

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: Functions		Grade Level: 8
8.F.B Cluster: Use functions to model relationships between quantities.		
Determine and interpret the rate of change and the initial value to construct a linear model. Use a real-world situation to sketch a graph and use a graph to write a verbal description of a real-world situation.		
<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>8.F.4: Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.</p> <p>8.F.5: Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.</p>		
Aspects of Rigor: (Conceptual, Procedural, and/or Application)		
Conceptual Understanding	Procedural Fluency	Application
Understand the rate of change represents slope and the initial value represents the y-intercept in a linear relationship. (8.F.4)	Determine the rate of change and the initial value when given: (8.F.4) <ul style="list-style-type: none"> ● Two (x, y) values ● Verbal description ● Table of values ● Graph ● Equation Construct a function to model a linear relationship. (8.F.4)	Interpret the rate the change (slope) and the initial value (y-intercept) in terms of a real-world situation. (8.F.4)
	Describe the graph of a function as: (8.F.5) <ul style="list-style-type: none"> ● Increasing or Decreasing ● Linear or Nonlinear 	Sketch a graph that represents a real-world situation. (8.F.5) Create a story that represents the features of a graph. (8.F.5)
Enacting the Mathematical Practices - Evidence of Students Engaging in the Practices		
1. Make sense of problems and persevere in solving them.		

- Identify and organize the key information in a verbal description.
2. **Reason abstractly and quantitatively.**
 - Interpret key values (intervals, rates, slope, y-intercept) by including relevant measuring units (labels).
 3. **Construct viable arguments and critique the reasoning of others.**
 - Critique the graphs and/or stories that were created by other students.
 4. **Model with mathematics.**
 - Construct an equation to represent a graph, table, and/or verbal description of a linear function.
 5. **Use appropriate tools strategically.**
 - Utilize the coordinate plane (graph paper) to graph relationships.
 6. **Attend to precision.**
 - Use the labels on x- and y-axes to accurately describe and interpret the real-world situation.
 7. **Look for and make use of structure.**
 - Sketch a graph including important features when given a verbal description.
 8. **Look for and express regularity in repeated reasoning.**

Vertical and Horizontal Coherence and Learning Progressions

<i>Previous Learning Connections</i>	<i>Current Learning Connections</i>	<i>Future Learning Connections</i>
<p>In 7th grade, learners</p> <ol style="list-style-type: none"> 1. analyze proportional relationships and use them to solve real-world and mathematical problems 2. solve real-world and mathematical problems using numerical and algebraic expressions and equations. 	<p>In 8th grade, learners</p> <ol style="list-style-type: none"> 1. graph proportional relationships, interpreting the unit rate as the slope of the graph 2. informally fit a straight line to a scatter plot that suggests a linear association and use the equation of a linear model to solve problems in context 3. interpret the equation $y = mx + b$ as defining a linear function 4. understand that a function is a rule that assigns to each input exactly one output 5. compare properties of two functions each represented in a different way 	<p>In high school, learners</p> <ol style="list-style-type: none"> 1. understand the concept of a function and use function notation 2. interpret functions that arise in application in terms of the context 3. choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.

Vocabulary (key terms and definitions)

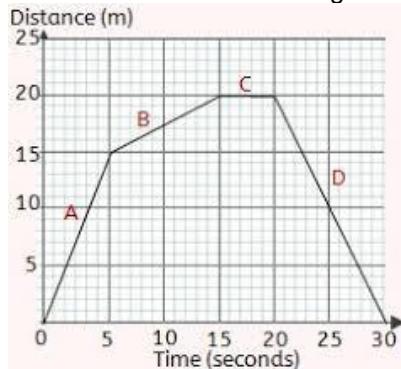
- | | | |
|--|--|--|
| <ul style="list-style-type: none"> • Function • initial value (y-intercept) • Linear • Nonlinear | <ul style="list-style-type: none"> • rate of change (slope) • Increasing • Decreasing | <ul style="list-style-type: none"> • constant (on a graph) • Interval • qualitative |
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Relevance, Explanations, and Examples:

8.F.5: Include intervals when describing the changes in a quantitative graph.

8.F.5: Below is a **quantitative** graph (numbers on axes) representing distance as time increases:

- Part A is increasing on the interval 0-5 seconds
- Part B is increasing at a slower rate than Part A on the interval 5-15 seconds
- Part C is constant (the distance is not changing) on the interval 15-20 seconds
- Part D is decreasing on the interval 20-30 seconds

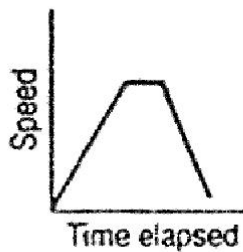


8.F.5:

Below are examples of **qualitative** graphs (no numbers on axes) representing speed as time increases:

5. A child climbs up a slide and then slides down.

a)



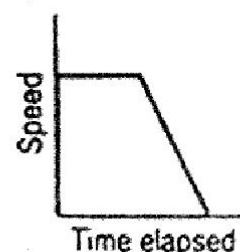
b)



c)



d)



Achievement Level Descriptors

Cluster: Use functions to model relationships between quantities.

Concepts and Procedures

Level 1: Students should be able to identify a function that models a linear relationship between two quantities

Level 2: Students should be able to construct a graphical or tabular model to represent a linear relationship between two quantities and should be able to find the rate of change of a linear relationship displayed in a graph or table. They should be able to analyze a graph of a linear function to qualitatively describe it.

Level 3: Students should be able to construct a function to represent a linear relationship between two quantities and construct a graph to represent verbally described qualitative features. Determine the rate of change and initial value of a function from a graph, a verbal description of a relationship, or from two sets of xy -values given as coordinate pairs or displayed in a table. They should be able to analyze a graph of a linear or nonlinear function to qualitatively describe it.

Level 4: Students should be able to interpret the rate of change and initial value of a linear function in terms of the situation it models and in terms of its

	graph or a table of values.
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