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Please circle your TA: Adam Suzanne Yiyu

Psychology 318 Exam #1 April 5, 2017

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!!

Grading

Problem	Points	Grader
1a-b	20	Suzanne
1c-d	25	Yiyu
1e	5	Suzanne
2a-b	14	Yiyu
2c-e	28	Adam
3	8	Adam
TOTAL	/100	

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1. An experiment (similar to that described in class last quarter in Psychology 317) is done investigating the effects of nicotine on rat growth.

A pair of rats from each of eight different litters of rats are used in the experiment. One member of each pair is randomly assigned to a Control condition in which a benign solution (saline) is administered daily during the rats' growth period. The other member is assigned to the Experimental condition in which a solution containing nicotine is administered daily.

All rats are weighed as adults. The results (weights in kilograms) are in the table below. Note that various things have been computed for you at the bottom of the table, and room has been left in the table for you to compute other things should you wish.

Rat Pair	Control (x_1)	Nicotine (x_2)	Difference
1	0.90	0.50	0.40
2	0.40	0.26	0.14
3	1.30	1.18	0.12
4	1.92	1.33	0.59
5	0.64	0.21	0.43
6	1.29	1.10	0.19
7	1.50	1.32	0.18
8	1.36	1.50	-0.14
Σx_i	9.31	7.40	1.91
Σx_i^2	12.520	8.725	0.815

The experimenter is uncertain whether to view this as a within-subjects design (since the two members of each pair are littermates) or as a between-subjects design (since the two pair members are, of course, different rats).

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a) Treat this design as a *between-subjects* design and assume homogeneity of variance. Test the alternative hypothesis that nicotine and control conditions *differ* against the null hypothesis that the two conditions don't differ. Use a .05 α -level. Show all hypothesis testing steps. (8 points)

b) Continuing to treat this as a between-subjects design (and assuming homogeneity of variance), compute 80% confidence intervals for the two condition means, and for the mean difference between the two conditions. (12 points)

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c) Treat this design as a *within-subjects* design. Use the .05 α -level. Test the same hypothesis as in Part (a). Show all hypothesis testing steps. (15 points)

d) Continuing to treat this as a within-subjects design, compute the 80% confidence interval around the relevant mean. (10 points)

e) *Briefly* discuss the reasons for any differences in conclusions that you get in Part (c) versus Part (a).
NOTE: You should have found that you rejected H_0 in Part (c) and didn't reject H_0 in Part (a). If that didn't happen you made a mistake somewhere. Answer *this* part as if you made the correct conclusions in Parts (a) and (c). (5 points)

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2. An experiment is done to investigate the proposition that impulsivity is higher for teenage boys than for teenage girls.

Samples of $n_1 = 1$ boy and $n_2 = 5$ girls have the following impulsivity scores (higher scores means more impulsive). We have computed relevant Σx and Σx^2 scores for you.

Boys	Girls
$x_{11} = 89$	$x_{12} = 90$
	$x_{22} = 85$
	$x_{32} = 89$
	$x_{42} = 90$
	$x_{52} = 92$
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$\Sigma x_{i1} = 89$	$\Sigma x_{i2} = 446$
$\Sigma x_{i1}^2 = 7,921$	$\Sigma x_{i2}^2 = 39,810$

In all of the problem parts below, if it is not possible to compute something then please explain (briefly!) why it is not possible.

- a) Do *not* assume homogeneity of variance. Compute means, sums of squares, estimates of σ^2 , and estimates of σ_{M_j} from each group. (8 points)
- b) Do assume homogeneity of variance. Compute one best estimate of σ^2 and also compute $\text{est}\sigma_{M_1-M_2}$. (6 points)

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c) Continue to assume homogeneity of variance. Compute 95% confidence interval magnitudes around M_1 and $(M_1 - M_2)$. (8 points)

d) *Do not* assume homogeneity of variance. Compute 95% confidence interval magnitudes around M_1 , M_2 , and $(M_1 - M_2)$. (10 points)

e) Again assume homogeneity of variance. Carry out the hypothesis test to determine whether girls have *lower* impulsivity scores than boys. **Use an α -level of .10**. Be sure to carry out all hypothesis testing steps (10 points)

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3. A manuscript reports the results of an experiment this way: “We rejected the null hypothesis, using the .05 α level. This means that the probability is less than .05 that the null hypothesis is true.”
- Is this second sentence correct? Why or why not? If not, how *should* the sentence have been phrased? *Be concise in your answer.* (8 points)