

Name \_\_\_\_\_

Date \_\_\_\_\_

## Summarizing Bivariate Categorical Data in a Two-Way

### Table

1. Explain what the term *bivariate categorical data* means.
2. Explain how to calculate relative frequency. What is another word for *relative frequency*?

Every student at Abigail Douglas Middle School is enrolled in exactly one extracurricular activity. The school counselor recorded data on extracurricular activity and gender for all 254 eighth-grade students at the school .

The counselor’s findings for the 254 eighth-grade students are the following:

- Of the 80 students enrolled in band, 42 are male.
- Of the 21 students enrolled in art, 9 are female.
- Of the 65 students enrolled in choir, 20 are male.
- Of the 88 students enrolled in sports, 30 are female.

1. Complete the table below.

		Extracurricular Activities				
		Band	Choir	Sports	Art	Total
Gender	Female					
	Male					
	Total					

2. Write a sentence explaining the meaning of the frequency 38 in this table.
3. What proportion of students is male and enrolled in choir?
4. What proportion of students is enrolled in a musical extracurricular activity (i.e., band or choir)?
5. What proportion of male students is enrolled in sports?

6. What proportion of students enrolled in sports is male?

A pregnant woman will often undergo ultrasound tests to monitor her baby’s health. These tests can also be used to predict the gender of the baby, but these predictions are not always accurate. Data on the gender predicted by ultrasound and the actual gender of the baby for 1,000 babies are summarized in the two-way table below.

		Predicted Gender	
		Female	Male
Actual Gender	Female	432	48
	Male	130	390

7. Write a sentence explaining the meaning of the frequency 130 in this table.
8. What is the proportion of babies predicted to be male but were actually female?
9. What is the proportion of incorrect ultrasound gender predictions?
10. For babies predicted to be female, what proportion of the predictions was correct?
11. For babies predicted to be male, what proportion of the predictions was correct?

3. A random group of students is polled about how they get to school. The results are summarized in the table below.

		School Transportation Survey			
		Walk	Ride Bus	Carpool	Total
Gender	Male	9	26	9	44
	Female	8	26	24	58
Total		17	52	33	102

- a. Calculate the relative frequencies for the table above. Write them as a percent in each cell of the table. Round to the nearest tenth of a percent.
- b. What is the relative frequency for the Carpool category? Write a sentence interpreting this value in the context of school transportation.
- c. What is the proportion of students that are female and walk to school? Write a sentence interpreting this value in the context of school transportation.
- d. A student is selected at random from this school. What would you predict this student’s mode of school transportation to be? Explain.

1. Explain what the term *bivariate categorical data* means.

*Bivariate categorical data means that the data set comprises data on two variables that are both categorical.*

2. Explain how to calculate relative frequency. What is another word for *relative frequency*?

*Relative frequency is calculated by dividing a frequency by the total number of observations. Another word for relative frequency is proportion.*

3. A random group of students is polled about how they get to school. The results are summarized in the table below.

		School Transportation Survey			
		Walk	Ride Bus	Carpool	Total
Gender	Male	9 ≈ 8.8%	26 ≈ 25.5%	9 ≈ 8.8%	44 ≈ 43.1%
	Female	7 ≈ 6.9%	26 ≈ 25.5%	25 ≈ 24.5%	58 ≈ 56.9%
	Total	16 ≈ 15.7%	52 ≈ 51.0%	34 ≈ 33.3%	102 100.0%

- a. Calculate the relative frequencies for the table above. Write them as a percent in each cell of the table. Round to the nearest tenth of a percent.

*See the completed table above.*

- b. What is the relative frequency for the Carpool category? Write a sentence interpreting this value in the context of school transportation.

*The relative frequency is 0.333, or 33.3%. Approximately 33.3% of the students surveyed use a carpool to get to school.*

- c. What is the proportion of students that are female and walk to school? Write a sentence interpreting this value in the context of school transportation.

*The proportion is 0.069, or 6.9%. Approximately 6.9% of the students surveyed are female and walk to school.*

- d. A student is selected at random from this school. What would you predict this student's mode of school transportation to be? Explain.

*I would predict the student would ride the bus because more students in the survey choose this mode of transportation.*

Every student at Abigail Douglas Middle School is enrolled in exactly one extracurricular activity. The school counselor recorded data on extracurricular activity and gender for all 254 eighth-grade students at the school.

The counselor's findings for the 254 eighth-grade students are the following:

- Of the 80 students enrolled in band, 42 are male.
- Of the 21 students enrolled in art, 9 are female.
- Of the 65 students enrolled in choir, 20 are male.
- Of the 88 students enrolled in sports, 30 are female.

1. Complete the table below.

		Extracurricular Activities				
		Band	Choir	Sports	Art	Total
Gender	Female	38	45	30	9	122
	Male	42	20	58	12	132
	Total	80	65	88	21	254

2. Write a sentence explaining the meaning of the frequency 38 in this table.

*The frequency of 38 represents the number of eighth-grade students who are enrolled in band and are female.*

3. What proportion of students is male and enrolled in choir?

$$\frac{20}{254} \approx 0.08$$

4. What proportion of students is enrolled in a musical extracurricular activity (i.e., band or choir)?

$$\frac{80 + 65}{254} \approx 0.57$$

5. What proportion of male students is enrolled in sports?

$$\frac{58}{132} \approx 0.44$$

6. What proportion of students enrolled in sports is male?

$$\frac{58}{88} \approx 0.66$$

A pregnant woman will often undergo ultrasound tests to monitor her baby's health. These tests can also be used to predict the gender of the baby, but these predictions are not always accurate. Data on the gender predicted by ultrasound and the actual gender of the baby for 1,000 babies are summarized in the two-way table below.

		Predicted Gender	
		Female	Male
Actual Gender	Female	432	48
	Male	130	390

7. Write a sentence explaining the meaning of the frequency 130 in this table.

*The frequency of 130 represents the number of babies predicted to be female but were actually male (i.e., the ultrasound prediction was not correct for these babies).*

8. What is the proportion of babies predicted to be male but were actually female?

$$\frac{48}{1000} \approx 0.048$$

9. What is the proportion of incorrect ultrasound gender predictions?

$$\frac{130 + 48}{1000} \approx 0.178$$

10. For babies predicted to be female, what proportion of the predictions was correct?

$$\frac{432}{562} \approx 0.769$$

11. For babies predicted to be male, what proportion of the predictions was correct?

$$\frac{390}{438} \approx 0.890$$