KFUPM
Mathematical Sciences

Term 043
STAT 212
Quiz# 4

Date: 24/7/2005
Duration: 15 minutes

Name: ID#: Section#: 1 2 Serial#:

Show your work in detail

A researcher wants to determine whether there are any preferences among 4 brands of orange juice. By asking 32 persons about their preference 9 preferred brand A, 10 preferred brand B and 8 preferred brand C. According to this sample do you think that the four brands of the juice are of equal preference?

The hypotheses are: H_0: The brands are uniformly distributed H_A: The 4 brands are NOT uniformly distributed. (2)

The assumption is: Each $e_i \geq 5$ (1)

The test statistic value:

i	O_i	e_i	$O_i - e_i$	$(O_i - e_i)^2$	$\frac{(O_i - e_i)^2}{e_i}$
A	9	8	1	1	1/8
B	10	8	2	4	4/8
C	8	8	0	0	0
D	5	8	-3	9	9/8
Total	32	32 (1)	0		14/8 (1)

$$\chi^2_{cal} = \sum \frac{(O_i - e_i)^2}{e_i} = \frac{14}{8} = 1.75$$

The critical value: $\chi^2_{\alpha, k-1} = \chi^2_{0.05, 3} = 7.8147$ (1) (1)

Decision Rule: If $\chi^2_{cal} > \chi^2_{tab} \Rightarrow$ Reject H_0. (1)

Since $\chi^2_{cal} = 1.75 \not> 7.8147 = \chi^2_{tab} \Rightarrow$ Do NOT reject H_0. (1)

Conclusion: Yes, the 4 brands are of equal preference. (1)

With My Best Wishes

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The following table classifies an individual in 2 ways: gender and education.

Gender	no college	2-year college	4-year college	total
male	7	13	30	50
female	13	17	20	50
total	20	30	50	100

Using an alpha = .05 level, Do you think that the education level and the gender are independent?

The hypotheses are: H_0: Education and Gender are independent H_A: The two ~~factors~~ are NOT independent (2)

The assumption is: Each $e_i \geq 5$ (1)

The test statistic value:

$$\chi^2_{Cal} = \chi^2_0 = \sum \frac{(O_i - e_i)^2}{e_i}$$

$$= \frac{(7-10)^2}{10} + \cdots + \frac{(20-25)^2}{25}$$

$$= \frac{9}{10} + \frac{4}{15} + \frac{25}{25} + \frac{9}{10} + \frac{14}{15} + \frac{25}{25}$$

$$= \frac{18}{10} + \frac{8}{15} + \frac{50}{25} = 1.8 + 0.53 + 2.0$$

$$= 04.33 \quad (1)$$

Level / Gender	No	2-year	4-year	Total
Male	7 / 10	13 / 15	30 / 25	50 / 50
Female	13 / 10	17 / 15	20 / 25	50 / 50
Total	20 / 20	30 / 30	50 / 50	100

(1)

The critical value: $\chi^2_{(r-1)(c-1),\alpha} = \chi^2_{(2-1)(3-1),0.05} = \chi^2_{2,0.05} = 5.9915$ (1) (1)

Decision Rule: If $\chi^2_{cal} > \chi^2_{tab} \Rightarrow$ Reject H_0. (1)

Since $\chi^2_{cal} = 4.33 \not> 5.9915 = \chi^2_{tab} \Rightarrow$ Do NOT reject H_0 (1)

Conclusion: Yes, they are Indep endent (1)

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