ID# _____ Exam 2 PS217, Fall 1999

OK, you know the drill by now. Read each question carefully. Answer each question completely. Because of time constraints, you shouldn't linger too long over any one question. I think of a point as a minute, so you should expect to spend about 10 minutes on a 10-point question. Good luck on the exam and have a good weekend.

1. Dewey, Fowlup, and Howe (1999) reported the following results from their experiment investigating the role of sleep deprivation on performance:

ANOVA Table for Performance

	DF	Sum of Squares	Mean Square	F-Value	P-Value	Lambda	Power
Sleep Deprivation	2	2.467	1.233	2.562	.0958	5.123	.457
Residual	27	13.000	.481				

First of all, tell me everything you can about their experiment (what kind of design it was, how many treatment conditions, how many participants). Then, tell me how they should interpret their results and what (very specifically) they should do next. [10 pts]

This is a single-factor independent groups design with three levels of sleep deprivation and n = 10 (so 30 participants in total). Because the p-value is greater than .05, you would retain H_0. Because of your interest in the question, your next step should be to try to determine why your results were not significant. How was your study lacking in power? You could certainly re-run the study with more participants. You may also want to re-think the three levels of sleep deprivation that you used to see if you could come up with a larger treatment effect. You may also want to think about your DV? Are you using a sufficiently sensitive measure of performance?

2. First-born children tend to develop language skills faster than their younger siblings. One possible explanation for the phenomenon is that first-borns have undivided attention from their parents. If this explanation is correct, then it is also reasonable that twins should show slower language development than single children and triplets should be even slower. Davis (1937) conducted research to test this hypothesis. The dependent variable is a measure of language skill at age three for each child (higher numbers indicate better language skills). Analyze these data as completely as you can. [25 pts]

Single Child	Twin	Triplet
8	4	4
7	6	4
10	7	7
6	4	2
9	9	3

F_{Max} = 1.8 and $F_{MaxCrit}$ = 15.5, so you' d have no concern about heterogeneity of variance. Your source table should look like:

ANOVA Table for Lang Skill

	DF	Sum of Squares	Mean Square	F-Value	P-Value	Lambda	Power
Num Sibs	2	40.000	20.000	5.714	.0181	11.429	.765
Residual	12	42.000	3.500				

Means Table for Lang Skill
Effect: Num Sibs

	Count	Mean	Std. Dev.	Std. Err.
Single	5	8.000	1.581	.707
Triplet	5	4.000	1.871	.837
Twin	5	6.000	2.121	.949

H_0: $\mu_{Sing} = \mu_{Tw} = \mu_{Tr}$
H_1: Not H_0

With $F_{Crit}(2,12) = 3.88$, you would reject H_0. (Of course, if you could actually generate a StatView analysis, you wouldn't need to look up the critical value of F, but would simply look at the P-Value and determine that it's less than .05.)

The next step would be to compute HSD to determine which of the three means differs. With q = 3.77, HSD = 3.15. Thus, a participant who is a member of a triplet scores significantly lower on language development than an only child, but no other differences are significant.

3. Dr. Beau Peep believes that pupil size increases during emotional arousal. He was interested in testing if the increase in pupil size was a function of the type of arousal (pleasant vs. aversive). A random sample of 5 participants is selected for the study. Each participant views all three stimuli: neutral, pleasant, and aversive photographs. The neutral photograph portrays a plain brick building. The pleasant photograph consists of a young man and woman sharing a large ice cream cone. Finally, the aversive stimulus is a graphic photograph of an automobile accident. Upon viewing each photograph, the pupil size is measured in millimeters. An incomplete source table resulting from analysis of these data is seen below. Complete the source table and analyze the data as completely as possible. [15 pts]

ANOVA Table for Stimulus

	DF	Sum of Squares	Mean Square	F-Value	P-Value	Lambda	Power
Subject	4	5.067	1.267				
Category for Stimulus	2	36.133	18.067	13.722	.0026	27.443	.978
Category for Stimulus * Subject	8	10.533	1.317				

Means Table for Stimulus
Effect: Category for Stimulus

	Count	Mean	Std. Dev.	Std. Err.
Neutral	5	2.600	.548	.245
Pleasant	5	6.400	1.517	.678
Aversive	5	4.400	1.140	.510

H_0: $\mu_A = \mu_N = \mu_P$
H_1: Not H_0

With $p < .05$, you would reject H_0. Thus, you would need to compute HSD to determine which of the means differs. With $q = 4.04$, HSD = 2.07. Thus, pleasant pictures lead to significantly greater dilation than neutral pictures, but none of the other means differ.