Lab 8

November 10, 2021

1. Binary Search

   You are given a sorted array on n numbers. Given any number x, you job is to find if x is in the array or not. To this end, implement the binary search algorithm.

   In the binary search algorithm, we first compare x with the middle element in the array, say mid. If $x = A[mid]$, then we are done. Else, we search x either in $A[1 \dots mid - 1]$ or $A[mid + 1 \dots n]$ appropriately.

   Input: The first input line contain an integer $n, k (1 \leq n, k \leq 1000)$. The next line contains n numbers seperated by a space. And then the next k lines contains query elements.

   Output: For each query element x, print "Y" if x is in the array else print "N" each on a seperate line.

Input	:	5 3
		1 4 6 8 10
		2
		6
		7
Output	:	N
		Y
		N

2. Tree Traversals

   You are given an inorder and preorder traversal of a binary tree. Your job is to print the post order traversal of the binary tree.

   Input: The first input line contain an integer $n (1 \leq n \leq 1000)$. This represents the number of nodes in the binary tree. The next two lines will contain the inorder and preorder traversal of the binary tree.

   Output: Print the post order traversal of the binary tree.

Input	:	5
		1 4 6 8 10
		8 6 1 4 10
Output	:	4 1 6 10 8

3. Nearest Big Number

   You are given a sequence of distinct numbers $A[1 \dots n]$. For each i (where $1 \leq i \leq n$), you need to find the smallest index $j > i$ such that $A[j] > A[i]$.

   You can certainly do this problem in time $O(n^2)$. But this problem can be done in $O(n)$ time. Think about it. Think about stacks.

   Input: The first input line contain an integer $n (1 \leq n \leq 1000)$. This represents n numbers in the array.

   Output: For each i (where $1 \leq i \leq n$), you need to find the smallest index $j > i$ such that $A[j] > A[i]$. Thus, for each i, you need to print the corresponding index j. (Remember that for this problem the index of our array starts from 1).

   If there is not such j, print "0". All the printed elements should be seperated by a space.

Input	:	5
		7 8 1 3 10
Output	:	2 5 4 5 0