

CS2002301 2021 Fall

Homework#3

Due date: 2021/12/15 08:00 (UTC+8)

1. This assignment weight 8 points.
2. Submit the code to Online judge system (<https://nlp.csie.ntust.edu.tw:2021>) and submit the report and source code to Moodle system. In the report, briefly explain how you solve the problem and list resources you referenced. Please followed the Homework rules and Online judge guide.
3. The source code you submit to Moodle should be the code your "last submit" to Online judge and **TAs will calculate your score by your "last upload"**.
4. If you have any question or confusion, feel free to ask on Moodle forum.

Problem 1 - Red-Black Tree(4 pt.)

Test case scores: 25+25+25+25

Since 瓦基 was too busy running from 魯拉拉 that he didn't write the stories, there won't be stories for HW3. He is very sorry for that.

Please implement a red black tree that support the insert and print operation.

Input

Each test case contains one red-black tree only. The test case contains MM lines of following commands.

1. I: The insertion command. The command is followed by an integer *input*, the desired number to be inserted into the red-black tree. Please insert *input* into the red-black tree.

input

input

2. P: The print command. Please print the red-black tree in the format `root(left_child_node())(right_child_node())` and print a node in the format `value_color()`. Please see the sample I/O for reference.

Please note that the number of MM will not be given, so the program should stop automatically upon EOF is read.

Output

Please print the results of the corresponding command line by line.

Constraints:

- Do not use any libraries (vector, queue, stack...) except for standard I/O. Please implement your own class using array if you needed.
- TAs will manually check your code after the deadline.

Problem 2 - Students' score manage system(3 pt.)

Test case scores: 25+25+50

There is a non-repeating sequence in ascending order, which is later permuted with an index k . That is, $[s[k], s[k+1], \dots, s[n-1], s[0], s[1], \dots, s[k-1]]$
 $[s[k], s[k+1], \dots, s[n-1], s[0], s[1], \dots, s[k-1]]$.

For example, sequence $[0, 1, 2, 4, 5, 6, 7]$ can be permuted with index 3 and then become $[4, 5, 6, 7, 0, 1, 2]$.

Given a sequence after the permutation, S , and an integer, $target$, please return the index of $target$ if $target$ is in S . Otherwise, return -1 .

Input

The first line of each test case contains an integer N , the length of the sequence S .

The second line contains N integers, the elements of sequence S after permutation.

The third line contains an integer M , the number of queries.

The next M lines are queries, each of which contains an integer $target$. Please output the index for each $target$ in S or -1 if the $target$ is not found in S .

Output

Print the index of target in the sequence.

Constraints:

- Do not use any libraries (vector, queue, stack...) except for standard I/O. Please implement your own class using array if you needed.
- TAs will manually check your code after the deadline.