

Chapter 14 Quest – Part 1: Multiple Choice. Circle the letter the best answer.

The information in this box is used in questions 1 through 5.

All current-carrying wires produce electromagnetic (EM) radiation, including the electrical wiring running into, through, and out of our homes. High-frequency EM radiation is thought to be a cause of cancer; the lower frequencies associated with household current are generally assumed to be harmless. To investigate this, researchers visited the addresses of children in the Denver area who had died of some form of cancer (leukemia, lymphoma, or some other type) and classified the wiring configuration outside the building as either a high-current configuration (HCC) or as a low-current configuration (LCC). Here are some of the results of the study.

	Leukemia	Lymphoma	Other Cancers
HCC	52	10	17
LCC	84	21	31

The Minitab output for the above table is given below. The output includes the cell counts, the expected cell counts, and the chi-square statistic.

Expected counts are printed below observed counts.

	C1	C2	C3	Total
1	52 49.97	10 11.39	17 17.64	79
2	84 86.03	21 19.61	31 30.36	136
Total	136	31	48	215

ChiSq = 0.082 + 0.170 + 0.023 + 0.048 + 0.099 + 0.013 = 0.435

- Using the above, what are the appropriate degrees of freedom for the chi-square statistic?
(a) 6 (b) 2 (c) 3 (d) 5 (e) None of the above
- The expected count for the LCC/Leukemia cell is found by which expression?
(a) $(136)(79)/215$ (b) $(31)(136)/215$ (c) $(136)(136)/215$
(d) $(136)(48)/215$ (e) $(79)(48)/215$
- Using the above data, what is the P-value for the chi-square statistic?
(a) Larger than 0.10
(b) Between 0.05 and 0.10
(c) Between 0.01 and 0.05
(d) Less than 0.01
(e) It is impossible to tell from the information presented.

4. Using the above data, which cell contributes most to the chi-square statistic?
 - (a) The cases of leukemia that occurred in homes with an HCC
 - (b) The cases of leukemia that occurred in homes with an LCC
 - (c) The cases of other cancers that occurred in homes with an LCC
 - (d) The cases of lymphoma that occurred in homes with an HCC
 - (e) None of the above

5. Using the above data, which of the following is the best conclusion?
 - (a) There is strong evidence of an association between wiring configuration and the chance a child will develop some form of cancer.
 - (b) HCC either causes cancer directly or is a major contributing factor to the development of cancer in children.
 - (c) There is weak evidence that HCC causes cancer in children.
 - (d) There is not much evidence of an association between wiring configuration and the type of cancer children in the study died of.
 - (e) There is insufficient information provided to reach a conclusion

Chapter 14 Quest – Part 2: Free Response. *Respond completely and clearly.*

1. The table below gives the number of births in a hospital in Switzerland during a given year. There were 700 births in total and the births were only recorded for women having their first child. Is there evidence that first births are not spread evenly throughout the year?

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Births	66	63	64	48	64	74	70	59	54	51	45	42

- a) State the hypotheses for this test.
 - b) Use calculator list operations to determine the chi-square statistic for this test.
 - c) What is the p-value of this test?
 - d) What is the conclusion of this test (write a sentence or two in context of the problem).
2. For 1000 shoppers donating blood at a mall, the frequencies of blood types were as shown in the table below. Consider this an SRS of all mall shoppers.

Blood Type	O	A	B	AB	Total
Frequency	465	394	96	45	1000

Theory says that these blood types should be in the ratio 9:8:2:1. For example, the fraction of people having type O blood should be $9/20$; furthermore, the fraction of people having type AB blood should be $1/20$. Here are the hypotheses we will test:

Ho: Mall shoppers have the same blood type proportions as the general public
 Ha: Mall shoppers DO NOT have the same blood type proportions as the general public

- a) Compute the expected counts for this table.
- b) Use the results of part (a) to show the entire calculation of the chi-square statistic.
- c) What is the p-value of this test?
- d) What is the conclusion of this test (write a sentence or two in context of the problem).