

Midterm

1. Consider a RCBD comparing a control to new treatments A, B, C, and D. Under the usual ANOVA null hypothesis $H_o : \mu_1 = \dots = \mu_a$, suppose the experimenter wants to be able to detect when each treatment mean is k units greater than the control mean at $\alpha = .01$.
 - (a) Find the noncentrality parameter λ for the researcher's alternative as a function of k .
 - (b) Conduct an analysis of the pilot study below.
 - (c) Write a SAS program to compute power for various choices of k and b . Use an estimate of σ from the pilot study. Construct a contour plot with k and b as the coordinate axes.
 - (d) How many blocks would we need to detect $k = .1$, $k = .2$, $k = .3$ with 80% power?

	Block		
Treatment	1	2	3
Control	9.60	9.61	9.52
A	9.75	9.64	9.79
B	9.87	9.83	9.60
C	9.72	9.82	9.69
D	9.56	9.90	9.87

2. Consider the following SAS output from analysis of a two-way model.
 - (a) Compute variance components assuming both factors are random.
 - (b) Construct tests for A, B and AB for both the unrestricted and restricted mixed effects models. Assume A is fixed and B is random for this exercise.

Source	DF	Type III SS	Mean Square	F Value	Pr>F
A	2	5467.85	2733.93	30.03	.000
B	4	2451.90	612.97	6.73	.003
A*B	8	1857.29	232.16	2.55	.056
Error	15	1365.82	91.05		
Total	29				

3. A crossover design appears in the table below.

	Patient					
Period	1	2	3	4	5	6
1	C=5	A=10	B=13	A=9	B=11	C=8
2	A=6	B=9	C=8	C=8	A=12	B=8
3	B=7	C=15	A=7	B=9	C=11	A=15

	Patient					
Period	7	8	9	10	11	12
1	A=12	B=10	C=12	A=2	B=10	C=5
2	B=8	C=11	A=4	C=9	A=10	B=12
3	C=15	A=3	B=9	B=10	C=9	A=11

- Test for Period, Treatment, Patient, and Residual Treatment Effects. Explain your results.
- Consider an alternative Residual Treatment Effect in which the residual effect depends on the combination of previous treatments. E.g., the residual treatment effect for Period 2, Patient 1 is “C”, while the residual treatment effect for Period 3, Patient 1 is “CA”. Construct a factor for this new residual treatment effect and test for it.
- Explain the degrees of freedom from the ANOVA table that you obtained from the type III analysis.
- Compare your results for residual treatment effects to what you obtained for the other residual treatment effect factor.