

HW 6- ANOVA

1. (6pt) In this problem we study the grain yield of rice at six seeding rates (kg/ha): The seeding rates are 25, 50, 75, 100, 125 and 150 kilograms per acre. Assume that four fields were chosen and each field was divided into 6 plots and each plot was planted at a seeding rate assigned to it at random. Besides the seeding rate, all other agricultural practices are the same. The data is

	Seeding rate (kg/ha)					
Filed	25	50	75	100	125	150
1	5.1	5.3	5.3	5.2	4.8	5.3
2	5.4	6.0	5.7	4.8	4.8	4.5
3	5.3	4.7	5.5	5.0	4.4	4.9
4	4.7	4.3	4.7	4.4	4.7	4.1

Fit an appropriate model to this data and test H_0 : the average yields are the same for the 6 seeding rates against the alternative H_a : There are not the same. Use $\alpha = 0.05$.

2. (10pt) The cutting speeds of four types of tools are being compared in an experiment. Five cutting materials of varying degree of hardness are to be used as experimental blocks. The data giving the measurement of cutting time in seconds appear in the table below

	Block				
Treatment	1	2	3	4	5
1	12	2	1	8	7
2	20	14	17	12	17
3	13	7	13	8	14
4	11	5	10	3	6

- (a) (4pt) Fit an appropriate model to this data and test H_0 :The mean cutting speeds are the same for the four tools H_a : There difference. Use $\alpha = 0.05$.
 - (b) (6pt) Use the Bonferroni method to determine where the differences are
3. (4pt) An experiment to investigate the effects of various dietary starch levels on milk production was conducted on four cows. The four diets, D1, D2, D3, and D4, (in order of increasing starch equivalent), were fed for three weeks to each cow and the total yield of milk in the third week of each period was recorded (i.e. third week to minimize carry-over effects due to the use of treatments administered in a previous period). That is, the trial lasted 12 weeks since each cow received each treatment, and each treatment required three weeks. The investigator felt strongly that time period effects might be important (i.e earlier periods in the experiment might influence milk yields differently compared to later periods). Hence, the investigator wanted to block on both cow and period. However, each cow cannot possibly receive more than one

treatment during the same time period; that is, all possible cow-period blocking combinations could not logically be considered. It is decided to use a 4x4 latin square design and the data is

Treatment	Cow			
	1	2	3	4
Period 1	D4(192)	D1(195)	D3(292)	D2(249)
Period 2	D1(190)	D4(203)	D2(218)	D3(210)
Period 3	D3(214)	D2(139)	D1(245)	D4(163)
Period 4	D2(221)	D3(152)	D4(204)	D1(134)

(each cell provides the treatment applied and response between the parentheses). Fit an appropriate model to this data and test H_0 : there is no difference between the four diets against H_a there is a difference.