ECS 271 Homework Assignment #7  (Due June 8 2004)

1. If a test contains 20 true-false questions, in how many different ways can a student mark her test?

2. In how many ways can six persons be seated at a round table?

3. The number of combinations of r objects selected from a set of n objects is written as nCr. Often it is necessary to use the fact that nCr = nC(n-r). First justify this formula informally. Then prove the formula mathematically.

4. In how many ways can a subcommittee of 4 persons be chosen from a committee of 10 persons if the chairman of the full committee is required to be on the subcommittee?

5. Consider a random binary sequence such as [0 0 1 0 .. 1 0] of length i. Suppose you wish to generate another random sequence of the same length by tossing a coin i times. What is the probability that both the strings match exactly?

6. Consider a population A comprised of n of random binary strings, each string of length i. Consider a test string T, of the same length.
   (a) what is the probability that none of the strings in A match T?
   (b) what is the probability that at least one string in A matches T?

7. Show that summation \[ \sum_{k=0}^{n} \binom{n}{k} 2^k = 3^n. \]

8. Consider bit strings of length l.
   (a) How many possible bit strings of length l are there? ______
   (b) Number of possible subsets of bit strings of length l are ______
   (c) How many schemas of length l are there? ______
   (d) A given bit string of length l is an instance of ____ schemas.

9. Prove that any string of length l is an instance of different schema. ( The best way to prove this is by illustration. )

10. Consider a ternary string S, of length l composed of the alphabet \{0, 1, *\}. Assume that i of the l characters in the string are either zero or one. Stated differently, there are i fixed positions.
    (a) Over these i fixed positions, how many schemata are there?
    (b) Over the length l, how many sets of fixed positions are there?