

EXPERIMENTAL DESIGN 515

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Example Test

Exam 2

Instructions: Write your name on the **BACK** of the exam. Please show your work. If you use contrasts in answering a question, specify the weights. This is a closed book test.

1. In a 3×2 factorial design, assume the population has an equal number of people in each cell, and the population means for row b_1 are:

	a_1	a_2	a_3
b_1	1	5	12
b_2			

Specify a set of b_2 population means that yields a table that has no A or B main effects, but does have an $A \times B$ interaction. If no such set of b_2 means exists, explain why.

2. In a 3×2 factorial design with 3 levels of A and 2 levels of B, an experimenter finds a large and significant $A_{\text{quad}} \times B$ effect, a large and significant B main effect, but no A main effect. Draw a plot of cell means that would be consistent with these results.

3. The following tables present cell totals for a completely randomized $2 \times 2 \times 3$ factorial design with 2 subjects per cell.

	level a_1			level a_2		
	c_1	c_2	c_3	c_1	c_2	c_3
b_1	4	1	8	3	4	0
b_2	0	3	2	4	1	0

a) Compute the SS due to the main effect of B:

b) Compute the SS due to the simple AB interaction at c_3 :

4. A total of 108 male Anglo subjects viewed video tape vignettes that showed a criminal offender committing a crime against a victim. Subjects were randomly assigned to view one of nine video tapes, so $n = 12$. The video tapes fit a 3×3 factorial design in which the outcome of the crime was either mild, intermediate, or serious (Seriousness factor), and the victim was either Anglo, Black, or Chicano (Victim factor). Subjects were asked to assign an appropriate punishment to the offender.

a) It is hypothesized that, averaged over seriousness of the crime outcome, offenders whose victims are minorities are sentenced less severely than offenders whose victims are Anglos. How, precisely, would you test this hypothesis?

b) It is also hypothesized that the minority victim effect described in part (a) will become larger as the severity of the outcome increases. How, precisely, would you test this hypothesis?

c) Finally, it is hypothesized that, averaging over the victim's race, as the severity of outcome increases, offenders will be sentenced more severely. How, precisely, would you test this hypothesis?

5. An experimenter interested in the effects of stress on performance ran an experiment in which subjects were randomly assigned to one of 4 conditions differing in stressfulness. There were 6 subjects in each group, and he analyzed the data as a simple fixed-effects one way analysis of variance with 4 levels. It turned out that exactly half of the subjects in each condition were males, half females. The experimenter thus decided to do a two way ANOVA on the data using sex as a second factor. When he did this the results were as follows:

<i>Source</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>
Stress	120.0	3	40.0	4.00
Sex	15.0	1	15.0	1.50
Stress \times Sex	75.0	3	25.0	2.50
Within	160.0	16	10.0	
Total	370.0	23		

a) Using only this information, find the value of F that the experimenter obtained in his original one way analysis.

b) Estimate the variance component (theta squared) for the Stress main effect parameters in the two way design.

End