

Midterm

1. A lumber company wants to estimate board feet of lumber from black cherry trees based on their height. They plan to harvest equal numbers of cherry trees at heights of 30', 40', 50' and 60'. A pilot study showed a strong linear trend with hints of curvilinearity, and the company wants to be able to test whether a quadratic regression model would be more appropriate than a simple linear model to predict board feet. Suppose the contrast coefficients for the quadratic contrast L_Q are $(1, -1, -1, 1)$ and the company would like to detect $L_Q/\sigma = 2$ with probability .9. How many trees of each height should be harvested? Assume $\alpha = .05$.
2. Members of the Native Plant Society and the Hemerocallis Society organize teams to plant Rocky Shoals Spider Lilies in the Broad River. Four different methods of planting comprise all combinations of Depth (6", 9") and Planting Material (Gravel, Sand). Each group used 4 distinct teams of members and planted 100 bulbs over 4 separate days (workdays for the separate teams did not overlap). The response is germination rate of the bulbs.

Day	Native Plant Society				Hemerocallis Society			
	Team 1	Team 2	Team 3	Team 4	Team 5	Team 6	Team 7	Team 8
1	(6,S)=26	(6,G)=30	(9,S)=21	(9,G)=27				
2	(6,G)=37	(9,S)=29	(9,G)=45	(6,S)=28				
3	(9,S)=33	(9,G)=37	(6,S)=36	(6,G)=41				
4	(9,G)=41	(6,S)=40	(6,G)=46	(9,S)=27				
5					(6,S)=33	(6,G)=44	(9,S)=29	(9,G)=43
6					(6,G)=48	(9,S)=43	(9,G)=59	(6,S)=35
7					(9,S)=43	(9,G)=57	(6,S)=41	(6,G)=52
8					(9,G)=46	(6,S)=49	(6,G)=52	(9,S)=46

- (a) Using SAS, test for an overall treatment effect (treat the 4 combos of Depth and Planting Material as a single 4-level factor). *Note: You may have difficulty interpreting block effects; confusing results for Blocks will have no effect upon the tests for treatment.*
 - (b) Test for Depth and Planting Material effects.
3. For the following Balanced Incomplete Block Design:

Block				
1	2	3	4	5
A=250	A=247	A=233	A=248	
B=236	B=241	B=242		B=234
C=262	C=246		C=251	C=255
D=256		D=252	D=251	D=249
	E=263	E=268	E=266	E=271

- (a) Compute estimates of σ^2 and σ_β^2 . What is the value of π for the combined estimator?
- (b) Treat Block as a random effect and obtain σ^2 and σ_β^2 (look for covariance parameters in the output) estimates from PROC MIXED. Are they different from your answers above? How does this affect π ?