## Psychology 318 Exam #2

## April 21, 2010

### 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:** Assume homogeneity of variance unless told otherwise.

11. Good luck!

### Grading

Problem Points Grader

1a-i 70 Leanne

2a-d 20 Alec

3a-b 10 Jianli

TOTAL /100

1. In an analysis of variance (ANOVA) design, there are 3 conditions, (labeled "Condition 1" through "Condition 3") as indicated in the table below. Scores are provided for each condition. Two summary statistics (xij2 and Tj2/nj) have been computed for you for each condition in two of the rows under the scores. The right hand column, provided for your convenience, is for any calculations you may wish to do (e.g., compute sums, means, whatever) across the columns within any of the rows.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Condition 1 | Condition 2 | Condition 3 |  | (Calculations) |
|  | 9.9 | 4.0 | 18.0 |  |  |
|  |  | 9.8 | 14.2 |  |  |
|  |  | 6.3 |  |  |  |
|  |  | 7.8 |  |  |  |
| nj |  |  |  |  |  |
| Tj |  |  |  |  |  |
| xij2 | 98.010 | 212.570 | 525.640 |  |  |
| Tj2/nj | 98.010 | 194.603 | 518.420 |  |  |
| Mj |  |  |  |  |  |
| SSj |  |  |  |  |  |
| dfj |  |  |  |  |  |
| estj2 |  |  |  |  |  |
| “weight”: wj |  |  |  |  |  |
| CIj (HOV) |  |  |  |  |  |
| estj2 (no HOV) |  |  |  |  |  |
| CIj (no HOV) |  |  |  |  |  |

In the questions below you will be asked to compute various quantities. **If there are any quantities that are not possible to compute, then place "X"s in the corresponding cells of the table**.

a) What are the values of T, N, and M? (3 points)

b) Fill in the table rows labeled nj, Tj,  Mj, SSj, and dfj for all three conditions. (30 points)

c) Compute your best estimate of 2 for each of the conditions. Place your answers in the table row labeled "estj2". (3 points)

d) Assume you wish to compute a best estimate of 2 from the individual estj2's (remember to assume homogeneity of variance.) Compute the appropriate weight that would go with each estj2. Place your answers in the table row labeled “weight”: wj. (3 points)

e) Using the weights from part (d) compute your one best estimate of 2. On how many degrees of freedom is this estimate based? (7 points)f) Compute SSW and dfW and then compute your best estimate of 2 again using the computed SSW and dfW. (4 points)

g) Continue to assume homogeneity of variance. Compute **80%** confidence intervals around whichever of the three means you can. Place your answers in the table row labeled "CIj (HOV)". (6 points)

h) *Do not* assume homogeneity of variance. Compute **80%** confidence intervals around whichever of the three means you can. Place your answers in the table row labeled "CIj (no HOV)". (4 points)

i) Can you reject the null hypothesis of no difference among the three population means corresponding to the three conditions? Use the standard  = .05 confidence level. Organize your results in a standard ANOVA summary table (10 points)

2. Suppose that 15 scores are randomly chosen from some population with a population standard deviation,  of 10. These scores are then randomly divided into J = 3 groups of n1 = 6, n2 = 4, and n3 = 5, scores.

Suppose you plan to carry out an analysis of variance on these scores. In the process, you plan to compute MSB, and MSW using the standard formulas.

a) What would be the degrees of freedom associated with the MSB and MSW that you plan to compute? (4 points)

b) What is your best guess about what MSB and MSW would be? Give reasons for your answers. (6 points)

c) Suppose that you were to compute the means, M1, M2, and M3 of the three groups. Compute the variances and the standard deviations of the sampling distributions that each of the 3 means comes from. (6 points)

d) Suppose you compute SST and dfT from the data, as described in class and in the readings. What is dfT? What is your best guess as to what SST would be? Give reasons for your answers. (4 points)

3. An exercise physiologist is investigating the joint effects of age and vitamin consumption on ability to perform sit-ups. A 4 (age) x 3 (drug dosage) experiment is run. There are n=6 subjects in each cell. The levels of each factor along with the data (mean sit-ups per minute) are provided below.

For purposes of this question, please think of this design as being a one-way design with 12 conditions. (Note, however that below we maintain the notation of a two-way design).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | **Age** | | | |  |
|  |  | Teens | 20's | 40's | 60's |  |
|  | None | 20 | 30 | 25 | 15 | 22.50 |
|  | 500 mg | 22 | 35 | 25 | 25 | 26.75 |
|  | 2000 mg | 29 | 31 | 30 | 30 | 30.00 |
|  |  | 23.667 | 32.000 | 26.667 | 23.333 | 26.42 = M |

It is true that: T2jk = 313,596 NOTE!! These sums of squared totals

It is also true that: T2 = 3,617,604 haven't yet been divided by anything!

Assume that: x2ijk = 56,106

a) Compute the 95% confidence interval that goes around each cell means (NOTE: You only need compute one confidence interval). (5 points)

b) What percent of the total sum of squares in this experiment comes from between cells? What percent comes from within cells? (5 points)