## Psychology 317 Exam #5

## March 9, 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. Good luck!

### Grading

Problem Points Grader

1a-c 18 Courtney

2 12 Andy

3a-f 40 Zach

4a-b 30 Tim

TOTAL /100

1. You’ll recall from the last exam that the Muy Munchy Mixed Nut company produces mixed nuts as follows: In a giant vat, three kinds of nuts—walnuts, almonds, and pecans—are thoroughly mixed. Proportions of nuts in the vat are as follows:

Walnuts (W): 50%

Almonds (A): 40%

Pecans (P): 10%

In addition to United Airlines, Air Eleganta also buys bags of Muy Munchy mixed nuts. However, Air Eleganta nut bags contain 250 nuts per bag. Calculate the probability that a random Air Eleganta passenger will receive a bag that contains the following. **Use the normal approximation to the binomial in your work, and don’t forget about the correction for continuity**. (6 points apiece)

a) (128 ≤ W< 140)

b) (P = 27)

c) (150 <  < 160) where  means “not an almond”.2. A normal distribution has a mean of 20 and a variance of 15. Consider an interval, whose lower bound is 21, which contains 28% of the distribution. What is the upper bound of the interval? (12 points)

3. Acme widgets have a mean weight, , of 27 grams and a variance, 2 of .024. Acme has made a change in its manufacturing process, but is somewhat fearful that the change will cause the mean weight to **decrease** by 0.06 grams. Acme selects a random sample of n = 10 widgets manufactured by the changed process, and weighs them all. It wishes to assess whether the manufacturing changes does or does not cause this weight decrease.

a) What are appropriate null and alternative hypotheses for dealing with this question? (2 points)

H0:

H1:

b) What would be an appropriate summary score to use for testing the hypotheses? (2 points)

c) Using the ** = 0.20 level**, what is the criterion summary score, or what are the criteria summary scores, that would determine whether you would make one decision or another? (10 points)

d) What is the power of the test implied by Part c? State explicitly what the power that you calculate refers to. (Suppose, for example that you calculated power to be 0.70. What would this number, 0.70 be the probability of?) (6 points)

Question 3 continues on the next page 🖙Question 3 continues…

e) Based on your answer to Part c, make up two hypothetical obtained summary scores, one of which would lead you to make one decision, and the other of which would lead you to make a different decision. State explicitly what your conclusion would be for each of the two hypothetical summary scores. (10 points).

f) Suppose that your sample mean weight were 26.8 grams. What would be the **85%** confidence interval around this sample mean? (10 points)

4. It’s known that the breaking strength of Acme widgets is normally distributed with a population standard deviation,  = 0.3 pounds (Breaking strength refers to the amount of force that must be applied to the end of an Acme widget before it breaks)

a) Acme develops two new methods, Method A and Method B for manufacturing widgets. Of interest is whether the two methods differ in the mean breaking strength of the resulting widgets. Method A is easy to use and a sample of nA = 25 Method-A widgets is obtained. However Acme is having serious problems with Method B and only nB = 1 Method-B widget is obtained (however, you may assume that this one Method-B widget is a random widget made using Method B).

You plan to test the null hypothesis that Methods A and B do not differ in the breaking strengths of resulting widgets against the alternative hypothesis that the two methods *do* differ. Being a bit perverse, you plan to use an  level of 0.07. What will you use as a summary score and what would this summary score have to be such that you would reject the null hypothesis (i.e., state your decision rule). (15 points)

b) Suppose that when you did the experiment, MA = 102.3 lbs and MB = 104.0 lbs. Compute **78%** confidence intervals around MA, MB, and your summary score . (15 points)