## Psychology 318 Exam #3

## May 4, 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. **New Instruction: Always assume homogeneity of variance unless told otherwise.**

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

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

13. Good luck!

### Grading

Problem Points Grader

1 60 Zach, Courtney

2 40 Andy

TOTAL /100

1. You may recall Question 2 from Exam 2, where the issue is perceived fizziness of three different cola brands: FremontOFizzo, RefreshCo, and Coolossal. The question is: Does fizziness depend on both cola brand and the drinker’s age? To answer this question, nR = 60 subjects are selected from each of four age groups: pre-teens, teens, 20-year olds, and 50-year olds. Each of these K = 4 groups is randomly subdivided into J = 3 subgroups of n = 20 subjects apiece. Each subject rates one cola brand on a scale from 1 (totally flat) to 15 (totally fizzy).

Data, from this design in the form of condition **means** are as follows.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | | **Cola Brand** | | | |
|  | | **FremontOFizzo** | | **RefreshCo** | **Coolossal** |
| **Pre-teens** | | 5 | | 3 | 8 |
| **Teens** | | 4 | | 3 | 7 |
| **20-year olds** | | 7 | | 6 | 10 |
| **50-year olds** | | 10 | | 14 | 7 |

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Data, from this design in the form of condition **totals** are as follows.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Cola Brand** | | |  |
|  | **FremontOFizzo** | **RefreshCo** | **Coolossal** | TRk |
| **Pre-teens** | 100 | 60 | 160 | 320 |
| **Teens** | 80 | 60 | 140 | 280 |
| **20-year olds** | 140 | 120 | 200 | 460 |
| **50-year olds** | 200 | 280 | 140 | 620 |
| **TCj** | 520 | 520 | 640 | 1680 = T |

Note: STjk2 = 280,800

TCj2 = 950,400

STRk2 = 776,800

Assume: SSXijk2 = 15,750

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

a) Carry out a two-way ANOVA on these data. Please organize all your information in a carefully constructed ANOVA table. Include all criterion F’s. (30 points)

Question 1 continues next page Question 1 continues

b) Inspect these data and briefly discuss why there is an interaction (which you should have found in your   
ANOVA). Please be specific in your answer. (5 points)

c) Compute the 90% confidence interval suitable for putting around each ***cell*** mean. (10 points)

d) Test the null hypothesis that there is no effect of cola brand **for 50-year olds only** against the alternative hypothesis that there is a cola-brand effect. (10 points)

e) Continue to assume homogeneity of variance over all 12 cells, but suppose that you want to analyze all cells *except* the Pre-teen FremontOFizzo cell (cell11). Is there a statistically significant effect of these remaining 11 cells? That is, consider this to be a one-way ANOVA with 11 conditions. NOTE: Given the information you have been provided, the calculations involved shouldn’t be very tedious. (5 points)

2. In class, I described an experiment in which the effect of picture degradation on picture memory is examined. There are four conditions, corresponding to four degradation levels: Either 0%, 15%, 30%, or 45% of pixels are removed.

Suppose this experiment is done as a within-subjects design. In particular, suppose that there are K=12 subjects who participate, at one time or another, in each of the four conditions. The mean for each subject in each condition is computed; thus, there is one observation per subject for each of the four conditions. The data consist of proportion correct pictures recognized. Below are totals and means across the 12 subjects.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Percent Degradation | | | |  |  |
|  | 0 | 15 | 30 | 45 |  |  |
| TCj | 10.550 | 9.620 | 9.090 | 8.420 | 37.68 | = T |
| MCj | 0.879 | 0.802 | 0.758 | 0.702 | 48 | = N |

Note that each of these four means and totals are of 12 numbers—the K=12 subjects.

NOTE: TCj2 = 357.3714

ASSUME: Tjk2 = 30.4774

TRk2 = 120.1332

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

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

a) Carry out the appropriate ANOVA on these data. Please organize all your information in a carefully constructed ANOVA table. Include all criterion F’s. (15 points)

Question 2 continues next page Question 2 (continued)

b) What is the confidence interval appropriate for putting around each of the four degradation-condition means that genuinely captures the corresponding population mean with 95% confidence? (9 points)

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

d) Suppose that we undertook with these data the exercise illustrated in class for removing the variance due to subjects. Now suppose that this was actually how the data actually came out. Re-do Parts a, b and c above. For your re-do of Part a, be sure to include a new ANOVA table. (6 points)