

L19: Homework Answer Key

Instructions: You are encouraged to collaborate with other students on the homework, but it is important that you do your own work. Before working with someone else on the assignment, you should attempt each problem on your own.

A study conducted among college students looked at the influence of religiosity on positive and negative outcomes associated with stress. The analyses are based on 742 college students at a large school in the United States. The students completed a cross-sectional survey. The following problem is based on the some of the data collected from the study. One of the questions on the study asked, "In the last month, how often have you been angered because of things that happened outside of your control? Using the data below, determine if frequency of anger in the last month is shaped by levels of religiosity. Use a level of significance of $\alpha = 0.05$.

In the last month, how often have you been angered because of something that happened outside of your control?

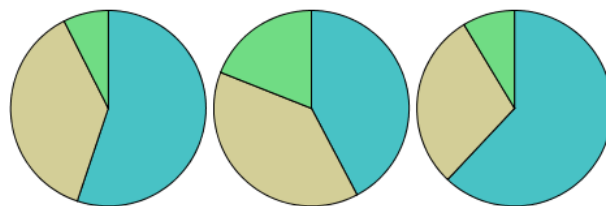
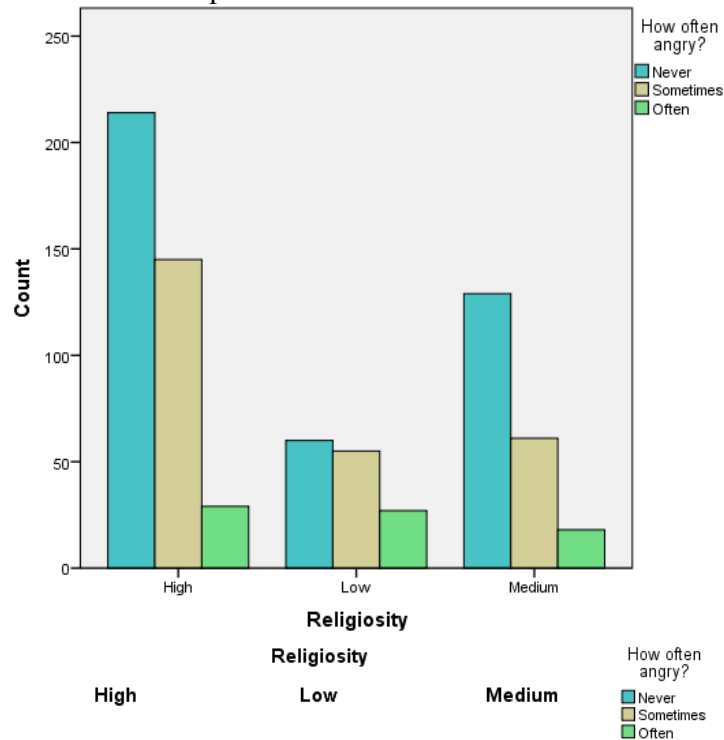
	Religiosity		
	High	Medium	Low
Never	214	129	60
Sometimes	145	61	55
Often	29	18	27

Note for 221B/221C students — You will need to input your data into SPSS as follows. Make sure to go to "Variable View" (found at the bottom of the screen) and change the width of the Religiosity variable to 6 and the Anger variable to 9 so that all of the letters for each category will be displayed.

	Religiosity	Anger	Count
1	High	Never	214
2	High	Sometimes	145
3	High	Often	29
4	Medium	Never	129
5	Medium	Sometimes	61
6	Medium	Often	18
7	Low	Never	60
8	Low	Sometimes	55
9	Low	Often	27
10			

Use this information to answer questions 1 through 7.

- Verify that the requirements are satisfied to conduct a χ^2 test for independence.
 The requirements are met because the value of each cell is greater than 5.
- Create a clustered bar or pie chart to illustrate this data.



- State the appropriate null and alternative hypotheses.
 H_0 : Religiosity and frequency of anger are independent
 H_a : Religiosity and frequency of anger are not independent
- Calculate the test statistic and give its degrees of freedom (df).
 $\chi^2 = 23.474$
 $df = 4$
- Calculate the P-value based on the test statistic.
 $P\text{-value} < 0.0001$

6. What decision do you make based on the P-value and the level of significance (α)?

Reject the null hypothesis.

