Homework 7

Due Date: Wednesday February 22, 2012.

Problem 1. (4 pts.) A shelf has room for 10 books. Given an inventory of 25 books, how many years will it take to display all combinations of 10 books if the display is changed once a week?

Problem 2. (9 pts.) The English alphabet contains 26 letters, including five vowels. In each case determine how many words of length five are possible provided that:
   a) Words contain at most two distinct vowels.
   b) Words contain at most one letter that is a vowel.
   c) Words contain at least four distinct vowels.

Problem 3. (4 pts.) A classroom has two rows of eight seats. There are 14 students in the class. Five students always sit in the front row, and four always sit in the back row. In how many ways can the students be seated?

Problem 4. (12 pts.) For each of the following five-card poker hands, determine the number of possible hands AND the probability that a randomly selected set of five cards has that holding.
   a) Straight Flush
   b) Flush
   c) one pair
   d) a hand that has no repeated denominations, nor five of the same suit nor five adjacent denominations - a dud of a hand.

Problem 5. (6 pts.) How many ways can a committee of three men and two women be chosen from six men and four women?
What if Adam Smith and Abigail Smith will not serve on the same committee?

Problem 6. (4 pts.) Two new drugs are to be tested using a group of 80 Xavier students. Drug A is to be given to 32 students, while drug B is to be given to another 32 students. The remaining 16 students are to be used as controls (i.e. no drugs). How many ways can the assignment of treatments to students be made?

Problem 7. (6 pts.) How many distinguishable ways can the letters of the word abracadabra be arranged in order?
   How many distinguishable orderings of the letter of abracadabra contain the two letters br next to each other in order?

Problem 8. (6 pts.) How many 16-bit strings contain exactly 5 1’s?
   How many 16-bit strings contain at least one 1?

Problem 9. (4 pts. Extra Credit) How many ways are there for a person to travel from the southwest corner to the northeast corner of an \( m \times n \) grid? Enumerate all the ways possible if the grid is \( 5 \times 3 \).