CS 70 Discrete Mathematics for CS
Spring 2006 Vazirani

HW 8

Due Friday March 24th

1. **placements**

   (a) Flip a coin thrice. How many ways can this be done? List them. Convert each to the corresponding placement of 3 balls in 2 boxes.

   (b) You are interviewing families in a certain district. In order to ascertain the opinion held by a given family you sample two persons from the family. Recognizing that the order matters in which the two persons from one family are interviewed, how many ways can one sample two people from a six person family? If the two people are interviewed simultaneously so that order no longer matters, how many ways can one sample two people from a 6-person family?

   (c) A small college has a soccer team that plays twelve games during its season. In how many ways can the team end its season with seven wins, three losses and two ties?

2. **(15 pts.) De Méré's problem**
   The birth of the probability theory has been partially attributed (by some) to the following question, posed by Chevalier de Méré in the 17th century. Is it more likely to get at least one double six in 24 throws of a pair of dice, or at least one six in 4 throws of a die? Calculate both probabilities, and show which is larger.

3. **Numbers**
   (a) How many odd numbers in [100,999] have distinct digits?

   (b) How many palindromes (numbers that are the same when you write them backwards) are in this range?

   (c) How about the range [1000,9999]?

   (Note: You may not brute force this one by writing a program - show your work!)

4. **Parking Lots**
   Your start-up company has twelve employees and twelve parking spaces arranged in a row. You may assume that each day all orderings of the twelve cars are equally likely.

   (a) What is the probability that you park next to the CEO on any given day?

   (b) What is the probability that there are exactly three cars between yours and the CEO's?

   (c) Suppose that, on some given day, you park in a space that is not at one of the ends of the row. As you leave your office, you know that exactly five of your colleagues have left work before you. Assuming that you remember nothing about where these colleagues had parked, what is the proabability that you will find both spaces on either side of your car unoccupied?

5. **Monty Hall**