04b Sample Examination Problems Chapter 9

1. (a) Explain and discuss the difference between one-way and two-way analysis of variance.

   (b) Explain qualitatively why in a one-way analysis of variance one rejects the null hypothesis of no differences between group means if the mean sum of squares between groups is large compared to the mean sum of squares within groups.

   (c) The table below shows measurements of sections taken from five European larch trees of the same age. Each section gives rise to 4 measurements of the trachoid length from each of the four aspects North, South, East and West.

	Aspect			
Tree	East	South	West	North
1	3.4	3.5	3.1	3.5
2	2.8	3.1	3.0	3.0
3	3.0	3.2	3.3	3.3
4	3.0	3.0	2.5	2.8
5	3.3	3.5	3.7	3.6

   i. Give the analysis of variance table for a two-way analysis of variance for these data, using the classification by aspects and by tree number.

   ii. Test the hypothesis that there is no difference between the trachoid lengths from different aspects.

2. (a) Sometimes it is suggested that one carries out an analysis of variance on the logarithms of the original data. Why might this be a sensible transformation?

(b) The table below shows the percentage vote for the Democratic Party in US presidential elections of several different campaigns for different counties of Connecticut.

	Lich	Fairf	Middx	Toll
1920	32.5	30.9	33.1	31.0
1924	30.0	24.5	29.9	30.3
1928	36.0	43.7	39.7	39.6
1932	41.9	47.1	46.3	46.0

i. Give the analysis of variance table for a two-way analysis of variance for these data, using the classification by counties and by years.

ii. Are some year effects significantly different from 0?

iii. Are these data suitable for this form of analysis?

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3. (a) Give a model for the two-way analysis of variance, specifying the distribution of any random variables included in your model.

(b) Explain what is meant by interaction in a two-way analysis of variance.

(c) The table below shows the values of price index numbers for glasshouse fruit and vegetables (with base January 1969 at 100).

i. Give the analysis of variance table for a two-way analysis of variance for these data, using the classification by years and by months.

ii. Give a set of 90% simultaneous confidence intervals for the differences between the first three years.

	Jan	Feb	March	April	May
1970	261	276	193	160	147
1971	214	239	193	2210	138
1972	332	248	208	164	128
1973	173	232	199	211	145
1974	328	314	259	209	121