SD Common Core State Standards Disaggregated Math Template

Domain:	Statistics and Probability	**Cluster:**	Investigate patterns of association in bivariate data	**Grade level:**	8

Correlating Standard in Previous Year	Number Sequence & Standard	Correlating Standard in Following Year
7.SP.4 Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.	8.SP.1 Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities.Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.	S-ID.6 (a-c) Represent data on two quantitative variables on a scatter plot and describe how the variables are related

Student Friendly Language:
I can make a scatter plot when given information about two variables. I can describe the data contained in a scatter plot. I can describe what clustering and outliers mean in a scatter plot. I can recognize a positive or negative association in a scatter plot. I can recognize a linear or nonlinear association in a scatter plot.

Know (Factual)	**Understand (Conceptual) The students will understand that:**	**Do (Procedural, Application, Extended Thinking)**
• Scatter plot • Clustering and outliers • Positive and negative associations • Linear and nonlinear associations	Scatter plots can be used to display 2 sets of numerical data. One set is graphed on the x-axis and the other is graphed on the y-axis. They can use the scatter plot to examine relationships between variables. The relationship is linear (positive, negative or no association) or nonlinear.	Construct a scatter plot from 2 variable data. Describe the data in the scatter plot, in particular any clustering or outliers, Describe positive or negative associations apparent in scatter plot. Describe the linear or nonlinear associations of the scatter plot. Make generalizations about the associations found in the data.

Key Vocabulary:					
scatter plot	variables	bivariate data	clustering	outliers	positive association
x-axis	y-axis	negative association	linear association	nonlinear association	

Relevance and Applications: How might the grade level expectation be applied at home, on the job or in a real-world, relevant context? Include at least one example stem for the conversation with students to answer the question "why do I have to learn this"?

Given the hot chocolate sales and the temperature at the football game, sandwich sales and temp and/or lemonade sales and temp, create a scatter plot and describe the association between the two variables

Measure your arm span and height. Combine your data with the class. Create a scatter plot. Describe the association.

Data for 10 students' Math and Science scores are provided in the chart. Describe the association between the Math and Science scores.

Student	1	2	3	4	5	6	7	8	9	10
Math	64	50	85	34	56	24	72	63	42	93
Science	68	70	83	33	60	27	74	63	40	96

Data for 10 students' Math scores and the distance they live from school are provided in the table below. Describe the association between the Math scores and the distance they live from school.

Student	1	2	3	4	5	6	7	8	9	10
Math score	64	50	85	34	56	24	72	63	42	93
Dist from school (miles)	0.5	1.8	1	2.3	3.4	0.2	2.5	1.6	0.8	2.5

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Data from a local fast food restaurant is provided showing the number of staff members and the average time for filling an order are provided in the table below. Describe the association between the number of staff and the average time for filling an order.

Number of staff	3	4	5	6	7	8
Average time to fill order (seconds)	180	138	120	108	96	84

Thanks to Arizona Dept of Education for several examples

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7.SP.4 Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.	8.SP.2 Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.	S-ID.6 (a-c) Represent data on two quantitative variables on a scatter plot and describe how the variables are related

Student Friendly Language:

I can use a line to model relationships between two sets of data.

I can see that some scatter plots will resemble a straight line.

I can use a straight line to assess the model fit by judging the closeness of the data points to the line.

Know (Factual)	Understand (Conceptual) The students will understand that:	Do (Procedural, Application, Extended Thinking)
• Linear association • Informal line of best fit • Modeling data with a linear model	If the relationship suggests a linear association, then a straight line can be used to model the bivariate data . They can assess the model fit by judging how well the data set closely fits the line.	Determine whether a graph of bivariate data resembles a linear association. Model the data by approximating it with a straight line. Determine whether an informal line of best fit in a scatter plot is a good model to use for this data.

Key Vocabulary:

linear association line of best fit linear model

Relevance and Applications: How might the grade level expectation be applied at home, on the job or in a real-world, relevant context? Include at least one example stem for the conversation with students to answer the question "why do I have to learn this"?

Given the following scenarios, informally fit a straight line to the data when it is graphed. Is the line a good fit to the data? Why or why not?

Measure your arm span and height. Combine your data with the class. Create a scatter plot. Describe the relationship.

Data from a local fast food restaurant is provided showing the number of staff members and the average time for filling an order. Describe the association between the number of staff and the average time for filling an order.

Number of staff	3	4	5	6	7	8
Average time to fill order (seconds)	180	138	120	108	96	84

The capacity of the fuel tank in a car is 13.5 gallons. The table below shows the number of miles traveled and how many gallons of gas are left in the tank. Describe the relationship between the variables. If the data is linear, determine a line of best fit. Do you think the line represents a good fit for the data set? Why or why not?

Miles Traveled	0	75	120	160	250	300
Gallons Used	0	2.3	4.5	5.7	9.7	10.7

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7.SP.4 Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.	8.SP.3 Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.	S-ID.6 (a-c) Represent data on two quantitative variables on a scatter plot and describe how the variables are related S-ID.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

Student Friendly Language:

I can create a scatter plot and draw a best fit line for two sets of data.
I can find the slope and y-intercept of the line and write an equation for the line.
I can use the equation to explain what the slope and y-intercept mean.

Know (Factual)	Understand (Conceptual) The students will understand that:	Do (Procedural, Application, Extended Thinking)
• Linear model • Slope and y-intercept • Equations written in slope-intercept form	They can create an equation for a linear model. They can use the equation to identify the slope and y-intercept. They can interpret what the slope and y-intercept mean for a given situation. They can use the equation to predict what could happen.	Create a linear model by drawing in a best fit line on a graph of bivariate data. Write an equation in slope-intercept form for the linear model. Interpret what the slope and y-intercept represent in a given situation. Predict what could happen when using the equation.

Key Vocabulary:

linear model slope y-intercept slope-intercept form scatter plot line of best fit

Relevance and Applications: How might the grade level expectation be applied at home, on the job or in a real-world, relevant context? Include at least one example stem for the conversation with students to answer the question "why do I have to learn this"?

Given the following scenarios, informally fit a straight line to the data when it is graphed. Create an equation written in slope-intercept form and interpret what the slope and y-intercept mean.

Measure your arm span and height. Combine your data with the class. Create a scatter plot. Describe the relationship.

Data from a local fast food restaurant is provided showing the number of staff members and the average time for filling an order. Describe the association between the number of staff and the average time for filling an order.

Number of staff	3	4	5	6	7	8
Average time to fill order (seconds)	180	138	120	108	96	84

The chart below lists the life expectancy in years for people in the United States every five years from 1970 to 2005. What would you expect the life expectancy of a person in the United States to be in 2010, 2015, and 2020 based upon this data? Explain how you determined your values.

Date	1970	1975	1980	1985	1990	1995	2000	2005
Life Expectancy (in years)	70.8	72.6	73.7	74.7	75.4	75.8	76.8	77.4

The capacity of the fuel tank in a car is 13.5 gallons. The table below shows the number of miles traveled and how many gallons of gas are left in the tank. Describe the relationship between the variables. If the data is linear, determine a line of best fit. Do you think the line represents a good fit for the data set? Why or why not? What is the average fuel efficiency of the car in miles per gallon?

Miles Traveled	0	75	120	160	250	300
Gallons Used	0	2.3	4.5	5.7	9.7	10.7

Thanks to Arizona Dept of Education for use of examples

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7.SP.4 Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.	8.SP.4 Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?	S.ID.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.*

Student Friendly Language:
I can read a two-way table. I can collect data with two variables. I can count the frequency of the two data sets and display it in a two-way table I can describe whether there is any association between the two variables.

Know (Factual)	Understand (Conceptual) The students will understand that:	Do (Procedural, Application, Extended Thinking)
• Bivariate categorical data • Two-way table	They can collect bivariate data. They can display frequencies in a two-way table. They can use relative frequencies to make generalizations about the information in the table.	Determine two variables that may be related. Gather bivariate data on the two variables. Construct a two-way table to display the data. Describe possible associations between the two variables. Make generalizations about the associations.

Key Vocabulary:			
bivariate categorical data	two-way table	frequency	relative frequencies

Relevance and Applications: How might the grade level expectation be applied at home, on the job or in a real-world, relevant context? Include at least one example stem for the conversation with students to answer the question "why do I have to learn this"?

The table illustrates the results when 100 students were asked the survey questions: Do you have a curfew? and Do you have assigned chores? Is there evidence that those who have a curfew also tend to have chores?

		CURFEW	
		YES	NO
CHORES	YES	40	10
	NO	10	40

Solution: Of the students who answered that they had a curfew, 40 had chores and 10 did not. Of the students who answered they did not have a curfew, 10 had chores and 40 did not. From this sample, there appears to be a positive correlation between having a curfew and having chores.

Example 1:
Twenty-five students were surveyed and asked if they received an allowance and if they did chores. The table
below summarizes their responses.

	Receive Allowance	No Allowance
Do Chores	15	5
Do Not Do Chores	3	2

Of the students who do chores, what percent do not receive an allowance?
Solution: 5 of the 20 students who do chores do not receive an allowance, which is 25%
5 of the 20 students who do chores do not receive an allowance, which is 25%

Thanks to Arizona Dept of Education

Survey 100 of your classmates with these questions:
1. Do you play in the school band?
2. Are you on the honor roll?

Create a two-way table. Is there evidence that those who play in the school band are also on the honor roll? Justify your answer.

Choose 2 variables which you think might have either a positive or negative association. Create 2 questions. Survey 100 of your classmates. Create a two-way table. Is there evidence that there is an association between the 2 variables. Justify your answer.