoring. They should be able to use properties of exponents to expand a single variable (coefficient of 1) with a positive integer exponent into an equivalent form and vice versa, e.g., $x^3 = xxx$.

Level 2:

Students should be able to write a quadratic expression with integer coefficients in an equivalent form by factoring or by completing the square. They should be able to use properties of exponents to expand a repeated single variable (coefficient of 1) with a nonnegative integer exponent into an equivalent form and vice versa, e.g., $x^0x^2x^3 = xxxxx = x^{2+3}$.

Level 3:

Students should be able to write a quadratic expression with rational coefficients in an equivalent form by factoring and by completing the square. They should be able to identify and use the zeros to solve or explain familiar problems, and they should be able to use properties of exponents to write equivalent forms of exponential functions with one or more variables, integer coefficients, and nonnegative rational exponents involving operations of addition, subtraction, and multiplication, including distributing an exponent across terms within parentheses.

Level 4:

Students should be able to find the maximum or minimum values of a quadratic function. They should be able to choose an appropriate equivalent form of an expression in order to reveal a property of interest when solving problems.