Math 104: Finite Mathematics
Summer 2002, Exam 2

This exam is meant to test your mastery of stuff we've done since the first test. If at any point it looks like I'm trying to trick you, or if it looks like you'd need something we haven't done, that's probably a clue that you're looking at it the wrong way. Of course, you're welcome to ask me if you have any questions about the statements of the problems.

Answer each question, *showing all work which is necessary to do the problem* (i.e. "my calculator says so" does not suffice). Answers may be left in the form of factorials unless otherwise noted.

1. (5 pts) Could this table be the probability distribution for some random variable X?

k	$Pr(X = k)$
1	0.1
2	0.1
3	0
4	0.5
5	0
6	0.05
7	0.05
8	0.3

2. (20 pts) Consider an experiment in which a student is asked three questions: Are you from Indiana? Have you read any Shakespeare since high school? Have you ever made pink cookies? The answers are observed.

   (a) Write the elements of the sample space.

   (b) Circle the event "At least two answers were 'Yes.'"

   (c) Calculate the probability of the event "At least two answers were 'Yes,'" assuming that all events are equally probable.

3. (12 pts) The probability of E is 0.5. The probability of F is 0.25. The probability of $E \cap F'$ is 0.4. Are E and F' independent? What is $Pr(E|F')$?

4. (25 pts) Suppose my CD case has 6 CD's. Two of them are by $U2$, and four are by other artists. Suppose that you pick 2 CD's at random and observe whether they are by $U2$.

   (a) Write the probability distribution for the outcome.

   (b) Find the mean of this distribution.

   (c) Find the population standard deviation (σ) of this distribution.

   (d) What is the probability that you get either 1 or 2 CD's by $U2$?

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5. (6 pts) Assume X is normally distributed. Find $Pr(X < 15)$ given that $E(X) = 10$ and $\sigma = 5$. (A table of areas under the standard normal curve is attached.)

6. (20 pts) Consider the data set

$$89, 89, 75, 75, 37, 75, 64, 19, 93, 23, 19$$

   (a) Give the five-number summary $(Q_0, Q_1, Q_2, Q_3,$ and $Q_4)$ of this data set, and draw a corresponding box plot.

   (b) Find the mean and *sample* standard deviation (s) for the data.

   (c) Both the quartiles and the standard deviation tell us something of how "spread out" the data are. Why go to the trouble to compute standard deviation?

7. (12 pts) A certain experiment is performed as follows. The subject is given a coin, and a yes-no question that s/he would ordinarily be embarrassed to answer. The subject flips the coin. If the coin shows "Heads" s/he answers the question (records "Yes" or "No"). If it shows "Tails," the subject flips again and records "Yes" if the coin shows "Heads" on this second flip and "No" otherwise. (Thus, the subject's privacy is preserved.) Suppose that the probability of a subject's answering "Yes" (on an initial flip of "Heads") is 0.2.

   (a) Draw a tree (labelled with probabilities) corresponding to the experiment described.

   (b) What is the probability that the subject records "Yes?"

   (c) What is the probability that the first coin flip was "Heads" given that the subject recorded "Yes?"