

STAT 514
Exam I — Spring 1990

Name _____

1) Samples from a line of tumor cells will receive one of the following treatments: $100\mu\text{m}$ PALA, $100\mu\text{m}$ PALA + $1\mu\text{m}$ DP, $100\mu\text{m}$ PALA + $2\mu\text{m}$ DP, or $100\mu\text{m}$ PALA + $20\mu\text{m}$ cytidine. There are three samples of cells for each treatment.

a) Sketch the layout.

b) Write out the model.

c) Write out the ANOVA table with d.f. and EMS.

d) Suppose a researcher wanted to compare different levels of DP, PALA + DP vs. PALA alone, and PALA + cytidine vs. the other treatments. Find a set of orthogonal contrasts which will do this.

2) Suppose I am considering using a range test to compare the treatments of the previous question.

a) If I used pairwise t-tests, would the experiment wise error or the comparison wise error be greater? Why? α

b) For part a) what α level should I use so that the experiment wise error rate is 10%?

3) In testing a two sided hypothesis, I wish to detect a two standard deviation difference of two means with a t -test.

a) To bound alpha by .05 and beta by .1, how many observations would I need?

You need a table for
a) + c)

b) To increase the power of the test, would I need fewer or more observations?

c) How many more observations would I need to bound both error probabilities by .05?

4) Consider the following ANOVA table.

Source	df	SS	MS
Operators	2	107,540	53,770
Aluminizers	4	139,805	34,951
$O \times A$ interaction	8	84,785	10,598
Error	15	230,900	15,393
Totals	29	563,030	

Assuming that Operators and Aluminizers are random and that this is completely randomized

a) Draw the layout.

b) Work out the EMS using the algorithm (on back of page).

c) Carry out significance tests, pooling where appropriate.

5) Suppose I have a two-way ANOVA with one observation per cell.

a) If I used the interaction for an error term but it was significant, would I be more or less likely to declare the main effects significant?

b) In view of your answer to a), what benefit would the Tukey procedure offer?

c) Would the Tukey procedure always give a more powerful test than the procedure of part a)? Why?

Stat 514 - Fall 1990
Exam I

Name: _____

1. I am interested in the effect of four temperatures 0° , 25° , 50° , 75° (C) and two specific finishing methods on the performance of widgets. One widget is assigned to each treatment combination.

(a) Sketch the layout.

(b) Write out the model.

(c) Work out the EMS on the back of this page using the algorithm.

(d) You have no degrees of freedom to test for interaction. What sort of plot could you make to check visually for interaction?

(e) Suppose interaction exists and you use Tukey (appropriately) to get a new Mean Square for testing. Will this Mean Square be smaller or larger than the interaction mean square? Why?

(f) Suppose that no interaction exists and you use Tukey to get a new Mean Square Error. Will this be smaller or larger than the interaction Mean Square? Why?

2. Twenty patients with moderate hypertension will be randomly divided into four groups. Group one will get alphadyne, Group two will get betacord, Group three will get gammadex, and Group four will get a placebo (control). Y = post-treatment blood pressure.

(a) Write out the ANOVA table with degrees of freedom.

(b) What set of contrasts will test each of the three drugs vs. control?

(c) Are these orthogonal? Why?

(d) Suppose I test each contrast at $\alpha = .05$. I could also do Dunnett's test at $\alpha = .05$ to test the same hypotheses. Which has a larger experimentwise error rate? Why?

3. Suppose that, in question two, I have X = pre-treatment blood pressure and Y = post-treatment blood pressure.

(a) If I were interested in doing analysis of covariance, what sort of plot would I do?

if no one else
problem.

(b) What would I be looking for in this plot?

4. Joe Blow ran the ANOVA in the given output.

(a) What is the *first* suggestion you would make?

(b) What other suggestion would you make?

General Linear Models Procedure

Student-Newman-Keuls test for variable: RATE

NOTE: This test controls the type I experimentwise error rate under the complete null hypothesis but not under partial null hypotheses.

Alpha= 0.05 df= 8 MSE= 16.435

Number of Means 2 3 4
Critical Range 7.633009 9.458315 10.600027

Means with the same letter are not significantly different.

SNK Grouping	Mean	N	PALA
A	51.333	3	500
B	29.467	3	100
C	20.800	3	50
C	16.367	3	0

Plot of R*P. Legend: A = 1 obs, B = 2 obs, etc.

