Name_____ Section_____

Psychology 317 Exam #4
March 8, 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!!**
9. Don't Panic!
10. Good luck!

Grading

Problem	Points	Grader
1a-c	30	Dominic
2a-f	60	Adam
3	10	Yiyu
TOTAL	/100	

Name_____ Section_____

1. Consider the sign-test example discussed in class: does nicotine affect body growth in rats? Suppose that there are 10 pairs of rats. For each pair, you give Rat 1 of the pair saline and Rat 2 of the pair nicotine each day. When the rats grow up, you measure all their weights. You are testing the null hypothesis that there is no difference between nicotine and saline against the alternative hypothesis that nicotine *lowers* body weight compared to saline. You plan to do a sign test on the data.

a) What is the criterion number of rat pairs that must show a plus (i.e., for which the nicotine rat weighs less than the saline rat) if α, the probability of a Type-I error is to be **less than 0.01**? Assume that no pair will be tied. (20 points)

(NOTE: If you're not using a calculator or Excel, the binomial tables on pp 603-608 of your book might be useful).

b) Suppose the null hypothesis were really true. Which would lead to the higher probability of making a Type-I error: setting α to 0.07 or setting α to 0.02? Give a *brief* explanation of your answer. (5 points)

c) Suppose that the alternative hypothesis were really true. What would be the relative size of the Type-II error probability (β) given that you choose α to be 0.07 versus 0.02? Again, give a brief explanation of your answer. (5 points)

Name_____ Section_____

2. It is known that, in normal circumstances, reaction time in adult humans is distributed with a population mean, $\mu = 230$ milliseconds and a standard deviation, $\sigma = 10$ milliseconds.

Suppose an experiment is planned to determine whether ingestion of caffeine decreases reaction time *below* the usual population mean. Each member of a group of $n = 25$ subjects is to be given caffeine in the form of a cup of coffee. Reaction times of all 25 subjects are to be measured.

a) What summary score should you use in this experiment, assuming you wish to test the alternative hypothesis that reaction time, measured in milliseconds, is *reduced* by caffeine against the null hypothesis that reaction time is not affected by caffeine? (5 points)

b) Assume you want to use an α level of 0.10. Compute the criterion summary score. What will be your decision rule, i.e., under what circumstances would you reject versus fail to reject H_0? (10 points)

c) Compute the **magnitude** of the **80%** confidence interval around the sample mean that you will measure in the experiment. NOTE: you haven't been given the actual sample mean, but you don't need it for computing the confidence interval magnitude; that is, your answer should look like: confidence interval = ± something. (15 points)

d) Suppose that *in reality* caffeine reduces mean reaction time by 4 milliseconds. Compute β and Power for your experiment. (15 points)

e) Suppose you had decided to set α at the usual .05 rather than .10. Recompute β and the power of your experiment. Explain in plain English any differences you find in power compared to what you found in Part d. (6 points).

Name_____ Section_____

f) Suppose you planned to investigate the effects of caffeine as a two-group experiment.

In this version of the experiment, there is to be an *experimental group*, with $n_1 = 25$ subjects, each of whom receives caffeine in the form of a cup of coffee, and a *control group* with $n_2 = 16$ subjects, each of whom receives a cup of decaf coffee.

Compute the magnitudes of three **85%** confidence intervals: a confidence interval that would go around each of the two group means, M_1 and M_2, and a confidence interval that would go around the summary score that you'd use were you to carry out a hypothesis testing procedure. (9 points)

Name_____ Section_____

3. Vijaya, a psychologist has just finished analyzing an experiment. Vijaya, having correctly carried out a statistical test, has rejected the null hypothesis in the experiment with α set at the usual .05 and has concluded that the null hypothesis is false. Vijaya claims that the probability that her conclusion is wrong is therefore no greater than 0.05. Is Vijaya correct in her claim? Why or why not? (10 points)