Midterm – 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 **queue**
    b. You have nine elements in a sample space. How many different five element sets (events) are there.
    c. There are 9 events in a sample space (A thru I). How many different sets of events include the event A.
    d. You have fifteen people in a baking contest. How many ways can there be four winners where there is a first, second, third and fourth place winner?
    e. Consider $(x+y)^{10}$. What is the coefficient of x^5y^5.
    f. How many outcomes of 10 flips of a coin have 5 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^cBC and ADBC are disjoint where D^c is ~D.
    b. Let A, B, C be events in a sample space. Prove that the whole sample space is $ABC \cup ABC^c \cup AB^cC \cup AB^cC^c \cup A^cBC \cup A^cBC^c \cup A^cB^cC \cup A^cB^cC^c$. The above is all the three intersections of the events or their complements.
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 different colors.
4. A total of 28 percent of American males smoke cigarettes, 7 percent smoke cigars and 5 percent smoke cigars and cigarettes.
    a. What percentage of males smoke neither cigars nor cigarettes.
    b. What percentage smokes cigarettes but not cigars?
5. Maria will take two books with her on a trip. Suppose that the probability that she will like book 1 is .6, the probability that she will like book 2 is .5 and the probability that she will like both books is .4. find the conditional probability that she will like book 2 given that she did not like book 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 $P(H_2|H_1)=.7$ 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 $P(H_1) = .5 = P(T_1)$
    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 $P(T_1|T_2)$