Math 10 - Homework Chapter 11 Answers

1. A bicycle safety organization claims that fatal bicycle accidents are uniformly distributed throughout the week. The table shows the day of the week for which 911 randomly selected fatal bicycle accidents occurred. At α= 0.10, can you reject the claim that the distribution is uniform?

(a) (DESIGN) State your Hypothesis

Ho: $p_1=p_2=p_3=p_4=p_5=p_6=p_7$
Ha: at least on p_i is different.

(b) (DESIGN) State Significance Level of the test and explain what it means.

α=.10, the maximum probability of making Type I error, which would be incorrectly claiming bike accidents are not uniformly distributed.

(c) (DESIGN) Determine the statistical model . Determine decision rule (critical value method)

$$\chi^2 = \frac{(O_i - E_i)^2}{E_i}$$

df = 6

Reject Ho if $\chi^2 > 10.645$

(d) (DATA) Conduct the test and **circle** your decision

Survey	Observe	pi	Expected	ChiSq
Sunday	118	0.143	130.143	1.133
Monday	119	0.143	130.143	0.954
Tuesday	127	0.143	130.143	0.076
Wednesday	137	0.143	130.143	0.361
Thursday	129	0.143	130.143	0.010
Friday	146	0.143	130.143	1.932
Saturday	135	0.143	130.143	0.181
Total	**911**	**0.143**	**911.000**	**4.648**

4.648<10.645
Fail to Reject Ho

(e) (CONCLUSION) State your overall conclusion in language that is clear, relates to the original problem and is consistent with your decision.

Insufficient evidence to conclude that bicycle accidents are not uniformly distributed.

2. Results from a survey five years ago asking where coffee drinkers typically drink their first cup of coffee are shown in the graph. To determine whether this distribution has changed, you randomly select 581 coffee drinkers and ask each where they typically drink their first cup of coffee. The results are shown in the table. Can you conclude that there has been a change in the claimed or expected distribution? Use $\alpha = 0.05$.

(a) (DESIGN) State your Hypothesis

Ho: p_1=.70 p_2=.17 p_3= .08 p_4=.05
Ha: at least on p_i is different

(b) (DESIGN) State Significance Level of the test and explain what it means.

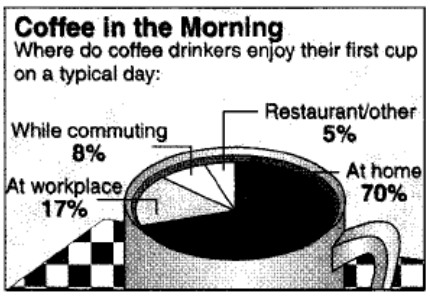
α=.05, the maximum probability of making Type I error, which would be incorrectly claiming that there has been a change in coffee drinking.

(d) (DESIGN) Determine the statistical model . Determine decision rule (critical value method)

$$\chi^2 = \frac{(O_i - E_i)^2}{E_i}$$

df = 3

Reject Ho if χ^2 > 7.815



(d) (DATA) Conduct the test and **circle** your decision

Survey	Observe	pi	Expected	ChiSq
Home	389	0.7	406.70	0.770
Work	110	0.17	98.77	1.277
Commute	55	0.08	46.48	1.562
Rest/Other	27	0.05	29.05	0.145
Total	581		581.00	3.754

3.754<7.815
Fail to Reject Ho

(e) (CONCLUSION) State your overall conclusion in language that is clear, relates to the original problem and is consistent with your decision

Insufficient evidence to conclude that coffee drinking habits have changed.

3. In a recent SurveyUSA poll, 500 Americans adults were asked if marijuana should be legalized. The results of the poll were cross tabulated as shown in the contingency tables below. Conduct **two** tests for independence to determine if opinion about legalization of marijuana is dependent on gender or age

Ho: Opinion on Marijuana Legalization and Gender are independent.
Ha: Opinion on Marijuana Legalization and Gender are dependent.

Model: Chi-square test of independence, 1 df. I will use $\alpha = .05$

		Male	Female	Total
Should be Legal	Observed	**123**	**90**	213
	Expected	106.50	106.50	213.00
	$(O - E)^2 / E$	2.56	2.56	5.11
Should Not be Legal	Observed	**127**	**160**	287
	Expected	143.50	143.50	287.00
	$(O - E)^2 / E$	1.90	1.90	3.79
Total	Observed	250	250	500
	Expected	250.00	250.00	500.00
	$(O - E)^2 / E$	4.45	4.45	8.91

8.91	chi-square
1	df
.0028	p-value

Since p-value<.05, Reject Ho

Women are less likely to support marijuana legalization.

Ho: Opinion on Marijuana Legalization and age are independent.
Ha: Opinion on Marijuana Legalization and age are dependent.

Model: Chi-square test of independence, 2 df. I will use $\alpha = .05$

		18-34	35-54	55+	Total
Should be Legal	Observed	**95**	**83**	**48**	226
	Expected	72.32	94.47	59.21	226.00
	$(O - E)^2 / E$	7.11	1.39	2.12	10.63
Should Not be Legal	Observed	**65**	**126**	**83**	274
	Expected	87.68	114.53	71.79	274.00
	$(O - E)^2 / E$	5.87	1.15	1.75	8.77
Total	Observed	160	209	131	500
	Expected	160.00	209.00	131.00	500.00
	$(O - E)^2 / E$	12.98	2.54	3.87	19.39

19.39	chi-square
2	df
.0001	p-value

Since p-value<.05, Reject Ho

Younger people are more likely to support legalizing marijuana.