## Psychology 318 Exam #4

## May 19, 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. Assume homogeneity of variance unless told otherwise.

11. Good luck!

### Grading

Problem Points Grader

1a-e 50 Alec

2a-f 50 Yigu

TOTAL /100

1. Below in Table 1, are the exact same data that you saw in Exam 3, Question 2. Recall that these data (times in minutes) were presumed to come from K = 20 runners, each of whom ran ten-kilometer races at each of 4 altitudes: sea level, 500 feet, 2,000 feet, and 5,000 feet. Each runner was assumed to have had one score for each of the 4 altitudes.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Table 1 | | | | |
|  | Race altitude (feet) | | | |
|  | Sea level | 500 | 2,000 | 5,000 |
| TCj | 838 | 880 | 930 | 1,042 |
| MCj | 41.90 | 44.00 | 46.50 | 52.10 |

Now suppose you discover that each of the runners had actually run n = 5 separate races at each of the four altitudes. The single score for each altitude for each runner, upon which Table 1 was based, was the mean of the n=5 scores for each runner at each altitude.

So now we want to consider the *complete* data, i.e., all N = 20 runners x 4 altitudes x 5 races per runner per altitude. Thus, what we will call Table 2 consists of the J = 4 columns (altitudes) x K = 20 rows (runners), with n=5 scores in each of the 80 cells. **We’re not showing you Table 2, but assume it exists.** Thus in Table 2, each score Xijk, is the ith race time of the kth runner at the jth level of altitude.

a) Summarize Table 2 by filling in Table 3 below. (8 points)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Table 3 | | | | |
|  | Race altitude (feet) | | | |
|  | Sea level | 500 | 2,000 | 5,000 |
| TCj |  |  |  |  |
| MCj |  |  |  |  |

b) Consider **the set of J x K = 80 numbers summarized in Table 1**: if you carried out an ANOVA on them, you’d get the same thing as you did in Exam 3. In particular, you’d find that,

SSB = 26,443.75, which is divided into sums of squares due to…

Altitude: SSC = 1,164.15

Runners: SSR = 20,000.00

Interaction: SS(CxR) = 5,279.60

Now carry out the *full* ANOVA; that is the ANOVA using all N = J x K x n = 4 x 20 x 5 = 400 data points in the complete design (the data summarized in the Table 2 that was described above). Include SST and dfT in your table.

To do this, assume that, across all N = 400 total data points,

X2ijk = 984,225

and that across all J x K = 80 cells,

T2jk = 4,916,125

Assume also *that you want to generalize to all runners from which this sample of runners has been chosen.*

Show your results in a complete ANOVA table. Show obtained and criterion F’s for effects of altitude and of the subject x altitude interaction. (17 points)

c) Making the same assumptions as in Part (b), compute the “within-subjects” confidence interval appropriate for putting around the MCj’s (i.e., the confidence interval appropriate for capturing the pattern of altitude (column) population means). (10 points)

d) Assume that you wish to generalize only to the K = 20 runners who are participating in this experiment. Re-do your ANOVA table from Part (b) Again show obtained and criterion F’s for effects of altitude and of the subject x altitude interaction. (5 points)

e) Suppose that the mean race time of Runner 5 in the 2,000-foot condition, i.e., M35 is 42.2 minutes. Compute the 95% confidence interval appropriate for estimating m35. (10 points)

2. Here is a table of X’s and Y’s from an experiment:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Score | X | Y | Y' | (Y-Y') |
| 1 | 11 | 2 |  |  |
| 2 | 3 | 0 |  |  |
| 3 | 7 | 10 |  |  |
| Sums of scores |  |  |  |  |
| Sums of squared scores |  |  |  |  |
| Means |  |  |  |  |
| Variances |  |  |  |  |

a) fill in the eight shaded cells of the table: that is, compute and fill in the values of X, X2, Y, and Y2, along with the means and variances of the X’s and the Y’s (and by “variance” we mean the variance of the sample, S2, *not* an estimate of a population variance, est 2). (8 points)

b) Compute b and a, the slope and intercept of the regression equation for predicting Y from X. (12 points)

c) Fill in the remaining 14 (unshaded, boxed) cells of the table. Note of course that Y’ is the score predicted from the corresponding X on the basis of your regression equation from Part (b). (14 points)

d) Compute the Pearson r2 and r, using the standard equation that was gone over in class (and is in the textbook). **Be sure to show your work.** (6 points)

e) Compute the Pearson r2 using your results from Part (c) (whichever of the results that you need from Part (c), but *only* the results from Part (c)). **Be sure to show your work.** (6 points)

f) Suppose we asked you to compute the 95% confidence interval around the Pearson r that you computed. Why would you run into difficulties? (4 points)