Stat 331/Elec 331, Homework 1, September 11

Solutions should be clear, complete and easy to follow. You are allowed to to use the book and lecture notes. Collaboration is allowed. The maximum score is given at the end of each problem.

Solutions are due on the date at the top at 5 pm. If you can not come to class and hand it to me there, you will have to come by my office (slide it under the door if I am not there). If you can not make it on time, you may still return your solutions but there will be a two point deduction for each day you are late.

1. Let E be the event that it rains on Saturday and F the event that it rains on Sunday. Suppose that $P(E) = P(F) = 0.5$. Let further p denote the probability that it rains both days. Express the following events in terms of E and F and express their probabilities as functions of p:

a. It rains Saturday but not Sunday

b. It rains one day but not the other

c. It does not rain at all during the weekend. **(3)**

2. From the integers 1,...,10, three numbers are chosen at random without replacement and disregarding the order. What is the probability that the smallest number is 4? **(3)**

3. A sign reads ARKANSAS. Three letters are removed and then put back into the three empty spaces again, at random. What is the probability that the sign still reads ARKANSAS? **(3)**

4. Two cards are chosen at random without replacement from a deck and inserted into another deck. This deck is shuffled and one card is drawn.

a. What is the probability that this card is an ace?

b. If this card is an ace, what is the probability that no ace was moved from the first deck? **(3)**

5. The serious disease D occurs with a frequency of 0.1% in a certain population. The disease is diagnosed by a method which gives correct result (i.e. positive result for those with the disease and negative for those without it) with probability 0.99. A person is selected at random (it turns out to be Mr Smith) and tested for D. The result turns out to be positive, i.e. the test shows that Mr Smith has the disease. Since the method seems very reliable, Mr Smith of course starts to worry, being '99% sure of actually having the disease'. Use Bayes' formula to show that this is not the relevant probability and that Mr Smith may actually be quite optimistic. Also try to give a brief intuitive explanation. **(4)**