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: Expressions and Equations	**Grade Level: 8**
8.EE.B Cluster: Understand the connections between proportional relationships, lines, and linear equations. Connect slope to unit rates, tables, lines, and equations. Connect similar triangles to slope.	
****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.* **8.EE.5** Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed. **8.EE.6** Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation y= mx for a line through the origin and the equation y= mx+ b for a line intercepting the vertical axis at b.	
Aspects of Rigor: (Conceptual, Procedural, and/or Application)	

Conceptual Understanding	***Procedural Fluency***	***Application***
Understand how to find slope given a graph, a table, and an equation. **(8.EE.5)** Know that slope is a unit rate. **(8.EE.5)**	Graph a proportional relationship. **(8.EE.5)**	Compare proportional relationships given a graph, a table, and an equation. **(8.EE.5)** Interpret the slope as the unit rate. **(8.EE.5)**
Explain, using similar right triangles, why the slope between two points on the same non-vertical line is the same. Derive the equations y = mx and y = mx + b by using the slopes from the similar right triangles and the y-intercepts. **(8.EE.6)** Understand the 4 types of slope **(8.EE.6)**: *Positive *Negative *Zero *Undefined	Identify the slope, the y-intercept, and write the equation y = mx or y = mx + b when given a line on a graph. **(8.EE.6)**	

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

1. **Make sense of problems and persevere in solving them.**
2. **Reason abstractly and quantitatively.**
   - Explain what the slope and y-intercept represent on a graph and in context with the proportional relationship.
3. **Construct viable arguments and critique the reasoning of others.**
   - Justify that similar right triangles provide the same slope for the same non-vertical line.
4. **Model with mathematics.**
   - Model a contextual proportional relationship by graphing and writing equations.
5. **Use appropriate tools strategically.**
   - Utilize the coordinate plane (graph paper) to graph lines.
   - Analyze graphs modeled by calculators.
6. **Attend to precision.**
   - Apply labels to the x- and y-axes.
   - Interpret the units for the unit rates.
7. **Look for and make use of structure.**
   - Explain the connection between the three representations of slope (table, graph, and equation).
8. **Look for and express regularity in repeated reasoning.**
   - Use repeated reasoning to create any similar right triangle to find the slope of a line.

Vertical and Horizontal Coherence and Learning Progressions

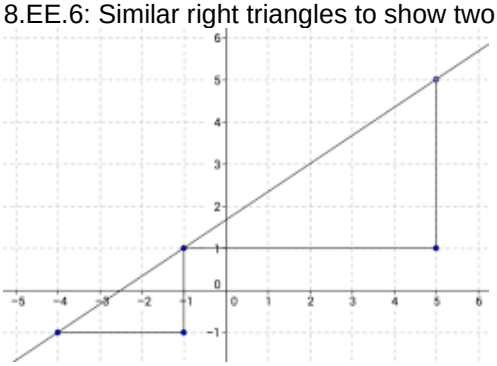
Previous Learning Connections	***Current Learning Connections***	***Future Learning Connections***
In 6th grade, learners 1. use ratio, rate reasoning, and unit rate. In 7th grade, learners 1. compute unit rates and recognize and represent proportional relationships.	In 8th grade, learners 1. will compare properties of functions given a table, a graph, or an equation (Functions).	In high school, learners 1. will understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).

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

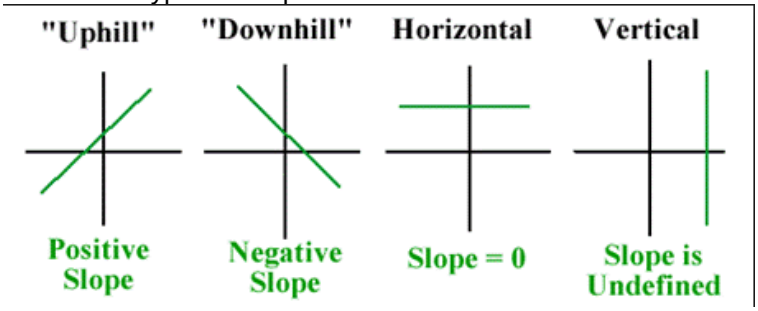
- Proportional Relationships
- Unit Rate
- Slope
- Origin
- Coordinate Plane
- Ordered Pair
- Coordinates
- Y-Intercept
- Similar Triangles
- Linear Equation

Relevance, Explanations, and Examples:

8.EE.6: Similar right triangles to show two different points on same non-vertical line will produce the same slope.



8.EE.6 4 Types of Slope:



Achievement Level Descriptors

Cluster: **Understand the connections between proportional relationships, lines and linear equations.**

Concepts and Procedures	***Level 1:*** Students should be able to graph a proportional relationship on a coordinate plane.
	Level 2: Students should be able to compare two different proportional relationships represented in different ways. They should also be able to calculate the slope of a line and identify the y-intercept of a line.
	Level 3: Students should understand that slope is a unit rate of change in a proportional relationship and convert proportional relationships to linear equations in slope-intercept form while also understanding when and why the y-intercept is zero. They should also be able to use repeated reasoning to observe that they can use any right triangle to find the slope of a line.
	Level 4: Students should be able to use similar triangles to explain why the slope is the same between any two distinct points on a nonvertical line in a coordinate plane.