

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 ... 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?