

Psychology 318 Exam #2
April 24, 2004

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 9:20!
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. Use the .05 α level unless told otherwise
10. Don't Panic!
11. Good luck!

Grading

<u>Problem</u>	<u>Points</u>	<u>Grader</u>
1a-b	45	Serena
1c-e	25	Katie
2a-c	30	Bailey

1. Daryl, a criminologist is studying prison terms for various classes of people: in particular, white females (WF), white males (WM), Hispanic males (HM), and African-American males (AAM). The plan is to obtain $n = 9$ individuals in each category who have been convicted of robbery and determine the sentence that they were given. Unfortunately, Daryl is not able to find enough individuals in each category, but goes ahead anyway, determining prison sentences, in years, for the people that he does have. Partial summary data are provided below. The extra column to the right and the extra rows below are for you to use as you wish.

Statistic	WF (Group 1)	WM (Group 2)	HM (Group 3)	AAM (Group 4)	
n_j		9		7	
df_j	0			6	
T_j		89.70	64.50	78.60	
$\sum x_{ij}^2$		926.53		893.12	
T_j^2/n_j	62.41			882.57	
M_j			12.90	11.23	
SS_j			6.70	10.55	
$est_j\sigma^2$				1.76	

a) Fill in the information in the remaining cells of the table. If something is uncomputable, indicate that by n/c. (32 points)

NOTE: If you're unable to figure out some particular number, a TA will sell you the number for 2 points. You'll need the numbers to be able to do parts b-e of this problem.

b) Carry out a standard one-way ANOVA on these data (use an ANOVA table and be sure to fill in the criterion F's). (13 points)

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c) Compute three 95% confidence intervals around M_2 (i.e., the WM mean): the first assuming homogeneity of variance (6 points), the second not assuming homogeneity of variance (5 points), and the third assuming that White Males and African-American Males have the same variance which is not necessarily the same as that of White females and Hispanic males. (4 points; so 15 points in all for this part)

d) Suppose that the null hypothesis is true and that there are no differences between any of the populations means, $\mu_1 \dots \mu_4$. What is your *best* estimate of the *standard deviation* of the population from which all N scores in the experiment are drawn? (NOTE: By “best estimate” is meant the estimate based on the largest possibly number of degree of freedom). (8 points)

e) Test the null hypothesis that the homogeneity of variance assumption is correct with respect to White males and African-American Males against the alternative hypothesis that it isn't. Use the standard .05 α level. (2 points)

2. In a second study on sentencing, a second question is posed: Does sentence length depend on the kind of crime committed as well as ethnic group? To answer this question, the same four ethnic groups (WF, WM, HM, AAM) are studied: Sentence length is recorded for each individual from within each group for each of three crimes: unarmed robbery, armed robbery, and first-degree murder. There are $n = 20$ individuals in each group (n is the same for all 12 groups). Summarized data are as follows: In each cell is M_{jk} ; T_{Cj} 's and T_{Rk} 's are also provided in the table.

	WF	WM	HM	AAM	T_{Rk}
Robbery	9.5	9.9	14.2	11.8	908
Armed robbery	11.2	7.6	13.2	16.9	978
Murder	12.9	16.7	13.3	16.5	1,188
T_{Cj}	672	684	814	904	

Note: $\sum \sum T_{jk}^2 = 826,652$

$$\sum T_{Cj}^2 = 2,399,252$$

$$\sum T_{Rk}^2 = 3,192,292$$

Assume: $\sum \sum \sum x_{ijk}^2 = 42,472.60$

(CAUTION! These sums haven't been divided by anything)

a) What are n_C , n_R , and N ? Also, fill in the M_{Cj} 's, the M_{Rk} 's, and T . (11 points)

b) Compute SSW , SSB , and SST . What are the degree of freedom corresponding to these three sums of squares? (12 points)

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Problem 2 (continued)

c) Compute the 95% confidence interval appropriate to each cell mean. (7 points)