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.*

<table>
<tr><td colspan="2">Domain: Interpreting Categorical and Quantitative Data</td><td>Grade Level: Algebra 1</td></tr>
<tr><td colspan="3">A1.S.ID.B Cluster: Summarize, represent and interpret data on two categorical and quantitative variables.

Construct two-way frequency tables and calculate relative frequencies in context.
Determine a function (linear, quadratic, or exponential) that best fits a set of data and use the function to solve problems within a context.
Use residuals to determine if a function is a good fit for the data set.</td></tr>
<tr><td colspan="3">**This is a SUPPORTING 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.

A1.S.ID.B.5 Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.

A1.S.ID.B.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.
a. Determine the function (linear, quadratic, or exponential model) that best fits a set of data and use that function fitted to data to solve problems within context.
b. Informally and using technology assess the fit of a function by plotting and analyzing residuals.
c. Fit a linear function for a scatter plot that suggests a linear association.</td></tr>
<tr><td colspan="3">Aspects of Rigor: (Conceptual, Procedural, and/or Application)</td></tr>
<tr><td colspan="3">A1.S.ID.B.5 Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.</td></tr>
<tr><td>Conceptual Understanding</td><td>Procedural Fluency</td><td>Application</td></tr>
<tr><td>Understand how to construct a two-way frequency table for categorical data in two categories.

Understand different relative frequencies exist within one single two-way table depending upon the two categories being related.

Note: The terms joint, marginal, and conditional relative frequencies is not required for students to know.</td><td>Construct a two-way frequency table.

Calculate a relative frequency (including joint, marginal, and conditional relative frequencies).</td><td>Interpret the relative frequency based on the context of the data from a two-way table.</td></tr>
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</table>

a. Determine the function (linear, quadratic, or exponential model) that best fits a set of data and use that function fitted to data to solve problems within context.
b. Informally and using technology assess the fit of a function by plotting and analyzing residuals.
c. Fit a linear function for a scatter plot that suggests a linear association.

Conceptual Understanding	***Procedural Fluency***	***Application***
Understand how to identify a linear, quadratic, or exponential model from a table, graph, and/or contextual situation. Understand the meaning of a residual. Understand a best-fit function is a function that best fits the shape of the scatter plot of the data. (It does not necessarily intersect data points or the origin.) Understand a best-fit function can only be used to make a prediction and not an exact calculation. Understand how to identify a line of best fit to a scatter plot that represents a linear association. Understand predictions made outside the range of the data assumes the trend in the data will continue.	Identify how variables in a set of data are related: linear, quadratic, or exponential. Fit a linear, quadratic, or exponential function (informally and by using technology) to a set of data. Assess the reasonableness of fit for a line drawn as a model for a linear association. Use a residual plot to determine whether the function is a good model for the data (informally and by using technology).	Use the function, fitted to the data, to solve problems within the context. Make predictions (extrapolate, interpolate) using best-fit models in the context of a situation.

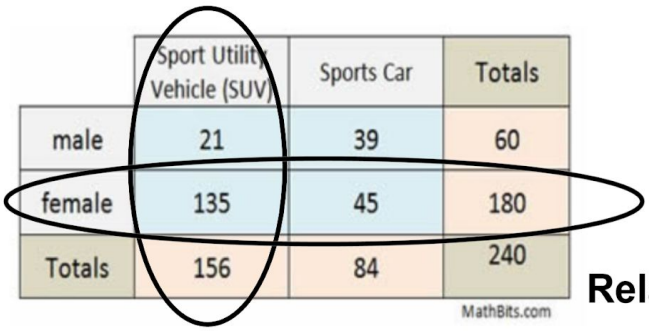
Enacting the Mathematical Practices - Evidence of Students Engaging in the Practices

1. **Make sense of problems and persevere in solving them.**
   - Create two-way tables and scatter plots to make sense of the problems.
2. **Reason abstractly and quantitatively.**
   - Make predictions using a best-fit model and relate it to the context of the situation.
3. **Construct viable arguments and critique the reasoning of others.**
   - Verbally justify why a model is a best-fit for a function.
4. **Model with mathematics.**
   - Create and use a function to model a linear, quadratic, or exponential representation.
5. **Use appropriate tools strategically.**
   - Use technology to create scatter-plots, calculate a best-fit function, and establish its reasonableness based on a residual plot.
6. **Attend to precision.**
   - Identify and find the relative frequency from a two-way table based on what's asked.
7. **Look for and make use of structure.**
8. **Look for and express regularity in repeated reasoning.**

Vertical and Horizontal Coherence and Learning Progressions

Previous Learning Connections	***Current Learning Connections***	***Future Learning Connections***
In middle school, learners: 1. construct and interpret two-way tables using frequencies and relative	In Algebra 1, learners: 1. write functions for linear, quadratic, and exponential representations	In future courses, learners: 1. calculate best-fit models for different types of functions including polynomial and

frequencies 2. use relative frequencies to describe a possible association between two variables 3. construct and interpret scatter plots 4. construct an equation or a function to model a linear relationship and determine/interpret the slope and y-intercept	2. identify representations as linear, quadratic and exponential models 3. construct and compare linear and exponential to solve problems.	trigonometric 2. construct and interpret two-way frequency tables to determine independence 3. construct and interpret two-way frequency tables to calculate conditional probabilities.
Vocabulary *(Key Terms Used by Teachers and Students in this Cluster):*		
● Two-way Table ● Relative frequency ● Frequency ● Categorical Data ● Extrapolate	● Interpolate ● Residual ● Best-line model ● Residual plot	
Relevance, Explanations, and Examples:		



	Sport Utility Vehicle (SUV)	Sports Car	Totals
male	21	39	60
female	135	45	180
Totals	156	84	240

MathBits.com

Conditional Frequency

$$\frac{21}{156} = 0.13$$

Relative frequency of SUV owners that are male

Conditional Frequency

$$\frac{135}{180} = 0.75$$

Relative frequency of females that own an SUV

Achievement Level Descriptors	
Cluster: **Summarize, represent and interpret data on two categorical and quantitative variables.**	
Concepts and Procedures	***Level 1:*** Students should be able to summarize and represent a data set in two categorical and quantitative variables.
	Level 2: Students should be able to summarize categorical data for two categories and represent data on two quantitative variables on a scatter plot. Describe and use appropriate function notation when assessing residuals.
	Level 3: Students recognize the type of models that could be used to fit the data and assess the fit of the models by examining and discussing the patterns in the residual plot.
	Level 4: Students should be able to interpret relative frequencies in the context of the data with possible associations and trends in the data. Justify extrapolation and interpolation throughout the data.