## Psychology 318 Exam #2

## April 20, 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. Good luck!

### Grading

Problem Points Grader

1a-j 88 Yu and Tim

2 12 Zach

TOTAL /100

1. Do different cola brands differ in how refreshing they are? To investigate this question, Laurelhurst Tasters Inc. (LTI) designs a blind tasting test of five different cola brands: Coke, Pepsi, FremontOFizzo, RefreshCo, and Coolossal.

LTI recruits a group of randomly selected people to participate in its test. The subjects are initially divided into five groups of n = 8/group, with each group sampling one of the colas. Each subject samples one cola brand and provides a "refreshingness rating" on a scale from 1 to 15 where 1 means "totally unrefreshing" and 15 means "totally refreshing."

Due to experimenter slipups, some of the data are lost. The remaining refreshingness scores are as follows:

|  |  |  |
| --- | --- | --- |
|  | Cola Brand |  |
| Coke | Pepsi | FremontOFizzo | RefreshCo | Coolossal |
| 4 | 4 | 3 | 2 | 3 |
| 4 |  | 2 | 2 | 4 |
| 4 |  | 4 | 1 | 5 |
| 4 |  | 5 | 1 | 5 |
|  |  | 2 | 1 | 5 |
|  |  | 14 | 1 | 5 |
|  |  | 5 |  |  |
| n1 = 4 | n2 = 1 | n3 = 7 | n4 = 6 | n5 = 6 |
| df1 =  | df2 = | df3 = | df4 = 5 | df5 = 5 |
| T1 =  | T2 = | T3 = | T4 = 8 | T5 = 27 |
| M1 =  | M2 = | M3 = | M4 = 1.333 | M5 = 4.500 |
| xi12 =  | xi22 = | xi32 = | xi42 = 12 | xi52 = 125 |
| SS1 = | SS2 = | SS3 = | SS4 = 1.333 | SS5 = 3.500 |
| est12 =  | est22 = | est32 = | est42 = 0.267 | est52 = 0.700 |

a) Fill in the shaded cells of the table. If anything cannot be computed, please place an “X” in the appropriate cell. (9 points)

b) What are the values of N and T in this experiment? (5 points)

c) Combine your estimates of estj2 into one best estimate in two ways: by using a weighted average and second by computing an appropriate sum of squares and associated degrees of freedom. (16 points)

d) Compute ***80%*** confidence intervals around M2 and M5. (14 points)

e) Do not assume homogeneity of variance. Re-compute your 80% confidence interval around M5. (6 points)

f) Do not assume homogeneity of variance. What is the 29.827364% confidence interval around M1? You must provide an *exact* answer. HINT: This is an easy question and you probably won't need to do any computation if you don't want to. You do, however, need to explain your answer. (6 points)

g) Perform a standard ANOVA. Organize your results in an ANOVA table. Use a = .05. (18 points)

h) Suppose you *knew* that the population variance, s2, was equal to 3.500. Re-do your ANOVA from Part (g), including a new ANOVA table. Use a = .05. HINT: You shouldn’t have to do much in the way of additional calculation. (7 points)

i) Consider FremontOFizzo and RefreshCo *only*. Test the null hypothesis that homogeneity of variance holds for these two groups against the alternative hypothesis that FremontOFizzo has a *larger* population variance than RefreshCo. Use the a = .05 level. (6 points)

j) Suppose that you *knew* both that the standard ANOVA H0 was true (i.e., that the five j's are identical to one another) and that the homogeneity of variance assumption is true (i.e., that  is the same for all five groups). Compute the best possible estimate of 2. On how many degrees of freedom is this estimate based? (6 points)

2. LTI is again working on perceived fizziness of different colas. This time, LTI is focusing its attention on two factors. Factor 1 is, as in Question 1, cola brands, but here LTI is concerned only with FremontOFizzo, RefreshCo, and Coolossal.

 Factor 2 is age: the FTC wishes to investigate pre-teens, teens, 20-year olds, and 50-year olds. The plan is that each subject in the experiment will sample one cola brand and will provide a fizziness rating on a scale from 1 to 9, as before.

Assume that the FTC randomly selects 20 people to be in each cell.

Draw a table indicating what this design looks like. What are the values of J, K, n, nC, nR, and N in this experiment? (12 points)