

# 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: Functions</b>		<b>Grade Level: 8</b>
<b>8.F.A Cluster: Define, evaluate, and compare functions.</b>		
Know what a function is and be able to compare the properties of two functions.		
<p><b>**This is a MAJOR cluster.</b> <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><b>8.F.1</b> Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. (Function notation is not required in Grade 8).</p> <p><b>8.F.2.</b> Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.</p> <p><b>8.F.3.</b> Interpret the equation <math>y = mx + b</math> as defining a linear function, whose graph is a straight line; give examples of functions that are not linear.</p>		
<b>Aspects of Rigor:</b> (Conceptual, Procedural, and/or Application)		
<b>Conceptual Understanding</b>	<b>Procedural Fluency</b>	<b>Application</b>
<p>Understand that a function is a rule that states each input has exactly one output. <b>(8.F.1)</b></p> <p>Understand that each function produces a graph. <b>(8.F.1)</b></p>		
<p>Understand how to find the slope and the y-intercept from an equation, a table, a graph, and a verbal description. <b>(8.F.2)</b></p> <p>Understand that slope represents rate of change and y-intercept represents initial value or starting value. <b>(8.F.2)</b></p> <p>Understand how to generate additional ordered pairs for a function. (ex: extend a table, extend a graph, evaluate an</p>		<p>Compare the properties of a graph, an equation, a table, and a verbal descriptions given a real-world linear situation. <b>(8.F.2)</b></p>

equation) <b>(8.F.2)</b>		
Understand a linear function has a constant rate of change called slope and will produce a line on a graph. <b>(8.F.3)</b>		
Understand a nonlinear function does not have a constant rate of change and will not produce a line on a graph. <b>(8.F.3)</b>		

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

- 1. Make sense of problems and persevere in solving them.**
  - Explain correspondences between equations, verbal descriptions, tables, and graphs of important features such as rate of change and y-intercepts.
- 2. Reason abstractly and quantitatively.**
- 3. Construct viable arguments and critique the reasoning of others.**
- 4. Model with mathematics.**
  - Identify important quantities such as rate of change and y-intercept in a real-world situation.
- 5. Use appropriate tools strategically.**
  - Utilize the coordinate plane (graph paper) to graph relationships.
- 6. Attend to precision.**
- 7. Look for and make use of structure.**
  - Use  $y = mx + b$  as the equation for a linear function.
- 8. Look for and express regularity in repeated reasoning.**

**Vertical and Horizontal Coherence and Learning Progressions**

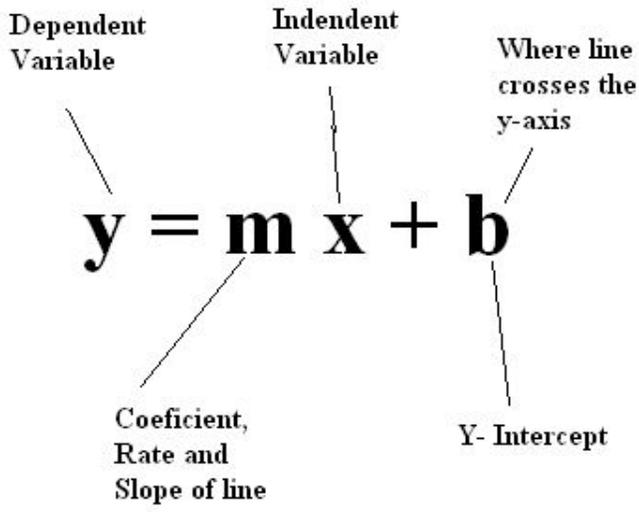
<u><i>Previous Learning Connections</i></u>	<u><i>Current Learning Connections</i></u>	<u><i>Future Learning Connections</i></u>
<p>In 7th grade, learners</p> <ol style="list-style-type: none"> <li>1. analyze proportional relationships and use them to solve real-world and mathematical problems</li> <li>2. solve real-world and mathematical problems using numerical and algebraic expressions and equations.</li> </ol>	<p>In 8th grade, learners</p> <ol style="list-style-type: none"> <li>1. describe qualitatively the functional relationship between two quantities by analyzing a graph</li> <li>2. construct a function to model a linear relationship between two quantities</li> <li>3. graph proportional relationships, interpreting the unit rate as the slope of the graph.</li> </ol>	<p>In high school, learners</p> <ol style="list-style-type: none"> <li>1. understand the concept of a function and use function notation</li> <li>2. interpret functions that arise in application in terms of the context</li> <li>3. choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.</li> </ol>

