Review Questions Chapter 13

1. A chi-square goodness of fit test is used to test whether a 0–9 spinner is "fair" (i.e., the outcomes are all equally likely). The spinner is spun 100 times, and the results are recorded. Which member of the chi-square family of curves is used?

(a) $\chi^2(8)$ (b) $\chi^2(9)$ (c) $\chi^2(10)$ (d) $\chi^2(99)$ (e) None of the above

2. A study of accident records at a large engineering company in England reported the following number of injuries on each shift for 1 year:

Shift	Morning	Afternoon	Night
Number of injuries	1372	1578	1686

Is there sufficient evidence to say that the numbers of accidents on the three shifts are not the same? Test at the 0.05, 0.01, and 0.001 levels.

(a) There is sufficient evidence at all three levels to say that the numbers of accidents on each shift are not the same.
(b) There is sufficient evidence at the 0.05 and 0.01 levels but not at the 0.001 level.
(c) There is sufficient evidence at the 0.05 level but not at the 0.01 or 0.001 levels.
(d) There is sufficient evidence at the 0.001 level but not at the 0.01 or 0.05 levels.
(e) There is insufficient evidence at any of these levels.

The next set of questions refers to the following situation:
A study was conducted to determine if the fatality rate depends on the size of the automobile. The analysis of accidents is as follows (with some values hidden):

Death frequency	SIze			Total
	M	S	L	
No	63	128	46	237
Yes	26	95	16	137
Total	89	223	62	373

Statistics for table of death by size:

Statistic	df	Value	Prob
Chi-square	*	8.663	****
Liklihood ratio chi-square	*	8.838	****

3. Under a suitable null hypothesis, the expected frequency for the cell corresponding to fatal type of accident and small size automobile is:

(a) 81.69 (b) 67.00 (c) 61.43 (d) 63.41 (e) 59.72

4. Which of the following is NOT CORRECT?

(a) The accidents were cross classified by size of automobile and fatality status. Each accident was counted in one and only one cell.
(b) The null hypothesis is that the fatality status is independent of the size of the automobile.
(c) The alternative hypothesis is that there is no association between fatality status and size of automobile.
(d) If all expected cell counts are greater than five, then the distribution of the test statistic is an approximate chi-square distribution.
(e) If we reject the null hypothesis then we have proven that the size of the automobile affects the chances of a fatality.

5. The null hypothesis will be rejected at α=0.05 if the test statistic exceeds:

(a) 12.59 (b) 7.81 (c) 5.99 (d) 3.84 (e) 9.49

6. The approximate *P*-value is:

(a) less than 0.005
(b) between 0.005 and 0.010
(c) between 0.010 and 0.025
(d) between 0.025 and 0.050
(e) between 0.050 and 0.100

The information in this box is used in questions 7, 8, 9, and 10.

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	10	17	79
	49.97	11.39	17.64	
2	84	21	31	136
	86.03	19.61	30.36	
Total	136	31	48	215

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

7. Using the above data, 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

8. 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.

9. 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

10. 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.

Answers: 1. B, 2. A, 3. A, 4. E, 5. C, 6. C, 7. B, 8. A, 9. D, 10. D