Name____ Section________________________

Psychology 317 Exam #2
January 30, 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!

INFORMATION AND DEFINITIONS

a) A "fair die" is a die that has a 1/6 probability of coming up each of the numbers 1-6.

b) A "fair coin" is a coin that has a .5 probability of coming up heads.

c) A standard deck has 4 suits (Clubs, Diamonds, Hearts, Spades) with 13 cards per suit (Ace, 2-10, Jack, Queen, King).

Grading

Problem	Points	Grader
1	10	Katie
2a-d	40	Serena
3a-c	40	Ren
4	10	Becky
TOTAL	/100	

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1. A test is developed to detect whether a person is HIV-positive. If the test were to work errorlessly then it would always register “positive” to an HIV-positive person and “negative” to a person who isn’t HIV-positive.

However the test is not quite error-free. In particular,

The false-positive rate is 5%. This means that if administered to a person who is *not* HIV positive, it will incorrectly register “positive” 5% of the time (and correctly register “negative” the remaining 95% of the time).

The false-negative rate is zero. That is, if administered to a person who *is* HIV-positive, the test will correctly register “positive” 100% of the time.

Assume that in the U.S. population, 2% of the people are actually HIV-positive and the remaining 98% are not.

Use This Notation:

H: A person is HIV positive

T: Person tests positive

N: Person tests negative

THE QUESTION: Suppose a person registers HIV-positive when given the test. What is the probability that he or she is actually ***not*** HIV-positive?

HINT: Make up a contingency table to represent this information.

(10 points)

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2. Suppose that you have two dice: A red die and a green die.

The red die is biased such that it comes up a "6" with a probability of p(6) = .6, while the other five numbers have equal probabilities of occurring.

The green die is normal, i.e., the probability of each of the 6 numbers is 1/6.

Suppose you throw the two dice. Consider a random variable that assigns to you the number of 6's that you get.

a) List (vertically, to the left below) the members of V, the set of all values that this random variable could assign. (10 points)

b) What is the theoretical probability distribution of V, i.e., the probability of each member of V? Add this information to your table (20 points)

c) Suppose that 1,200 people perform this dice-throwing exercise. What is the theoretical frequency distribution of V, i.e., what do you expect to be the frequency of each member of V? Add this information you table. (5 points)

d) Suppose that of the 1,200 people who performed the exercise, no one got zero 6's, 200 people got one 6, and the remainder got two 6's. Add this *empirical-frequency distribution* information to your table. Describe how you would compute a single number that would reflect the degree to which your empirical and theoretical frequency distributions disagree with one another. This number should be zero when the two distributions agree perfectly and should be big to the degree that the two distributions disagree. (You need not actually compute the number unless you want to do so in order to illustrate what it is). (5 points)

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3. Every February 2, reporters converge on Punxsutawney, Pennsylvania to watch Phil the groundhog emerge from his hole. The following numbers represent the number of reporters in Punxsutawney during each year between 1980 and 1984. (We have left additional rows for your convenience, and you may use them as you see fit).

Year:	1980	1981	1982	1983	1984
Reporters	9	9	9	7	21

BE SURE TO SHOW HOW YOU ARRIVED AT YOUR ANSWERS IN THE FOLLOWING QUESTIONS!

a) Compute the mean, median, mode, variance, and standard deviation of the number of reporters between 1980 and 1984. (15 points)

b) Compute the frequency and probability distributions of number of reporters between 1980 and 1984. (15 points)

c) Suppose that you eliminate the extreme value of 21 for 1984. Recompute the mean, median, mode, variance, and standard deviation. Compare the values of the standard deviation that you got in parts (a) and (c) and briefly comment on how and why they are different. (10 points)

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4. The amount of tomato juice in Squawker tomato juice cans is distributed as follows.
The amount is never less than 10 oz and is never more than 10.5 oz.
The probability density is equal between 10 and 10.5 oz.

a) Draw the probability distribution. Make sure that you include a label and appropriate values on both axes (7 points).

b) Suppose that we measure tomato juice in cups rather than in ounces. NOTE THAT THERE ARE 8 OUNCES IN A CUP. Re-draw your probability distribution from Part a. (3 points)