

Midterm

1. In a Complete Randomized Design, 7 different levels of baking powder were tested for their effect on relative rise of biscuit dough. 4 biscuits were baked using each recipe. Use $\alpha = .05$ for all tests.
 - (a) Test the cell means model and examine the residuals. Are model assumptions satisfied?
 - (b) Test for a linear trend against the intercept model.
 - (c) Test all orthogonal polynomial models for lack of fit against the cell means model (be sure to include lower-order polynomial terms in each of these models). Which models are adequate?

0 tsp	.25 tsp	.5 tsp	.75 tsp	1 tsp	1.25 tsp	1.5 tsp
3.1	11.4	27.8	47.6	61.6	63.6	64.2
2.3	11.0	29.2	47.0	62.4	65.2	64.8
1.9	11.3	26.8	47.3	63.0	61.5	64.4
2.7	9.5	26.0	45.5	63.9	63.3	66.1

2. A Quality Control department at an adhesive company tests three types of backing using three different tests. As the QC department has only 3 technicians, a simple latin square design was proposed as a pilot study. A single roll of tape constitutes an experimental unit. Use $\alpha = .05$ as your test size.
 - (a) Analyze the design. Are treatment effects significant?
 - (b) Test $H_o : \mu_B - \mu_A = 0$.
 - (c) The experiment is easily replicated with other rolls of tape. Using the same technicians and tests, the experiment was replicated 10 times. What alternative values of $L = \mu_B - \mu_A$ can we detect in this experiment with 90% power? Use the MSE estimate from the pilot study as your estimate of σ^2 .

Tech	Test		
	1	2	3
1	A=2.7	C=10.6	B=.5
2	B=3.1	A=10.8	C=.2
3	C=2.5	B=10.7	A=.5

3. Analysis of a Balanced Incomplete Block Design with $b=a=5$, $k=r=4$ generated the ANOVA table below.
 - (a) Complete the table
 - (b) What is $\hat{\sigma}_\beta^2$?
 - (c) Compute $V(\hat{\tau})$, $V(\tilde{\tau})$ and π .
 - (d) When $\hat{\sigma}_\beta^2 = 0$, derive a general formula for the ratio $V(\hat{\tau})/V(\tilde{\tau})$. What implications do you think this has for π ?

Source	df	SS	MS
Treatment		241	
Block(Adjusted)		41	
Error		215	
Total		497	