Midterm Makeup – probability – Schneider

1. Write down the number of possibilities in the following problems (you can leave in symbolic form with numbers in correct places)
   a. The number of different letter arrangements from **aardvark**
   b. You have 110 people in a baking contest. How many ways can there be five winners where there is a first, second, third ,fourth and fifth place winner?
   c. Consider $(x+y)^{30}$. What is the coefficient of x^5y^{25}.
   d. You have 15 elements in a sample space. How many different six element sets (events) are there.
   e. There are 9 events in a sample space (A thru I). How many different sets of events include the events A and B.
   f. How many outcomes of 30 flips of a coin have 5 or 6 heads?
2. Note that (like the book) when I write capital letters next to each other I am indicating intersection. A,B,C and D are sets.
   a. Show that the sets AD^c and AD are disjoint where D^c is ~D.
   b. Show that A\D U AD = A
3. Urn A contains 2 red and 8 black balls. Urn B contains 8 red and 2 black balls. If a ball is randomly chosen from each urn what is the probability that they will be the same color.
4. On rainy days, Joe is late to work with probability .5; on non-rainy days, he is late to work with probability .1. With probability .6 it will rain tomorrow.
   a. Find the probability that Joe is early tomorrow.
   b. Given that Joe is early what is the conditional probability that it rained.
5. Show from our union law (for non-disjoint sets) and the fact that P(X)<=1 for any set X that P(AB)>= P(A)+P(B) -1.
6. Prove our theorem (from definitions of conditional probability) that if P(AB) = P(A)P(B) then P(A|B)= $P(A|B^c)$ where P(B)and $P(B^c)$ are not 0.
7. Suppose $P(H_2|H_1)$=.25 and $P(T_2|T_1)$=.5 where we are either in an H situation or a T situation (heads or tails) and the subscripts refer to the first or second trial. We also know that $P(H_1)$ = .4 .
   a. Let T_2 be the event of a tail on the second trial. What is $P(T_2)$.
   b. With similar notation what is $P(T_1|T_2)$