## Psychology 318 Exam #4

## May 18, 2009

### Instructions

1. Use a pencil, not a pen

2. Put your name on each page where indicated, and in addition, put your section on this page.

3. Exams will be due at 10:20!

4. If you find yourself having difficulty with some problem, go on to the rest of the problems, and return to the troublemaker if you have time at the end of the exam.

5. Leave your answers as reduced fractions or decimals to three decimal places.

6. **CIRCLE** **ALL** **ANSWERS:** **You** **will** **lose** **credit** **if** **an** **answer** **is** **not** **circled!!**

7. Check to make sure that you have all questions (see grading below)

**8.** **SHOW** **ALL** **YOUR** **WORK:** **An** **answer** **that** **appears** **from** **nowhere** **will** **receive** **no** **credit!!**

9. Don't Panic!

10. **Always assume homogeneity of variance unless told otherwise.**

11. **Always indicate degree of freedom in your answers whenever it is appropriate.**

12. **Always use an  level of .05 unless told otherwise.**

13. Good luck!

### Grading

Problem Points Grader

1a-d 45 Zach

1e 5 Tim

2 15 Courtney

3a-e 35 Yu

TOTAL /100

1. In Exam 3 an experiment was described in which the effect of picture degradation on picture memory was examined. This experiment was similar to the between-subjects experiment described in class: there were J = 4 conditions, corresponding to four degradation levels: Either 0%, 15%, 30%, or 45% of pixels are removed.

In the Exam-2 question, it was supposed that this experiment is done as a within-subjects design. Here is a somewhat different version of that experiment.

There are K = 10 subjects who participate in each of the J = 4 conditions. Each subject contributes n = 8 observations to each of the J = 4 conditions.

The data consist of proportion pictures correctly recognized. Below are totals and means across the 10 subjects.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Percent Degradation | | | |  |  |
|  | 0 | 15 | 30 | 45 |  |  |
| TCj | 71.2 | 65.1 | 62.1 | 58.9 | 257.28 | = T |
| MCj | 7.120 | 6.512 | 6.208 | 5.888 | 320 | = N |

NOTE: TCj2 = 16,630.8352

ASSUME: Tjk2 = 1,699.4048

TRk2 = 6,712.1920

Xijk2 = 220.8256

**CAUTION**: **These sums haven't been divided by anything**

**NOTE: Please carry out calculations to 4 decimal places**

a) Assume subjects to be a **random effect**. Carry out the appropriate ANOVA on these data. Please organize all your information in a carefully constructed ANOVA table that includes total sum of squares. Test effects of every thing it’s possible to test. Include all criterion F’s. (15 points)

Question 1 continues next page Question 1 (continued)

b) What is the 95% “within-subjects” confidence interval appropriate for inferring the *pattern* of condition population means? (10 points)

c) Assume subjects to be a **fixed effect**. Carry out the appropriate ANOVA on these data. Please organize all your information in a carefully constructed ANOVA table. Test effects of every thing it’s possible to test. Include all criterion F’s. (10 points)

d) Again assuming subjects to be a fixed effect, compute the appropriate confidence interval to put around the cell mean corresponding to each subject-condition combination. (10 points)

e) Evaluate the hypothesis that, in this experiment, what I called in class “intrinsic error variance”, or equivalently, “intrasubject variance”, (e is equal to zero. Based on these data, can you reject this hypothesis? Explain your answer. NOTE: You should have to do minimal or no calculation here and your answer should be brief. (5 points)

2. Below is a 3 (conditions) x 2 (subjects) within-subjects design. The columns represent Conditions, while the rows represent Subjects. Assume that each subject has **two** observations in each conditions (i.e., there are supposed to be two scores in each of the six cells).

Make up the two scores within each cell as well as totals for columns, rows, and cells such that all of the following are true:

* mean square due to conditions is greater than zero
* mean square due to subjects is zero
* mean square due to interaction is greater than zero
* intrasubject variation is greater than zero

(HINT: Your life will be easiest if you do things in the following order: First, make up the totals for rows. Next make up totals for columns. Next make up totals for each of the six cells. Finally, make up the 2 scores within each cell)

(15 points)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Conditions | | |  |
|  | Level 1 | Level 2 | Level 3 |  |
| Subject 1 |  |  |  |  |
| Subject 2 |  |  |  |  |
|  |  |  |  |  |

3. An experimenter is interested in the relation between average number of hours per day that twelve-year old boys spend eating at the family dinner (X) and the their weights (Y). A total of n=13 boys are observed. The following are the summary data.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| X = | 14.05 |  |  | Y = | 1,335 |
| X2 = | 15.53 | XY = | 1,441.24 | Y2 = | 137,905 |

a) Compute MX and MY, the means over the 13 boys of amount time spent during dinner and weight. Also compute SX and SY, the variances of time and weight. (4 points)

b) Assume you wish to predict weight from hours at dinner. Suppose that you observe a boy who spent an average of 1 hour per day at dinner. What would be his predicted weight? (6 points)

c) What are the Pearson r and Pearson r2 between the X and Y scores? CAUTION: It is recommended that you compute the Pearson r *before* you compute the Pearson r2. (15 points)

Question 3 continues next page Question 3 (continued)

d) What is the Pearson r and the Pearson r2 between the X-scores and the predicted scores, (that is between the X scores and the Y'-scores)? Give a *very brief* justification for your answer. (NOTE: this should require little, if any, additional calculation). (6 points)

e) What is the Pearson r and the Pearson r2 between the X-scores and the error scores, (that is between the X scores and the (Y-Y')-scores)? Give a *very brief* justification for your answer. (NOTE: this should require little, if any, additional calculation). (4 points)