



Practice Exercises: Lesson 4.3

Diez, D. M., Çetinkaya-Rundel, M., Barr, C. D. (2019). OpenIntro Statistics (4th ed.). OpenIntro.
<https://www.openintro.org/book/os/> CC BY-SA 3.0

STAT 1201
Introduction to Probability and Statistics

ONLINE AND DISTANCE EDUCATION

Exercises

6.35 Quitters. Does being part of a support group affect the ability of people to quit smoking? A county health department enrolled 300 smokers in a randomized experiment. 150 participants were assigned to a group that used a nicotine patch and met weekly with a support group; the other 150 received the patch and did not meet with a support group. At the end of the study, 40 of the participants in the patch plus support group had quit smoking while only 30 smokers had quit in the other group.

- Create a two-way table presenting the results of this study.
- Answer each of the following questions under the null hypothesis that being part of a support group does not affect the ability of people to quit smoking, and indicate whether the expected values are higher or lower than the observed values.
 - How many subjects in the “patch + support” group would you expect to quit?
 - How many subjects in the “patch only” group would you expect to not quit?

6.36 Full body scan, Part II. The table below summarizes a data set we first encountered in Exercise 6.26 regarding views on full-body scans and political affiliation. The differences in each political group may be due to chance. Complete the following computations under the null hypothesis of independence between an individual’s party affiliation and his support of full-body scans. It may be useful to first add on an extra column for row totals before proceeding with the computations.

		<i>Party Affiliation</i>		
		Republican	Democrat	Independent
<i>Answer</i>	Should	264	299	351
	Should not	38	55	77
	Don’t know/No answer	16	15	22
	Total	318	369	450

- How many Republicans would you expect to not support the use of full-body scans?
- How many Democrats would you expect to support the use of full-body scans?
- How many Independents would you expect to not know or not answer?

6.37 Offshore drilling, Part III. The table below summarizes a data set we first encountered in Exercise 6.23 that examines the responses of a random sample of college graduates and non-graduates on the topic of oil drilling. Complete a chi-square test for these data to check whether there is a statistically significant difference in responses from college graduates and non-graduates.

	<i>College Grad</i>	
	Yes	No
Support	154	132
Oppose	180	126
Do not know	104	131
Total	438	389

6.38 Parasitic worm. Lymphatic filariasis is a disease caused by a parasitic worm. Complications of the disease can lead to extreme swelling and other complications. Here we consider results from a randomized experiment that compared three different drug treatment options to clear people of the this parasite, which people are working to eliminate entirely. The results for the second year of the study are given below:⁴⁶

	Clear at Year 2	Not Clear at Year 2
Three drugs	52	2
Two drugs	31	24
Two drugs annually	42	14

- Set up hypotheses for evaluating whether there is any difference in the performance of the treatments, and also check conditions.
- Statistical software was used to run a chi-square test, which output:

$$X^2 = 23.7 \qquad df = 2 \qquad \text{p-value} = 7.2\text{e-}6$$

Use these results to evaluate the hypotheses from part (a), and provide a conclusion in the context of the problem.

⁴⁶Christopher King et al. “A Trial of a Triple-Drug Treatment for Lymphatic Filariasis”. In: *New England Journal of Medicine* 379 (2018), pp. 1801–1810.

Chapter exercises

6.39 Active learning. A teacher wanting to increase the active learning component of her course is concerned about student reactions to changes she is planning to make. She conducts a survey in her class, asking students whether they believe more active learning in the classroom (hands on exercises) instead of traditional lecture will help improve their learning. She does this at the beginning and end of the semester and wants to evaluate whether students' opinions have changed over the semester. Can she use the methods we learned in this chapter for this analysis? Explain your reasoning.

6.40 Website experiment. The OpenIntro website occasionally experiments with design and link placement. We conducted one experiment testing three different placements of a download link for this textbook on the book's main page to see which location, if any, led to the most downloads. The number of site visitors included in the experiment was 701 and is captured in one of the response combinations in the following table:

	Download	No Download
Position 1	13.8%	18.3%
Position 2	14.6%	18.5%
Position 3	12.1%	22.7%

- Calculate the actual number of site visitors in each of the six response categories.
- Each individual in the experiment had an equal chance of being in any of the three experiment groups. However, we see that there are slightly different totals for the groups. Is there any evidence that the groups were actually imbalanced? Make sure to clearly state hypotheses, check conditions, calculate the appropriate test statistic and the p-value, and make your conclusion in context of the data.
- Complete an appropriate hypothesis test to check whether there is evidence that there is a higher rate of site visitors clicking on the textbook link in any of the three groups.

6.41 Shipping holiday gifts. A local news survey asked 500 randomly sampled Los Angeles residents which shipping carrier they prefer to use for shipping holiday gifts. The table below shows the distribution of responses by age group as well as the expected counts for each cell (shown in parentheses).

	Age			Total
	18-34	35-54	55+	
USPS	72 (81)	97 (102)	76 (62)	245
UPS	52 (53)	76 (68)	34 (41)	162
FedEx	31 (21)	24 (27)	9 (16)	64
Something else	7 (5)	6 (7)	3 (4)	16
Not sure	3 (5)	6 (5)	4 (3)	13
Total	165	209	126	500

- State the null and alternative hypotheses for testing for independence of age and preferred shipping method for holiday gifts among Los Angeles residents.
- Are the conditions for inference using a chi-square test satisfied?

6.42 The Civil War. A national survey conducted among a simple random sample of 1,507 adults shows that 56% of Americans think the Civil War is still relevant to American politics and political life.⁴⁷

- Conduct a hypothesis test to determine if these data provide strong evidence that the majority of the Americans think the Civil War is still relevant.
- Interpret the p-value in this context.
- Calculate a 90% confidence interval for the proportion of Americans who think the Civil War is still relevant. Interpret the interval in this context, and comment on whether or not the confidence interval agrees with the conclusion of the hypothesis test.

⁴⁷Pew Research Center Publications, Civil War at 150: Still Relevant, Still Divisive, data collected between March 30 - April 3, 2011.