7. State your conclusion in an English sentence.

There is sufficient evidence to suggest that religiosity and frequency of anger at something beyond one's control are not independent.

A sociologist wanted to discover whether family structure and whether or not girls attend college are related. She randomly selected 380 18-year-old female students about to graduate from high school and asked each to disclose her family structure and if she was planning on attending college. Use the data below to determine if there is a connection between family structure and whether or not girls attend college. Use a level of significance of $\alpha = 0.05$.

	Both Parents	Single Parent	Parent and Step Parent	Nonparental Guardian
Going to college	86	41	36	18
Not going to college	64	59	44	32

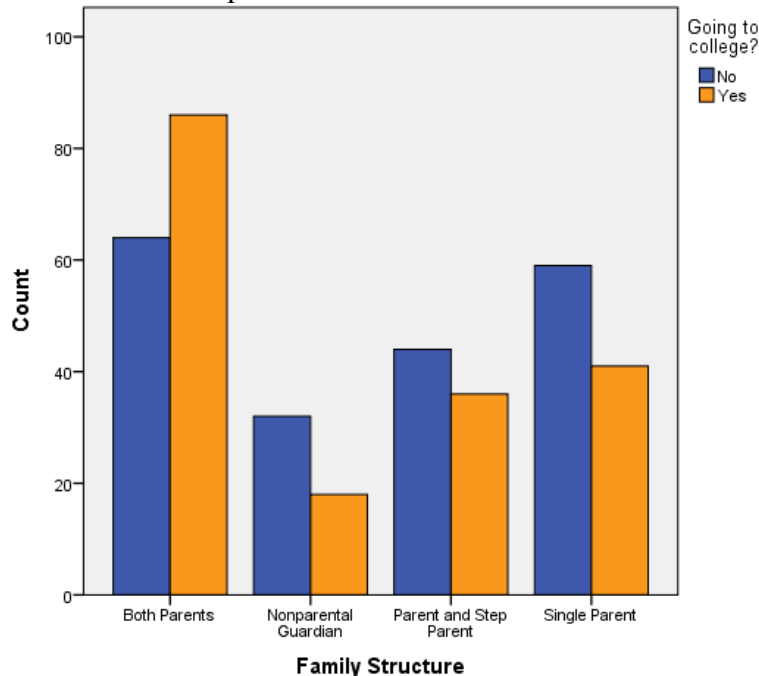
Note for 221B/221C students — Be sure to input your data into SPSS following the example given in the first problem.

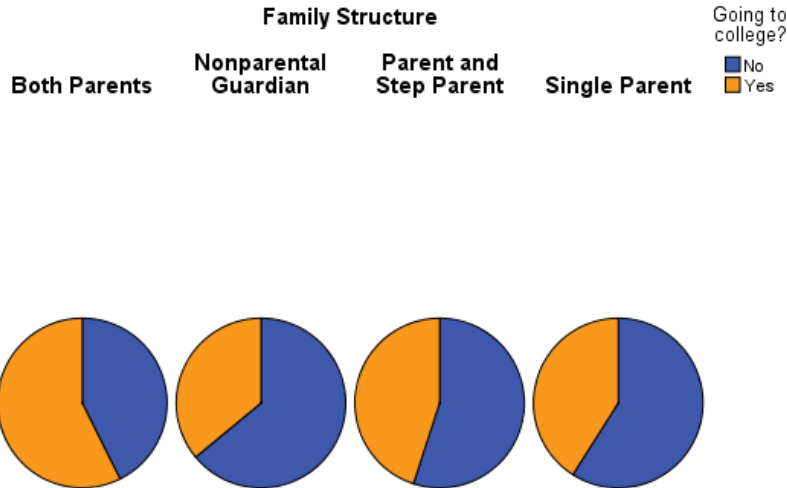
Use this information to answer questions 8 through 14.

8. Verify that the requirements are satisfied to conduct a χ^2 test for independence.

The requirements are met because all of the expected counts are ≥ 5 .

9. Create a clustered bar or pie chart to illustrate this data.





10. State the appropriate null and alternative hypotheses.

H_0 : Family structure and whether a girl goes to college are independent

H_a : Family structure and whether a girl goes to college are not independent

11. Calculate the test statistic and give its degrees of freedom (df).

$\chi^2 = 10.357$

$df = 3$

12. Calculate the P-value based on the test statistic.

P-value = 0.016

13. What decision do you make based on the P-value and the level of significance (α)?

Reject the null hypothesis.

