

Psychology 317 Exam #3
February 13, 2006

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. Don't Panic!
10. Good luck!

Grading

<u>Problem</u>	<u>Points</u>	<u>Grader</u>
1a-c	28	Greg
2a-d	24	Bailey
3a-c	28	Vicki
4	10	Becky
5	10	Serena
TOTAL	/100	

Name _____

Section _____

1) On each round of a game called "Bopper", a player wins the following sums of money according to the following probability distribution.

v	$p(v)$
1	0.2
8	0.3
27	0.4
0	0.1

a) Compute the expected value and standard deviation of this distribution. (16 points)

b) Suppose that 4,201,024,330 people were to each play a round of Bopper. What is your best guess as to what the mean and standard deviation of amount won over these 4,201,024,330 people would be? (HINT: This shouldn't be too hard). (6 points)

c) Suppose you personally play 5,000 rounds of Bopper. What is your best guess as to what the mean and standard deviation of amount you win over the 5,000 rounds would be? (HINT: This shouldn't be too hard). (6 points)

2. The little-known ex-Soviet republic of Confusistan is choosing how it will design its new automobile license plates. Confusistan plates have spaces for five characters (digits or letters). Confusistanians use the same digits and letters that we do. However, they plan not to use the letters I or O or the digits 0 or 1 because of confusability.

a) How would Confusistan design its license plates (i.e., utilize the five spaces) such that the maximum number of distinct license plates would be available? JUSTIFY YOUR ANSWER. (10 points)

b) How many distinct license plates would there be under this scheme you devised in Part (a)? (5 points)

c) Suppose the actual design is that a license plate is either DLDDL or LLLDL (where D is a digit and L is a letter). There is a constraint that the first (left-most) position can't be the letter A or the digit 2. How many distinct license plates are there with this design? (5 points).

d) Suppose that the scheme is as in Part (c) but any character (a digit or a letter) can only be used once in a license plate. How many distinct license plates are there with this design? (4 points).

3. A Poulso traffic engineer has determined that every day, the probability of having zero traffic accidents in Poulso is 0.9. The probability of an accident on any given day is independent of the probability of an accident on any other day. Thus, an accident-free day in Poulso can be termed a “success” and a day on which there is at least one accident is a “failure”. The engineer plans to observe Poulso for 400 days and record the number of accident-free days.

a) Characterize this situation as a binomial situation. What are N , p , and q ? (10 points)

b) What are the expected value, variance, and standard deviation of the distribution of accident-free days over the 400 days? (10 points)

c) Suppose that you considered not the *number* of accident-free days during the 400 days, but the *proportion* of these 400 days that are accident-free. What would be the expected value, variance, and standard deviation of the distribution of proportions? Compute these values to *six* decimal places. (8 points)

Name _____

Section _____

4. Suppose that you are a geologist working for an oil company. You select a spot in West Texas where you think there may be oil. Now you have to decide whether you should actually go to the trouble and expense of drilling. Your company is quite poor, so if you drill and there's no oil, the company will go bankrupt, while if you don't drill, you will simply continue looking, i.e., there won't be dire consequences.

Express this situation in terms of the general hypothesis testing framework discussed in class. Be sure to carefully label everything, including error types. (10 points)

Name _____

Section _____

5. Suppose you have a set of n scores, X_1, X_2, \dots, X_n . Consider some number Z where Z is *not equal* to M , the mean of the X_i 's. Prove, algebraically, that $\sum_{i=1}^n (X_i - Z) \neq 0$. (10 points)