

# 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.

<b>Domain: Creating Equations</b>		<b>Grade Level: Algebra I</b>
<b>A1.A.CED.A Cluster: Create equations that describe numbers or relationships.</b>		
Create and graph equations, inequalities, systems of equations, and systems of inequalities to represent constraints in a real-world context and find viable solutions. Rewrite formulas to solve for a specific variable.		
<p><b>**This is a MAJOR cluster.</b> 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><b>A1.A.CED.A.1:</b> Create equations and inequalities in one variable arising from situations in which linear, quadratic, and exponential functions are appropriate and use them to solve problems.</p> <p><b>A1.A.CED.A.2:</b> (i) Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.</p> <p><b>A1.A.CED.A.3:</b> (i) Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context.</p> <p><b>A1.A.CED.A.4:</b> (i) Rewrite formulas to highlight a quantity of interest, using the same reasoning as in solving equations.</p>		
<b>Aspects of Rigor:</b> (Conceptual, Procedural, and/or Application)		
<b>A1.A.CED.A.1:</b> Create equations and inequalities in one variable arising from situations in which linear, quadratic, and exponential functions are appropriate and use them to solve problems.		
<b>Conceptual Understanding</b>	<b>Procedural Fluency</b>	<b>Application</b>
<p>Understand an equation or an inequality in one variable can be used to model a real-life situation.</p> <p>Understand when a situation will be represented by a linear, quadratic, or an exponential equation or inequality in one variable.</p> <p>Understand the form of each type of function (ex: <math>mx + b</math> is linear, <math>ax^2 + bx + c</math> is quadratic, <math>a(b^x)</math> is exponential).</p>		<p>Create and solve one variable equations and inequalities from real-world contexts.</p>
<b>A1.A.CED.A.2:</b> (i) Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.		
<b>Conceptual Understanding</b>	<b>Procedural Fluency</b>	<b>Application</b>

<p>Understand an equation in two or more variables can be used to model a real-life situation.</p> <p>Understand when a situation will be represented by a linear, quadratic, or an exponential equation in two or more variables.</p> <p>Understand the form of each type of equation (ex: <math>Ax + By = C</math> is linear, <math>ax^2 + bx + c = y</math> is quadratic, <math>a(b^x) = y</math> is exponential).</p>	<p>Create linear, quadratic, and exponential equations in two variables.</p> <p>Graph linear, quadratic, and exponential equations in two variables including labels and scales.</p>	<p>Create and/or graph equations in two variables representing real-world situations.</p>
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**A1.A.CED.A.3:** (i) Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context.

<b>Conceptual Understanding</b>	<b>Procedural Fluency</b>	<b>Application</b>
<p>Understand that certain real-world problems have constraints that can be represented by equations or inequalities (ex: since time can't be negative, <math>t \geq 0</math>).</p> <p>Understand how to write linear, quadratic, or exponential equations or inequalities.</p> <p>Understand how to find solutions of a system of equations and inequalities.</p>		<p>Write and graph an equation/inequality or system of equations/inequalities to represent the constraints in a real-world situation.</p> <p>Determine a viable range of solutions from the graph of an equation/inequality or a system of equations/inequalities.</p>

**A1.A.CED.A.4:** (i) Rewrite formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

<b>Conceptual Understanding</b>	<b>Procedural Fluency</b>	<b>Application</b>
<p>Understand the properties that allow an equation to be written in an equivalent form.</p> <p>Understand the procedures used to solve an equation can be applied to rearrange a formula.</p>	<p>Solve for a specific variable (quantity of interest) within a formula.</p>	

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

- 1. Make sense of problems and persevere in solving them.**
  - Write and graph linear, quadratic, and exponential equations/inequalities and systems of those equations/inequalities to represent constraints and find solutions in real-world contexts.
- 2. Reason abstractly and quantitatively.**
  - Determine reasonable solutions based on the context of real-world problems from graphs of equations/inequalities and systems of linear equations/inequalities.
  - Rewrite a formula using algebraic properties.
- 3. Construct viable arguments and critique the reasoning of others.**
  - Explain the viability or nonviability of a proposed solution.
- 4. Model with mathematics.**
  - Write and graph linear, quadratic, and exponential equations/inequalities and systems of those equations/inequalities to model real-world situations.
- 5. Use appropriate tools strategically.**

- Use paper/pencil and/or technology to graph linear, quadratic, and exponential equations/inequalities.
- Attend to precision.**
    - Graph systems of equations/inequalities precisely to find the solution/range of solutions.
  - Look for and make use of structure.**
  - Look for and express regularity in repeated reasoning.**

### Vertical and Horizontal Coherence and Learning Progressions

#### Previous Learning Connections

- In middle school, learners
1. create and solve equations in one variable
  2. reason with inequalities
  3. solve real-world problems involving two linear equations in one and two variables.

#### Current Learning Connections

- In Algebra 1, learners
1. graph equations and inequalities
  2. graph systems of equations and inequalities
  3. solve equations in one variable including those equations with coefficients represented by variables.

#### Future Learning Connections

- In future courses, learners
1. will extend their knowledge of to include additional types of functions such as trigonometric, rational, and polynomial
  2. communicate relevant domain and range for all types of functions.

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

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|---|---|
| <ul style="list-style-type: none"> <li>• constraints</li> <li>• linear equation</li> <li>• quadratic equation</li> <li>• exponential equation</li> <li>• system of equations</li> </ul> | <ul style="list-style-type: none"> <li>• inequalities</li> <li>• system of inequalities</li> <li>• viable solution</li> <li>• nonviable solution</li> </ul> |
|---|---|

#### *Relevance, Explanations, and Examples:*

**A1.A.CED.A.2 (i):** Please be sure to include linear, quadratic, and exponential equations not in isolation. Mix it up!

**A1.A.CED.A.3 (i):** Viable vs Nonviable solutions:

Ex: Mark earns \$5 per hour babysitting. Create and graph the inequality that represents Mark's wages as a function of the hours worked.

Determine the number of hours Mark would need to work if he wanted to earn at least \$30.

Note to teachers: While working for 4 hours and making \$20 is a solution to the inequality written, it is not a viable solution because Mark wants to earn at least \$30.

Ex: Carrie would like to have \$10,000 when she leaves for college in 4 years. She has invested \$8,000 at an interest rate of 5% compounded annually. Will she meet her goal? If not, what is a more realistic goal for Carrie?

#### **Achievement Level Descriptors**

**Cluster: Create equations that describe numbers or relationships.**

#### **Concepts and Procedures**

**Level 1:** Students should be able to create and use one-step linear equations in one variable to model a familiar situation and to solve a familiar problem.

**Level 2:** Students should be able to create and use quadratic equations, linear equations, and linear inequalities in one and two variables to model a familiar situation and to solve a familiar problem. They should be able to graph a linear or a quadratic equation in two variables and be able to rearrange a familiar formula or an unfamiliar linear formula in one or two variables for a particular given quantity.

	<p><b>Level 3:</b> Students should be able to create and use linear and quadratic equations and inequalities and exponential equations with an integer base and a polynomial exponent in multiple variables to model an unfamiliar situation and to solve an unfamiliar problem. They should be able to graph an equation in two variables and be able to rearrange a linear, a quadratic, a rational, or a cubic multivariable formula for a particular given quantity.</p>
	<p><b>Level 4:</b></p>