

16.3 Exercises

Basic Concepts

1. Give two examples of relationships between qualitative variables that would be of interest to a manager in a business setting.
2. Explain the difference between the chi-square test for goodness of fit and the chi-square test for association.
3. What is a contingency table?
4. Describe the information that each cell in a contingency table gives.
5. What properties must the two categories of the contingency table possess?
6. What level(s) of measurement may the categories of a contingency table have?
7. Consider the variable income. Describe how this variable could be transformed to be included in a contingency table. Is information lost during the transformation?
8. Explain why a test for association is not valid if single data points are allowed to belong to more than one category.
9. Restate the multiplication rule for independent events. Explain how this rule pertains to the chi-square test for association.
10. State the null and alternative hypotheses for a chi-square test for association between two qualitative variables.
11. What is the test statistic for the chi-square test for association?
12. How many degrees of freedom are associated with the test statistic given in Exercise 11?

Exercises

13. A political analyst is interested in studying the relationship between age and political affiliation. The analyst randomly selects 200 people and determines their age and political affiliation. The number of responses in each of the categories is as follows.

Age and Political Affiliation			
Age	Political Affiliation		
	Democrat	Republican	Independent
18–34	50	10	15
35–51	15	25	15
52–68	25	35	10

- a. Can the analyst conclude that age and political affiliation are dependent at $\alpha = 0.05$?
- b. What assumptions were made in the test for part a.?

14. A sociologist is interested in studying the relationship between education and crime. She randomly selects 150 people and asks their education level and whether or not they have ever been convicted of a felony. The following table displays the number of respondents in each category.

Education and Crime		
Have you ever been convicted of a felony?		
Education Level	Response	
	Yes	No
Less Than 9 Years	2	35
9 Years to 12 Years	4	31
12 Years to 16 Years	1	31
16+ Years	4	42

- a. Can the sociologist conclude that education level and crime are dependent at $\alpha = 0.10$?
- b. What assumptions were made in the test for part a.?
15. A psychologist is preparing his thesis on child abuse. He thinks that there may be a relationship between various types of child abuse and the age of the child. To study this, he randomly selects the records of 197 abused children and determines both the age group in which each child falls (Tweens (ages 9-12) and Teens (ages 13-17)) and the documented type of child abuse. The results of the study are as follows.

Child Abuse		
Type of Abuse	Age Group	
	Tweens	Teens
Neglect	50	50
Physical	20	30
Sexual	10	19
Emotional	10	8

- a. Can the psychologist conclude that the type of child abuse and age group in which the child falls are dependent at $\alpha = 0.05$?
- b. What assumptions were made in the test for part a.?
16. The National Fire Protection Association is interested in studying the relationship between the causes of fires and the region of the country in which the fires occur. They randomly select 500 fires and determine the region of the country in which the fire occurred and cause of the fire with the following results.

Fires				
Cause of Fire	Region			
	North	South	East	West
Smoking	37	38	40	35
Heating Equipment	25	20	18	19
Arson	17	15	16	15
Electrical	12	13	12	13
Children at Play	10	11	12	11
Other	27	28	29	27

- a. Can the association conclude that the cause of the fire and the region of the fire are dependent at $\alpha = 0.01$?
- b. What assumptions were made in the test for part a.?