

CS 70 SPRING 2007 — DISCUSSION #10

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1. ADMINISTRIVIA

(1) Course Information

- Homework 8 is posted, and it's due on the *Tuesday* after the spring break.

2. PROBABILITY

Conditional Probability. $\Pr(E \mid F) = \frac{\Pr(E \cap F)}{\Pr(F)}$

Product Rule. $\Pr(E \cap F) = \Pr(E \mid F) \times \Pr(F)$

Exercise 1. Suppose that you are looking in your desk for a letter from some time ago. Your desk has eight drawers, and you assess the probability that it is in any particular drawer as 10% (so there is a 20% chance that it is not in the desk at all). Suppose now that you start searching systematically through your desk, one drawer at a time. In addition, suppose that you have not found the letter in the first i drawers, where $0 \leq i \leq 7$. Let p_i denote the probability that the letter will be found in the next drawer, and let q_i denote the probability that the letter will be found in some subsequent drawer (both p_i and q_i are conditional probabilities, since they are based on the assumption that the letter is not in the first i drawers). Find formulas for p_i and q_i .

Independence. $\Pr(F \mid E) = \Pr(F)$

Exercise 2. Prove that $\Pr(A \mid B) = \Pr(A \mid \overline{B})$ iff A and B are independent.

3. EXPECTATION

Exercise 3. Suppose that I choose a permutation of the numbers $1, 2, \dots, n$ uniformly at random. What is the expected number of entries that are greater than all preceding entries? For example, in the permutation 4, 2, 1, 5, 3, the numbers 4 and 5 are greater than all preceding entries (Hint: What's the probability that the first entry is greater than all the preceding entries? What about the second one?)