Online Homework System

Name:	
Class #:	

Class:	
Section #:	

Instructor: Nathaniel Stevens

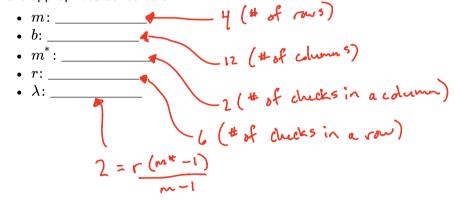
Assignment: Quiz 6

Question 1: (5 points)

Consider the following balanced incomplete block design (BIBD).

	Block 1	Block 2	Block 3	Block 4	Block 5	Block 6	Block 7	Block 8	Block 9	Block 10	Block 11	Block 12
Condition 1		х	x			х		$\sqrt{}$	$\sqrt{}$	x	х	х
Condition 2	x	$\sqrt{}$	x	$\sqrt{}$	x	$\sqrt{}$	x	x	$\sqrt{}$	x	$\sqrt{}$	$\sqrt{}$
Condition 3	$\sqrt{}$	$\sqrt{}$	$\sqrt{}$	x	x	x	x	$\sqrt{}$	х	$\sqrt{}$	x	$\sqrt{}$
Condition 4	x	x	$\sqrt{}$	x	$\sqrt{}$	$\sqrt{}$	$\sqrt{}$	x	х	$\sqrt{}$		x

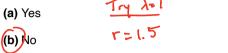
Let m, b, m^* , r, and λ be defined as in class. Using the table above, determine each of their values, and indicate them in the appropriate boxes below.

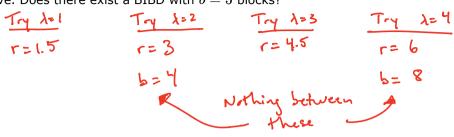


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$$c = \frac{\lambda (m-1)}{m^*-1} \qquad b = \frac{mr}{m^*}$$

Interest lies in experimenting with *one* design factor (with m=4 levels) while controlling for the influence of one nuisance factor (by blocking). Unfortunately, only $m^{st}=3$ experimental conditions can be carried out in a single block. Since a randomized complete block design (RCBD) is not possible, a balanced incomplete block design (BIBD) may be used as an alternative. Does there exist a BIBD with b=5 blocks?





Question 3: (4 points)

A partially complete 4x4 Latin Square is shown below. By selecting the appropriate letters from the drop-down menus, complete the Latin Square.

С	A	カ	В		
В	D	А	C		
A	С	В	D		
D	В	- C	А		

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Question 4: (2 points)

Suppose that a 3x3 Latin Square design is performed to study the significance of *one* design factor while controlling for the influence of *two* nuisance factors. The following "full" logistic regression model is fit to the response observations, which are collected from n=75 units assigned to each block:

$$\log\left(rac{\pi}{1-\pi}
ight)=lpha+eta_1x_1+eta_2x_2+\gamma_1z_1+\gamma_2z_2+\delta_1w_1+\delta_2w_2$$

where the x's represent the design factor, the z's represent nuisance factor 1, and the w's represent nuisance factor 2. Suppose we wish to determine whether blocking by nuisiance factor 1 was necessary. Which of the following "reduced" models should the "full" model be compared to, in order to make this determination?

(a)
$$\log\left(rac{\pi}{1-\pi}
ight)=lpha+eta_1x_x+eta_2x_2$$

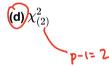
(b)
$$\log\left(rac{\pi}{1-\pi}
ight)=lpha+\gamma_1z_1+\gamma_2z_2+\delta_1w_1+\delta_2w_2$$

(c)
$$\log\left(\frac{\pi}{1-\pi}\right) = \alpha + \beta_1 x_1 + \beta_2 x_2 + \delta_1 w_1 + \delta_2 w_2$$

(d)
$$\log\left(rac{\pi}{1-\pi}
ight)=lpha+eta_1x_1+eta_2x_2+\gamma_1z_1+\gamma_2z_2$$

The comparison above would be carried out using a likelihood ratio test. Which of the following is the appropriate null distribution?

- (a) $F_{(2,668)}$
- (b) $\chi^2_{(3)}$
- (c) $F_{(3,668)}$



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Question 5: (3 points)

A latin square design was used to determine whether a continuous response variable is significantly influenced by a design factor (with 3 levels) while controlling for the influence of two nuisance factors. Response observations were collected on 50 experimental units in each block. A partially complete ANOVA table for this experiment is shown below.

Fill in the missing cells of this table. Round your mean squares and test statistics to 1 decimal place. Be sure to round your answers *before* using them in subsequent calculations.

Source	SS	df	MS	Test Stat.	
Condition	90	p-1= 2	SSc/2 = 45	6	- MS= /MS= = 23.7
Nuisance Factor 1	35	p-1 = 2	SSB, /2 = 17.5	4	ms6, MSE = 9.2
Nuisance Factor 2	45	p-1 > Z	550/2=22.5	4	mse /ms = 11.8
Error	860	N-3p+ 2 = 443	SSE/443 = 1.9		
Total	1,030				
		N-1 = ~p2 -	l		-

Question 6: (1 point)

Suppose that a 5x5 Latin Square Design was used to investigate the significance of *one* design factor while controlling for the influence of *two* nuisance factors. Response observations were collected for each of the n=5 experimental units in each block. The resulting ANOVA table is shown below.

Source	SS	df	MS	Test. Stat.	P-value	
Design Factor	330	4	82.5	7.73	0.00002	less than x=0.05 so we
Nuisance Factor 1	68	4	17	1.59	0.18188	reject hypothesis of overall
Nuisance Factor 2	150	4	37.5	3.51	0.00971	equality.
Error	1195	112	10.67			
Total	1743	124				

Based on this analysis of variance and a significance level of 5%, is it reasonable to believe that the expected response is the same in all 5 experimental conditions?