Psychology 610 Fall 2004
Prof. Moore SHOW YOUR WORK!

ID# _____
Do not put your name on this exam.

1. (5 points each) Fill in the blanks in a-e using the information in the following ANOVA Source Table:

Source	df	SS	MS	F
Mean	1	28560.5	28560.5	1785.031
A	2	4	2	1.531
B	1	24.5	24.5	1.365
C	3	65.5	21.833	0.125
AxB	2	292	146	1.365
AxC	6	92	15.333	9.125
BxC	3	65.5	21.833	0.958
AxBxC	6	116	19.333	1.208
S/ABC	48	768	16	

a. $\sum SS_{A@B_k} =$ _____

b. $SS_{A_{Linear}xB_{Linear}} + SS_{A_{Quadratic}xB_{Linear}} =$ _____

c. $\sum df_{AxB@C_l} =$ _____

d. $SS_{C/B} =$ _____

e. $MS_{AxC/B} =$ _____

2. Professor Cope studies gender differences in adjustment to chronic illness. She recently conducted a study with 72 people who have one of three chronic illnesses (heart disease, rheumatoid arthritis, or diabetes). She collaborated with 9 medical professionals (3 Medical Doctors, 3 Physician Assistants, and 3 Nurse Practitioners). Each medical professional recruited 8 of his or her own patients to participate in the study (4 women and 4 men). The dependent measure was score on a self-report questionnaire of psychological adjustment (out of 20). Higher scores indicate better adjustment. The cell totals are presented in the table below. The following bracket expressions have been calculated for you to save time: [Y] = 12735, [ABC] = 12462.75, [AC] = 12341.25, [BC] = 12322.125, [A] = 12274.25, [B] = 12258.375, [T] = 12246.125. Factor A is Gender, Factor B is Illness, and Factor C is Medical Professional.

		A (Gender)		
		Women	Men	Total
Heart Disease	Medical Doctor	42	57	306
	Physician Assistant	51	57	
	Nurse Practitioner	42	57	
Rheumatoid Arthritis	Medical Doctor	54	57	327
	Physician Assistant	54	63	
	Nurse Practitioner	42	57	
Diabetes	Medical Doctor	63	51	306
	Physician Assistant	57	45	
	Nurse Practitioner	42	48	
	Total	447	492	T = 939

Assume that all factors are fixed and crossed for questions a-e.

a. (15 points) Make a graph for the main effect of gender. Calculate the pooled standard error for this effect, and include standard error bars on your graph.

b. (5 points) Describe how you would calculate the standard error for the main effect means of gender using the "partially pooled" method (don't calculate—too time consuming for this exam).

c. (10 points) Test the main effect of gender, and interpret your result.

d. (10 points) Test the two-way interaction of gender and illness, and interpret your result.

e. (10 points) In a lab meeting, one of Professor Cope's graduate students suggests that medical professional should be treated as a random nested factor. Provide one argument **for** and one argument **against** the graduate student's suggestion.

Now assume that medical professional is a random nested factor for questions f and g.

f. (10 points) Test the main effect of gender again, and interpret your result. Are your conclusions similar to your conclusions in question c above? Why or why not?

g. (5 points) How could Professor Cope increase power for testing the main effect of gender?

3. Research has shown a relationship between number of extracurricular activities and self-esteem in adolescents. Professor Brady hypothesizes that the relationship depends on number of siblings. She performs a 4 (number of extracurricular activities: 0, 1, 2, or >2) x 4 (number of siblings: 0, 1, 2, or >2) ANOVA, with score on the Rosenberg Self-Esteem Scale as the dependent measure. She finds a significant interaction between number of extracurricular activities and number of siblings. To follow-up the significant interaction, she performs a complete set of orthogonal A_ψ x B_ψ two-way trend tests. Factor A is number of extracurricular activities, and Factor B is number of siblings.

   a. (5 points) How many two-way trend tests did Professor Brady perform? Explain how you know your answer is right.

b. (10 points) Graph the pattern that the A_{Linear} x B_{Cubic} two-way trend test is actually testing.

c. (5 points) In general, what is a two-way trend test actually testing (in terms of the linear model)?

4. Matt Campbell, a graduate student in the UW psychology department, has developed a method for training cotton-top tamarins to recognize predators, and he wants to examine whether his method is effective. First, he uses his method to train four families of tamarins to recognize snakes as predators. Then, he records how each family responds to three stimuli: (1) an inanimate object, (2) a rat, and (3) a snake. Each family of tamarins is tested in all three conditions, and the order of conditions is randomized across families. The dependent measure is the number of vocalizations made by the family in the five minutes following stimulus presentation.

	Inanimate object	Rat	Snake
Family 1	30	60	69
Family 2	33	63	66
Family 3	33	60	69
Family 4	42	60	60

   a. (20 points) Matt predicts that vocalizations will be greatest in the snake condition. Test this hypothesis using the partitioned error term contrast, and interpret your results.

b. (5 points) Why is partioned error recommended for contrasts in within-subject designs?

c. (10 points) Describe why this design is likely to have more power than a one-way between-subjects design with 12 participants. Also explain why it is not guaranteed to have more power.