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 $\mathrm{nCr}=\mathrm{nC}(\mathrm{n}-\mathrm{r})$. 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 $\left[\begin{array}{llllll}0 & 0 & 1 & 0 & 1\end{array} \ldots l l l l\right.$ 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 $\sum_{k=0}^{n}\binom{n}{k}^{k}=3^{n}$.
8. Consider bit strings of length $l$.
(a) How many possible bit strings of length 1 are there?
(b) Number of possible subsets of bit strings of length 1 are $\qquad$
(c) How many schemas of length 1 are there?
(d) A given bit string of length 1 is an instance of $\qquad$ schemas.
9. Prove that any string of length 1 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?
