Test 1 Purdom
2-24-03 B503 Analysis of Algorithms

Suppose $A[1..m]$ is an array of m distinct integers and $B[1..n]$ is an array of n distinct integers. The following algorithm finds the indexes of the pairs of elements, one from A and on one from B, such that the two elements are equal. Give good upper and lower limits on the number of times each step is done.

1. Suppose $A[1..m]$ is an array of m distinct integers and $B[1..n]$ is an array of n distinct integers. The following algorithm finds the indexes of the pairs of elements, one from A and on one from B, such that the two elements are equal. Give good upper and lower limits on the number of times each step is done. (After the exam, consider a better algorithm for the problem.)
   Algorithm 1.
   a. For $i := 1$ to m do the remaining steps.
   b. For $j := 1$ to n do the remaining steps.
   c. If $A[i] = B[j]$, Output the pair $[i, j]$.

2. If n is an integer randomly selected in the range 0 to 110, what the is the average and variance of n mod 11?

3. Simplify $\sum_{1 \le i \le n} i3^i$.

4. If you randomly select one of the 2^n subsets of n items, what is the expected number of items in the subset, and what is the variance of that number.

Note: "randomly select" (questions 2 and 4) means each possibility has the same probability.