

SPOJ Problem Set (classical)

3544. Binary Search Tree

Problem code: BST

A binary search tree is a tree in which every node has at most two children nodes (a left and a right child). Each node has an integer written inside it. If the number X is written inside a node, then the numbers in its left subtree are less than X and the numbers in its right subtree are greater than X .

You will be given a sequence of integers between 1 and N (inclusive) such that each number appears in the sequence exactly once. You are to create a binary search tree from the sequence, putting the first number in the root node and inserting every other number in order. In other words, run `insert (X, root)` for every other number:

```
insert (number X, node N)
    increase the counter C by 1
    if X is less than the number in node N
        if N has no left child
            create a new node with the number X and set it to be the left child of node N
        else
            insert (X, left child of node N)
    else (X is greater than the number in node N)
        if N has no right child
            create a new node with the number X and set it to be the right child of node N
        else
            insert (X, right child of node N)
```

Write a program that calculates the value of the counter C after every number is inserted. The counter is initially 0.

Input

The first line contains the integer N ($1 \leq N \leq 300\,000$), the length of the sequence.

The remaining N lines contain the numbers in the sequence, integers in the interval $[1, N]$. The numbers will be distinct.

Output

Output N integers, each on its own line, the values of the counter C after each number is inserted into the tree.

Example

Input :

```
8
3
5
1
6
8
7
2
4
```

Output :

0
1
2
4
7
11
13
15

Warning: large input/output data.

Warning: A naive algorithm may not run in time; do not simply implement the above algorithm.

Note: The test data for this problem consist of the official test cases from the contest, as well some cases of my own.

Added by: Neal Wu

Date: 2008-12-17

Time limit: 1s-5s

Source limit:50000B

Languages: All

Resource: Croatian Open 08/09 - Contest 3