

Data Structures HW3

Logistics

Due date: **5/19 (Wed) 23:59**

Submission

- Via LMS (**no email submission**)
- **Three files** (please make sure to upload three files)
 1. Report (No template. You can write a report in English or in Korean.)
 2. output.txt (answer file)
 3. Zip file of your program (**Compress it** to make a single file.)

Note: **No restrictions on programming languages and platforms.**

Evaluation Policy (10 pts in total)

Score (10pts) = Report (5pts) + Accuracy (3pts) + Implementation (2pts)

Report: **relative evaluation**

Top 30%: 5 pts

<= 50%: 4 pts

<= 70%: 3pts

<= 90%: 2pts

<= 100%: 1pt

Accuracy: $\text{Full Mark} \times \frac{\# \text{ right answers}}{\# \text{ total cases}}$

Penalties

1. Unable to build code → Accuracy = 0
2. **Plagiarism → Score = -5 (will affect your overall grade)**
3. Late Submission → Report -= 2
4. **Wrong output format** and missing files (in case you forget to submit output.txt, or...)
→ Accuracy /= 2

Problem Description: DFS and BFS on BST

Write a program that constructs a BST for a given set of integers, and uses DFS and BFS to search a specific number. Note that when using DFS, you must use **preorder based DFS**, where the traversal sequence is Root \rightarrow Left Subtree \rightarrow Right Subtree. Plus, assume that **BFS always goes from left to right**.

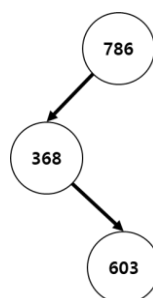
A "input.txt" file in the following format is provided:

```
2
3 dfs(3)
786 368 603
5 bfs(4)
825 162 768 724 635
```

The number in the first line (i.e., 2) shows the number of test cases to be processed. From the second line, test cases are given, and the information for each case is provided over two lines.

In the first line (line number 2 in the example above), the first number (i.e., 3) indicates the number of integers in that case, and the next string (i.e., dfs(3)) shows the location of the target number that you need to look for. In this example, the target number is on the third node of DFS.

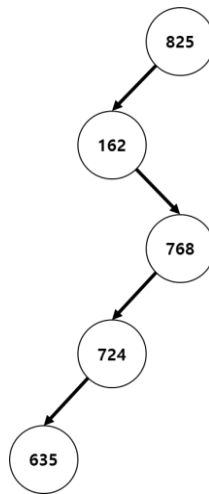
The next line shows the integers for that test case. Note that when you construct a BST, **you must add integers in the order entered**. That is, in the example above, 786 should be entered first into the tree, then 368 and 603 should be added. In this case, the corresponding BST would be constructed as the following:



Applying DFS to this tree, we have the traversal sequence of 786 \rightarrow 368 \rightarrow 603. Recall that we use preorder based DFS. Then, in this case the answer would be 603, which is the third node in the

sequence.

Now, let us take a look at the second example. Similarly, we have the following BST:



The corresponding BFS sequence is $825 \rightarrow 162 \rightarrow 768 \rightarrow 724 \rightarrow 635$, and the fourth number is 724, which is the answer for this case. This is not the case for this example, but BFS normally moves from left to right

For the above example, your "output.txt" should be as follows:

603

724

Please be sure to follow the output format, and additionally, the number of integers in each test case is limited to a maximum of 12.