

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: Reasoning With Equations and Inequalities		Grade Level: Algebra I
A1.REI.A Cluster: Understand solving equations as a process of reasoning and explain the reasoning.		
Justify the steps of solving linear and quadratic equations using properties of mathematics.		
<p>**This is a MAJOR cluster. <i>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.</i></p> <p>A1.REI.A.1: Explain each step in solving an equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.</p>		
Aspects of Rigor for Student Learning: (Conceptual, Procedural, and/or Application)		
<p>A1.REI.A.1 Explain each step in solving an equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.</p>		
Conceptual Understanding	Procedural Fluency	Application
Understand the properties that allow an equation to be written in an equivalent form.	Justify each step of solving linear and quadratic equations using mathematical properties. Note: Rational and radical equations are learned in Algebra 2.	
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 the steps for solving an equation. • Justify a different solution method to a classmate through discussion or written explanation. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. <ul style="list-style-type: none"> • Use the properties of mathematics to solve linear and quadratic equations. 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>

<p>In elementary school, learners:</p> <ol style="list-style-type: none"> 1. apply associative, commutative, distributive, and identity properties. <p>In middle school, learners:</p> <ol style="list-style-type: none"> 1. learn math properties and their names 2. use variables to write expressions and equations 3. solve linear equations. 	<p>In future math courses, learners:</p> <ol style="list-style-type: none"> 1. justify steps in solving rational and radical equations 2. justify steps in writing proofs for geometry.
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Vocabulary (Key Terms Used by Teachers and Students in this Cluster):

- Associative Property
- Distributive Property
- Properties of Equality
- Commutative Property
- Substitution Property
- Symmetric Property
- Identity Properties

Relevance, Explanations, and Examples:

Examples:

1. Transform $2x - 5 = 7$ to $2x = 12$ and tell what property of equality was used.

Solution:

$$\begin{aligned}
 2x - 5 &= 7 \\
 2x - 5 + 5 &= 7 + 5 && \text{Addition property of equality.} \\
 2x &= 12
 \end{aligned}$$

2. Justify each step when solving $3(x + 5) - 2x = 12$.

Solution:

Statements	Reasons
$3(x+5) - 2x = 12$	Given
$3x + 15 - 2x = 12$	Distributive Property
$3x - 2x + 15 = 12$	Commutative Property
$x + 15 = 12$	Substitution Property
$x + 15 - 15 = 12 - 15$	Subtraction Property of Equality
$x = -3$	Substitution Property

Note: Substitution Property is used to justify combining like terms; the step using the Commutative Property is optional

Achievement Level Descriptors

Cluster: Understand solving equations as a process of reasoning.

Concepts and Procedures

Level 1: Students should be able to explain solution steps for solving one-step linear equations in one variable.

Level 2: Students should be able to look for and make use of structure to solve simple rational equations in one variable in which the variable term is in the numerator and should understand the solution steps as a process of

	reasoning. They should be able to understand and explain solution steps for solving linear equations in one variable as a process of reasoning.
	Level 3: -They should be able to understand and explain solution steps for solving quadratic-equations in one variable as a process of reasoning.
	Level 4: