Reporting Measure: Bivariate Categorical Data

Level	Description
Above & Beyond (4.0)	The student will: • Account for any properties of a given set of bivariate data that might influence or distort the conclusions drawn from it (for example, when given a two-way table displaying the favorite type of pet of boys and girls in a class, explain that the fact that 60% of the students who preferred a given pet as their favorite were female does not suggest a clear association between gender and pet preference if 60% of the total number of students surveyed were female).
3.5	In addition to score 3.0 performance, partial success at score 4.0 content
Proficient (3.0)	The student will: **BCD1—Create two-way tables to solve problems involving bivariate categorical data** (for example, when given the results of a survey on the favorite type of pet of boys and girls in a class, arrange the data in a two-way table, determine how many students out of those who preferred a given type of pet were male versus female, and determine how many female students out of the total number surveyed described a given type of pet as their favorite). **BCD2—Determine relative frequencies for data displayed in a two-way table** (for example, when given a two-way table displaying the favorite type of pet of boys and girls in a class, determine the percentage of male students who preferred a given type of pet over others, and determine the percentage of students preferring a given type of pet who were male versus those who were female). **BCD3—Determine possible associations between categories displayed in a two-way table** (for example, when given a two-way table displaying the favorite type of pet of boys and girls in a class, determine whether or not the data suggests an association between a preferred type of pet and the gender of the respondent, and justify the conclusion).
2.5	No major errors or omissions regarding score 2.0 content, and partial success at score 3.0 content
Getting There (2.0)	**BCD1—**The student will recognize or recall specific vocabulary (for example, *bivariate data*, *categorical data*, *category*, *numerical data*, *two-way table*) and perform basic processes such as: • Identify two-way tables. • Describe the components (categories, frequencies, category totals, total number of data points) of a two-way table. • Identify the categories of a given set of bivariate categorical data. For example, when given a set of survey data representing the number of students from each grade whose favorite food is pizza, hamburgers, or ice cream, explain that "grade level" and "favorite food" are the categories or variables represented by the data set. • Explain that the frequencies in the cells of a two-way table indicate the number of data points that are simultaneously associated with the categories indicated by both the row and column of that cell. For example, when given a two-way table displaying the number of students from each grade who described pizza, hamburgers, or ice cream as their favorite food, explain that the cell belonging to the row "eighth grade" and the column

"pizza" displays the number of students who are both in eighth grade and who described pizza as their favorite food.

BCD2—The student will recognize or recall specific vocabulary (for example, *conditional relative frequency*, *frequency*, *joint frequency*, *marginal frequency*, *relative frequency*) and perform basic processes such as:

• Interpret data from two-way tables.

• Express a frequency displayed in a two-way table as a ratio comparing the frequency to its associated category totals. For example, when given a two-way table representing data from a survey of male and female students who described either math or social studies as their favorite subject, and when given that 26 males preferred math, 22 females preferred math, 24 males preferred social studies, and 28 females preferred social studies, explain that 26 out of 50 males described math as their favorite subject and that 26 out of the 48 students who described math as their favorite subject were male.

• Determine the frequency and category total that must be compared in order to compute a specified relative frequency for a given two-way table. For example, when given a two-way table displaying the number of surveyed male and female students who described a given subject as their favorite, determine which frequency and category total must be compared to compute the relative frequency of male students who, out of all the male students surveyed, preferred social studies.

• Calculate the ratio between two quantities as a percentage. For example, when given that 26 out of 50 surveyed male students described math as their favorite subject, explain that 52% of the surveyed male students described math as their favorite subject.

• Differentiate between frequencies (category counts), marginal frequencies (category totals), and relative frequencies (conditional relative frequencies or the ratios of frequencies to their associated category totals).

BCD3—The student will recognize or recall specific vocabulary (for example, *association*) and perform basic processes such as:

• Interpret a relative frequency in terms of its context. For example, when given a two-way table depicting the number of surveyed seventh- and eighth-grade students who described math, social studies, or English as their favorite subject, explain that a relative frequency comparing a cell in the "seventh grade" row to its row category total indicates the ratio or percentage of seventh-grade students who, out of all the seventh-grade students surveyed, preferred the subject indicated by the cell's column.

• Determine whether or not the relative frequencies of the cells in a specified row or column of a two-way table display significant differences. For example, when given the relative frequencies of the number of seventh-grade students who described either math, social studies, or English as their favorite subject, determine whether or not the distribution of relative frequencies indicates a significant preference for any of the subjects.

• Explain that the distribution of relative frequencies in the different rows or columns of a two-way table can be compared to determine possible associations between the categories of the data. For example, when given that the relative frequencies of a two-way table indicate that seventh-grade students described social studies as their favorite subject and eighth-grade students prefer math, explain that the difference in preference between grade levels indicates a possible association between grade level and subject preference.

• Explain that a difference in the distribution of relative frequencies between the different rows or columns of a two-way table suggests a possible association between the categories of the data, while a lack of difference suggests a lack of association. For example, when given a two-way table depicting the relative frequencies of seventh- and eighth-grade students who described math, social studies, or English as their favorite subject, explain that a similarity in the relative frequency distributions of subject

		preferences for both seventh and eighth graders suggests a lack of association between grade level and subject preference.
	1.5	Partial success at score 2.0 content, and major errors or omissions regarding score 3.0 content
Beginning (1.0)		With help, partial success at score 2.0 content and score 3.0 content