CS109A Problem Set #4

Due 4:30 PM, 2/10/95

Note: Many of these problems call only for an answer. If you want partial credit, you should include a formula or other description of how you got the answer.

Also note: The UNIX command `bc` is an infinite-precision desk calculator that responds with the value of any expression when you type it and hit return.

1) (10 points) In the game of "Hollywood squares," X's and O's may be placed in any of the nine squares of a tic-tac-toe board (a 3×3 matrix) in any combination (i.e., unlike ordinary tic-tac-toe, it is not necessary that X's and O's be placed alternately, so, for example, all the squares could wind up with X's). Squares may also be blank, i.e., not containing either an X or and O. How many different boards are there? (Exercise 4.2.4, FCS)

2) (10 points) In a class of 200 students, we wish to elect a President, Vice President, Secretary, and Treasurer. In how many ways can these four officers be selected? (Exercise 4.4.2, FCS)

3) (15 points) One hundred people participate in a lottery. One will win the grand prize of $1000, and five more will win consolation prizes of a $50 savings bond. How many different possible outcomes of the lottery are there? (Exercise 4.6.4, FCS)

4) (15 points) Suppose we start at the lower-left corner of a chessboard and move to the upper-right corner, making moves that are each either one square up or one square right. In how many ways can we make the journey? (Exercise 4.7.4, FCS)

5) (15 points) How many anagrams of the word `little` are there in which the two `t`'s are not adjacent? (Exercise 4.8.6, FCS)

6) (15 points) How many distinct ways are there to seat 10 people around a circular table? Note that because a round table has no obvious starting point, seatings are not "distinct" if they are rotations of one another.

7) (20 points) Suppose we have infinite supplies of red balls, blue balls, and green balls. How many ways are there of choosing m balls? Order of the balls is unimportant. You must give a simple formula (and there *is* such a formula!) that works for any m to get full credit. However, we shall give partial credit for algorithms that compute the number or for calculations for specific m.