

Chapter 13 Review

Ch. 13

AP Statistics

Name: Mr. Morton

Directions: Work on these sheets. A chi-square table appears at the end of this test.

Part 1: Multiple Choice. Circle the letter corresponding to the best answer.

1. A two-way table of counts is analyzed to examine the hypothesis that the row and column classifications are independent. There are 3 rows and 4 columns. The degrees of freedom for the chi-square statistic are

$$(3-1)(4-1) = 6$$

(a) 12

(b) 11

(c) 6

(d) The minimum of $n_1 - 1$ and $n_2 - 1$

(e) None of the above

The next set of questions refer to the following situation

In the paper "Color Association of Male and Female Fourth-Grade School Children" (J. Psych., 1988, 383-8), children were asked to indicate what emotion they associated with the color red. The response and the sex of the child are noted and summarized below. The first number in each cell is the count, the second number is the row percent.

Frequency	anger	happy	love	pain	Total
f	27	19	39	17	102
m	* 34	12	38	28	112
Total	61	31	77	45	214
Statistic			DF	Value	Prob
Pearson Chi-Square			*	4.629	*****

2. The expected frequency for the cell corresponding to Anger and Males is:

(a) 15.9

(b) 55.7

(c) 30.4

(d) 31.9

(e) 29.1

$$\frac{61(112)}{214}$$

3. The null hypothesis is:

(a) Emotional association with red is independent of gender.

(b) Gender is dependent upon the emotional association with red.

(c) The probability of selecting an emotion with red is related to gender.

(d) The number of children in each cell does not depend upon gender or upon emotion.

(e) The color red is independent of the emotion associated with it and with gender.

$$df = (2-1)(4-1) = 3$$

4. The null hypothesis will be rejected at $\alpha=0.05$ if the test statistic exceeds:
- (a) 3.84
 - (b) 5.99
 - (c) 7.81
 - (d) 9.49
 - (e) 14.07

χ^2 chart

5. The approximate P -value is:
- (a) Between 0.100 and 0.900
 - (b) Between 0.050 and 0.100
 - (c) Between 0.025 and 0.050
 - (d) Between 0.010 and 0.025
 - (e) Between 0.005 and 0.010

$$\chi^2 = 4.6286$$

$$P\text{-value} = 0.2011$$

Part 2: Free Response

Answer completely, but be concise. Write sequentially and show all steps.

6. A recent estimate by a large distributor of gasoline claims that 60% of all cars stopping at their service stations chose unleaded gas and that super unleaded and regular were each selected 20% of the time. In order to check the validity of these proportions, a study was conducted of cars stopping at the distributor's service stations in a large city. The results were as follows:

Regular	Gasoline Selected	
	Unleaded	Super Unleaded
51	261	88
80	240	80

$$n = 400$$

Carry out a significance test of the distributor's claim.

P We want to test a claim about the proportions of cars pumping different types of gas.

$$H_0 = P_{\text{Reg}} = 0.20, P_{\text{super}} = 0.20, P_{\text{un}} = 0.60$$

$H_a =$ at least one of the proportions differs from stated claim.

A SRS? Proceed with caution, expected counts ≥ 5 ✓

N χ^2 Goodness of Fit Test.

$$T \quad \chi^2 = \sum \frac{(\text{observed} - \text{expected})^2}{\text{expected}} = \frac{(51-80)^2}{80} + \frac{(261-240)^2}{240} + \frac{(88-80)^2}{80}$$

$$O \quad \chi^2 = 13.15, \quad p\text{-value} = 0.001395$$

M/s Since $0.001395 < 0.05$, we reject H_0 at the 5% significance level. Therefore, we have enough evidence to say that at least one of the proportions differs from the stated claim. 24