14. State your conclusion in an English sentence.

There is sufficient evidence to suggest that family structure and whether or not a girl goes to college are not independent.

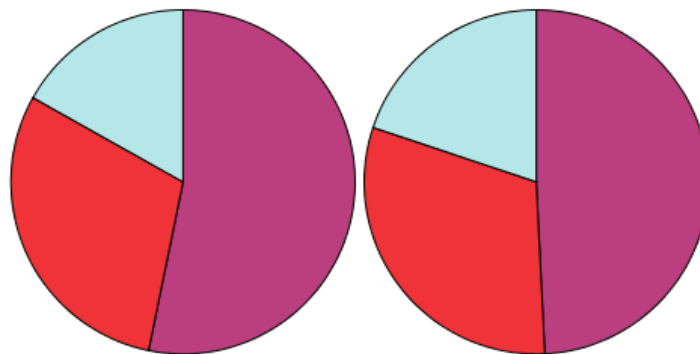
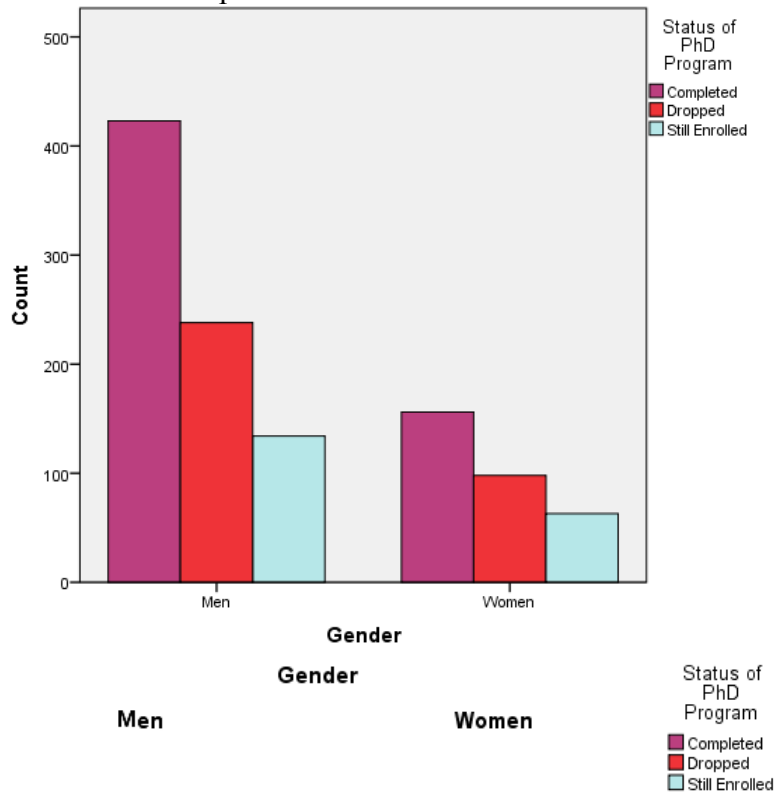
A major university wanted to know if there are gender differences in the progress of students in their doctoral programs. They ran a study that classified 1024 students who entered PhD programs in a given year by their status six years later. The categories used were: completed the degree, still enrolled, and dropped out. Use the data below to determine whether a student's gender is related to his or her status as a PhD student. Use a level of significance of $\alpha = 0.05$.

	Gender	
Status	Men	Women
Completed	423	156
Still Enrolled	134	63
Dropped	238	98

Use this information to answer questions 15 through 21.

15. Verify that the requirements are satisfied to conduct a χ^2 test for independence.
 The requirements are met because all of the expected counts are ≥ 5 .

16. Create a clustered bar or pie chart to illustrate this data.



17. State the appropriate null and alternative hypotheses.

H_0 : Gender and PhD status are independent

H_a : Gender and PhD status are not independent

18. Calculate the test statistic and give its degrees of freedom (df).

$\chi^2 = 1.932$

$df = 2$

19. Calculate the P-value based on the test statistic.

P-value = 0.381

20. What decision do you make based on the P-value and the level of significance (α)?

Fail to reject the null hypothesis.

21. State your conclusion in an English sentence.

There is insufficient evidence to conclude that a student's gender and status in a PhD program are not independent.