8.5.4 Summarizing Bivariate Categorical Data: Lesson 1

Problem Set

Several students at Rufus King High School were debating whether males or females were more involved in after-school activities. There are three organized activities in the after-school program—intramural basketball, chess club, and jazz band. Due to budget constraints, a student can only select one of these activities. The students were not able to ask every student in the school whether they participated in the after-school program or what activity they selected if they were involved.

1. Write questions that could be included in the survey to investigate the question the students are debating. Questions that could be used for this study include the following:
2. Rufus King High School has approximately students. Sam suggested that the first students entering the cafeteria for lunch would provide a random sample to analyze. Janet suggested that they pick students based on a school identification number.

Who has a better strategy for selecting a random sample?

How do you think students could be randomly selected to complete the survey?

1. Consider the following results from randomly selected students:
* Of the female students selected, of them played intramural basketball, played chess, and were in the jazz bland. The rest of them did not participate in the after-school program.
* Of the male students, did not participate in the after-school program, played intramural basketball, played in the jazz band, and the rest played chess.

A two-way frequency table to summarize the survey data was started. Indicate what label is needed in the table cell identified with a ???.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Intramural Basketball** | **Chess Club** | **Jazz Band** | **???** | **Total** |
| **Female** |  |  |  |  |  |
| **Male** |  |  |  |  |  |
| **Total** |  |  |  |  |  |

1. Complete the above table for the students who were surveyed.
2. The table shows the responses to the after-school activity question for males and females. Do you think there is a difference in the responses of males and females? **Justify** your answer.

Summarizing Bivariate Categorical Data with Relative Frequencies: Lesson 2 Problem Set

1. Consider the Rufus King High School data from the previous lesson regarding after-school activities:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Intramural Basketball** | **Chess Club** | **Jazz Band** | **Not Involved** | **Total** |
| **Males** |  |  |  |  |  |
| **Females** |  |  |  |  |  |
| **Total** |  |  |  |  |  |

Calculate the relative frequencies for each of the cells to the nearest thousandth. Place the relative frequencies in the cells of the following table. (The first cell has been completed as an example.)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Intramural Basketball** | **Chess Club** | **Jazz Band** | **Not Involved** | **Total** |
| **Males** |  |  |  |  |  |
| **Females** |  |  |  |  |  |
| **Total** |  |  |  |  |  |

1. Based on your relative frequency table, what is the relative frequency of students who indicated they play basketball?
2. Based on your table, what is the relative frequency of males who play basketball?
3. If a student were randomly selected from the students at the school, do you think the student selected would be a male or a female? Why?
4. If a student were selected at random from school, do you think this student would be involved in an after-school program? Explain your answer.
5. Why might someone question whether or not the students who completed the survey were randomly selected? If the students completing the survey were randomly selected, what do the marginal relative frequencies possibly tell you about the school? Explain your answer.
6. Why might females think they are more involved in after-school activities than males? Explain your answer.

Conditional Relative Frequencies and Association: Lesson 3 Problem Set

Consider again the summary of data from the randomly selected students in the Rufus King High School investigation of after-school activities and gender.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Intramural Basketball** | **Chess Club** | **Jazz Band** | **Not Involved** | **Total** |
| **Females** |  |  |  |  |  |
| **Males** |  |  |  |  |  |
| **Total** |  |  |  |  |  |

1. Construct a row conditional relative frequency table for this data. Decimal values are given to the nearest thousandth.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Intramural Basketball** | **Chess Club** | **Jazz Band** | **Not Involved** | **Total** |
| **Females** |  |  |  |  |  |
| **Males** |  |  |  |  |  |
| **Total** |  |  |  |  |  |

1. For what after-school activities do you think the row conditional relative frequencies for females and males are very different?

 What might explain why males or females select different activities?

1. If John, a male student at Rufus King High School, completed the after-school survey, what would you predict was his response? Explain your answer.
2. If Beth, a female student at Rufus King High School, completed the after-school survey, what would you predict was her response? Explain your answer.
3. Notice that female students participate in intramural basketball and that male students participate in intramural basketball. Is it accurate to say that females and males are equally involved in intramural basketball? Explain your answer.
4. Do you think there is an association between gender and choice of after-school program? Explain.

*Column conditional relative frequencies* can also be computed by dividing each frequency in a frequency table by the corresponding column total to create a column conditional relative frequency table. Column conditional relative frequencies indicate the proportions, or relative frequencies, based on the column totals.

1. If you wanted to know the relative frequency of females surveyed who participated in chess club, would you use a row conditional relative frequency or a column conditional relative frequency?
2. If you wanted to know the relative frequency of band members surveyed who were female, would you use a row conditional relative frequency or a column conditional relative frequency?
3. For Summit’s Presidential Election survey data, write a question that would be answered using a row conditional relative frequency.
4. For Summit’s Presidential Election survey data, write a question that would be answered using a column conditional relative frequency.