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

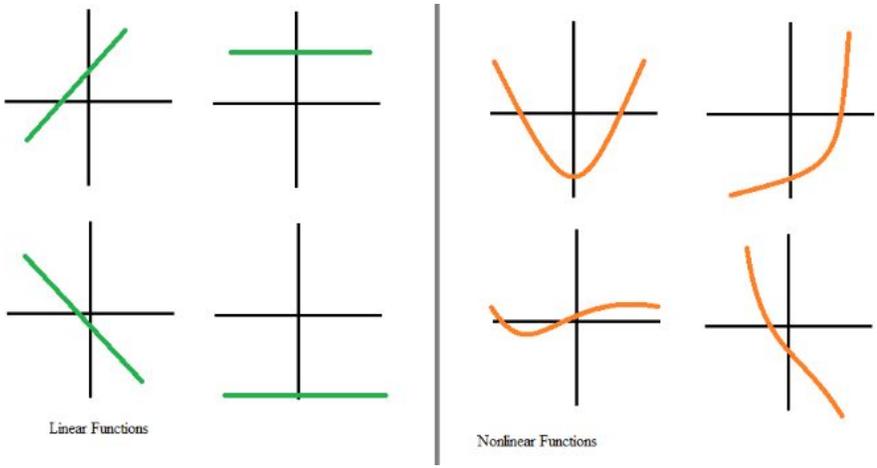
- |   |  |  |
|---|--|--|
| <ul style="list-style-type: none"> <li>● Function</li> <li>● Input</li> <li>● Output</li> </ul> | <ul style="list-style-type: none"> <li>● Relation</li> <li>● Linear</li> <li>● Non-Linear</li> </ul> | <ul style="list-style-type: none"> <li>● Ordered Pairs</li> <li>● Rate of Change (Slope)</li> <li>● Y-Intercept</li> </ul> |
|---|--|--|

**Relevance, Explanations, and Examples:**

8.F.3 for m and for b in  $y = mx + b$



8.F.3 Graphs:



8.F.3: Equations:

Linear equations

- $2x + 5 = -8$
- $X = 9$
- $Y = .5x$
- $6s - 3t = 8$

Non linear equations

- $7a + b^2 = 3$
- $y = 1/x$
- $x + xy = 1$
- $y = \sqrt{x+5}$

**Achievement Level Descriptors****Cluster: Define, evaluate and compare functions.****Concepts and Procedures**

**Level 1:** Students should be able to identify whether or not a relationship that is represented graphically, in a table, or algebraically is a function. They should be able to compare the properties of two linear functions represented in the same way (graphically or in a table).

**Level 2:** Students should be able to produce input and output pairs for a given function and identify whether an input/output pair satisfies a function. They should be able to compare properties of two functions represented in the same way (algebraic, graphic, tabular, or verbal). They should be able to classify functions as linear or nonlinear on the basis of their graph.

**Level 3:** Students should be able to classify functions as linear or nonlinear in different forms (e.g., graphical, algebraic, verbal description, and/or tabular) and should know linear equations of the form  $y = mx + b$  are functions. They should also be able to define a function as a rule that assigns to each input exactly one output. They should be able to compare properties of two functions represented in different ways (algebraic, graphic, tabular, or verbal).

**Level 4:** Students should be able to give examples of functions that are not linear and be able to compare properties of two nonlinear functions represented in different ways (algebraic, graphic, tabular, or verbal).