

QUANTITATIVE METHODS

Martin Huard

Winter 2005

Assignment 24

SOLUTIONS

This assignment is due **Friday April 29, 2005**. Question 1 is to be done by hand and question 2 with Excel, so a copy of your work for this question must be sent by *e-mail*.

Question 1 (10 points)

A random sample of 1000 was asked whether they voted in the last general election. Here are the results, broken down by age group.

	18-24 years	25-39 years	40-59 years	60 years or older	<i>Total</i>
Voted	46 (73.7)	159 (183.2)	178 (160.4)	159 (124.7)	542
Did not vote	90 (62.3)	179 (154.8)	118 (135.6)	71 (105.3)	458
<i>Total</i>	136	338	296	230	1000

At the 1% level of significance, test the claim that voting status and age are independent.

Step 1 Assumptions: The classes are all inclusive and mutually exclusive

Step 2 H_0 : voting status is independent of age

H_A : voting status is dependent of age

Step 3 $\alpha = 0.01$ $df = (3)(1) = 3$

$$\chi^2_c = 11.34$$

Step 4

$$\begin{aligned}\chi^2 &= \sum \frac{(O - E)^2}{E} \\ &= \frac{(46 - 73.7)^2}{73.7} + \frac{(159 - 183.2)^2}{183.2} + \dots + \frac{(71 - 105.3)^2}{105.3} \\ &= 54.58\end{aligned}$$

Step 5 χ^2 is in the critical region

Reject H_0 .

\therefore There is sufficient evidence at the 1% level of significance to conclude that voting status and age are not independent.

Question 2 (10 points)

A sociologist conducted a survey to determine if the highest level of education attained by at least one of the partners is independent of or affects the number of years that a marriage will last (before ending in divorce). A summary of that survey is given below.

		Number of Years Marriage Lasted Before Ending in Divorce			
		0-1	2-5	6-15	16-20
Highest Education Level Attained by at Least One of the Partners	High School	91	82	74	40
	CEGEP	109	91	79	87
	University	133	111	96	68

Using a 2% level of significance, test the claim that the highest educational level attained by at least one of the partners is independent of the number of years that a marriage will last. This problem is to be done on Excel using the classical approach. Also, find the *p*-value.

	A	B	C	D	E	F	G	H	I	J	K	L
1	Chi-Square Test of Independence											
2	Assignment 24 - Question 2											
3	By: Martin Huard											
4												
5	Observed Values						Assumptions: Classes are mutually exclusive and all inclusive					
6		0-1	2-5	6-15	16-20	Total						
7	High School	91	82	74	40	287						
8	CEGEP	109	91	79	87	366	$\alpha =$	2%				
9	University	133	111	96	68	408	$\chi^2_c =$	15.03				
10	Total	333	284	249	195	1061	$\chi^2 =$	12.10				
11												
12												
13	Expected Values						Decision : Fail to reject Ho					
14		0-1	2-5	6-15	16-20	Therefore there is not sufficient evidence at the 2% level of significance to conclude that the highest educational level attained by at least one of the partners is not independent of the number of years that a marriage will last.						
15	High School	90.076	76.822	67.354	52.747							
16	CEGEP	114.87	97.968	85.894	67.267							
17	University	128.05	109.21	95.751	74.986							
18												
19												
20	Chi-Square Calculations						<i>p</i> -value = 0.060					
21		0.0095	0.349	0.6557	3.0807							
22		0.3001	0.4956	0.5534	5.7889							
23		0.1911	0.0293	0.0006	0.6508							
24												
25												