## Psychology 317 Exam #4

## February 23, 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-e 50 Yu

2a-c 30 Zach

3a-d 20 Courtney

TOTAL /100

1. 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%

Random samples of 10 nuts are then plucked from the vat and put into bags called WAP bags, which then become “lunch” for United Airlines coach class passengers (each coach passenger gets one WAP bag).

a) Suppose that Ashley, a United coach passenger loves pecans and therefore considers each pecan in her WAP bag to be a “success.” What is the probability that Ashley gets two or more pecans in her WAP bag? (10 points)

b) Chip, Ashley’s United coach row-mate hates almonds, so he considers getting an almond to be a “failure”. What would be Chip’s chances of getting exactly 7 nuts that are not almonds? (10 points)

Question 1 continues on the next page 🖙Question 1 continues…

c) Meanwhile, up in first class, passengers get WAP-Gold bags for lunch. WAP-Gold bags are just like WAP bags except they contain not 10, but 150 nuts that have been randomly selected from the Muy Munchy vat. Gabriella, a first class passenger is like Ashley back in coach: she considers any pecan to be a success. What are the mean, variance, standard deviation, and mode of number of pecans that will be in Gabriella’s WAP-Gold bag? (10 points)

d) Suppose that Gabriella is interested in the *proportion* of pecans that she will get. Specify the mean, variance, standard deviation, and mode of proportion of pecans that will be in Gabriella’s WAP-Gold bag. (10 points)

e) Back in coach is a group of 5 people who are going to the “Walnuts Anonymous” convention which is devoted to helping people who are hopelessly addicted to walnuts. Naturally all of these people are interested in the walnuts in their WAP bags. Each of them considers their lunch to be successful if their WAP bag contains more than half walnuts. What is the probability that at least 4 of these 5 people have successful lunches? (10 points)

2. President Obama claims that 75% of the American population supports his economic stimulus package. To investigate whether this is true, the Rabid Republican Pollsters Association (RRPA) plans to ask a random sample of N = 8 Americans whether they support the stimulus package. (You may assume that all 8 people in the sample will respond “favor” or “not favor”).

Suppose that the RRPA sets up the following hypotheses:

H0: President Obama is correct: 75% of all Americans support his package.

H1: President Obama is incorrect: *Fewer* than 75% of all Americans support his package.

The RRPA will decide, based on the results of its sample, whether or not to reject Obama's claim.

a) Given that the RRPA doesn't like Obama or his package very much, would they be generally biased toward making a Type I error or a Type II error? To achieve such a bias in their hypothesis-testing procedure, how should they set  relative to the normal 0.05 level? Give reasons for your answers. (10 points)

b) What should the RRPA use as a *summary score*, i.e., a single score representing the evidence from the survey that Obama's claim is or isn't valid? Explain your answer. (5 points)

c) Suppose that, under pressure from statisticians, the RRPA decides that  should be, as usual, be less than 0.05. Given this requirement, under what circumstances would the RRPA reject Obama's claim? What would be the actual value of ? (10 points)

d) Suppose that in fact 5 people from the sample support the stimulus package. How should the RRPA phrase its conclusions? (5 points)

3. On any given day, maximum wind velocity, v, at Tranquility Glen, Vermont is distributed normally with a mean,  = 4 mph and a variance,  = 5.

a) Write the equation for the probability density function (p(v) as a function of v). (5 points)

b) Draw the graph that corresponds to your distribution from Part (a). Make sure to provide numbers on the horizontal axis, but don’t worry about providing numbers on the vertical axis. Indicate on the graph, an interval, centered at the mean, such that on approximately 2/3 of all days, the maximum wind velocity is within this interval. (Provide the values of the endpoints of this interval). (10 points)

c) Describe why it would be *impossible* for maximum wind velocity to be distributed *exactly* according to your equation from Part (a). HINT: You should probably be able to answer this question even if your answers to Parts (a) and (b) are incorrect or even if you haven’t answered them yet. (5 points)