

04b Sample Examination Problems Chapter 14

1. (a) Why are the degrees of freedom for a test of independence of row and column classifications in an $r \times c$ contingency table equal to $(r - 1)(c - 1)$?

- (b) The table below shows the number of units sold by three sales operatives for three different products.

Sales Operative	Product		
	A	B	C
Alpha	14	12	4
Beta	21	16	8
Gamma	15	5	10

- Is there any difference in the patterns of sales for different Sales Operatives?
- Display the information in the table in column profile form, and comment on any association displayed.

2. (a) Why would it usually be unwise to carry out both a chi-squared test for independence of the row and column classifications of a table and a two-way analysis of variance for the same table.

- (b) The table below shows the numbers of piston ring failures in each of three legs of four compressors.

Compressor	Compressor legs		
	North	Centre	South
1	17	17	12
2	11	9	13
3	11	8	19
4	14	7	28

- Is there any difference in the pattern of failures over different legs for different compressors?
- By looking at the contributions to χ^2 , or profiles, give a qualitative description of any difference that you find.

3. (a) Explain why the fitted values for a χ^2 test of association in a two-way table take the form that they do.

(b) The table below shows the number of employees of a manufacturer of animal feeds and soap classified by gender, year of entrance, and length of service in months before resignation. Only those employees with lengths of service of less than 15 months are included.

Length of service	1950 Entrants		1951 Entrants	
	Male	Female	Male	Female
< 3	182	25	147	38
> 3, < 6	103	26	54	29
> 6, < 9	60	22	47	15
> 9, < 12	29	13	21	9
> 12, < 15	31	15	12	5

- i. Is there any difference in the patterns of length of service over the different columns of the table?
- ii. Would there be more or less association in the table if the results for female employees were excluded completely? Explain your answer.