Statistics 7 Homework Assignment, Feb 13
Due Wed, February 20th

This assignment is being given on a separate sheet because these problems are *modifications* of problems in the book.

8.52, slight modification in parts c and d to ask for P(X ≥ 6) instead of P(X = 6). (This is how the problem was supposed to be printed, but the P(X = 6) emerged as a typo.) In other words, this is Exercise 8.52, but in parts c and d, find P(X ≥ 6) rather than P(X = 6). **This problem counts double.**

In an ESP test, a "participant" tries to draw a hidden "target" photograph that is unknown to anyone in the room. After the drawing attempt, the participant is shown four choices and asked to determine which one had been the real target. The real target is randomly selected from the four choices in advance, so the probability of a correct match by chance is 1/4. The test is repeated ten times, using four new photographs each time.
a. Go through the conditions for a binomial experiment, and explain how this situation fits each one of them, assuming that the participant is just guessing each time.
b. Let X = number of correct choices in the ten tests. If the participant is just guessing, is X a binomial random variable? If not, explain why not. If so, specify n and p.
c. If the participant is just guessing, find $P(X \geq 6)$.
d. Suppose the participant actually has some psychic ability and can get each answer correct with probability .5 instead of .25. Find $P(X \geq 6)$.
e. Compare the answers in parts (c) and (d). If the participant actually selects six of the ten answers correctly, would you believe that he or she was just guessing or that he or she was using some psychic ability? Explain your answer. (Note that there is no correct answer here; your reasoning is what counts.)

8.55, modification of parts b and c. In the actual problem you are asked to write down but not find probabilities. Here, you are asked to find them. You will need to use a computer. (Find exact probabilities, not using the normal approximation we will cover on Friday.)

(You do not have to do part a.)
b. A pharmaceutical company claims that 20% of those taking its new allergy medication will experience drowsiness. To test this claim, it randomly assigns 500 people to take the new medication and measures X = the number who experience drowsiness. Find the probability that 110 or more people in the sample experience drowsiness if the claim is true.
c. A student has not studied the material for a 20-question true–false test and simply guesses on each question. A passing grade is 70%; the desired probability is the probability that the student passes the test.

Added part: Find E(X) for each of these situations, where X = the number who experience drowsiness (in part b) and X = number correct on the test (in part c).