Vertical Limit

Problem Code: **VERTLIM**

This problem is worth 1 point

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You are given a binary tree in the input defined by the following grammar rules.

```
NODE_VALUE := lowercase english alphabet .
NODE_DEFINITION := NODE_VALUE ( LEFTCHILD_DEFINITION
RIGHTCHILD_DEFINITION )
```

Thus a definition such as "a(b(..)c(d(..)e(f(..).)))" refers to a tree with 'a' as the root, whose children are 'b' and 'c'. 'b' has no children. 'c' has two children 'd' and 'e'. 'd' has no children. 'e' has one left child 'f' and no right child. Note that after every 'english character' there is always an opening round bracket '(' that starts the definition of the subtree that is defined under the node. For any position that is empty, there is a '.' character.

You draw the tree as follows.

- Write the root on column 0
- Write the left child of the root on one column to the left of root and right child of the root on one column to the right of the root.
- Continue writing the subtree, such that if the value at a node is written in column 'x', then the left child is written in column 'x-1' and the right child is written in column 'x+1'.

You are given a column number 'x'. Print all the values in column 'x' in sorted order ('a' < 'b' < 'c' and so on)

Input

First line contains a number T, the number of test cases.

Each test case contains a two lines. The first line contains a number, x, the column number for which you need to print the result. The second line contains the definition of the tree in the format given above, without any spaces.

Output

For each test case, print all the values that are in column x in sorted order, as a string without spaces. If there are no values in column x, print "Hallelujah!", without the quotes.

Solution Templates

In the solution templates provided, complete the function whose signature is

```
C
char* printColX(int col, char* tree)
WARNING: Allocate a global char array.
Set your result string in that global, and return that.
This is to ensure that you do not return a string which you allocate
within the method.
Runtimes deallocate all variables that are initialized within the
method.
Also, do not forget to terminate your string with a '\0' :)

C++
string printColX(int col, string tree)

Java
static String printColX(int col, String tree)
```

printColX is passed two arguments. 'col' is the index of the column whose elements have to be printed. 'tree' is the string representation of the tree as specified in the problem statement. Return the string that contains the elements (including repetitions) in the vertical column col. Remember that the elements you return should be sorted!

Note: You are allowed to edit the code as you please. Add / delete headers. Add / delete methods. And so on.. So long as your final code solves the problem with Input and Output as described above. You may submit your own code, without using the template at all.

Constraints

```
1 ≤ T ≤ 100
1 ≤ Length of Tree Input ≤ 1000
-100 ≤ x ≤ 100
```

Sample Input

```
3
2
a(b(..)c(d(..)e(f(..).)))
-1
a(d(.c(b(a(.b(..)).).))c(..))
3
a(b(..)c(..))
```

Sample Output

```
e
bbd
Hallelujah!
```

Explanation

In the second test case, d (left child of root), then b (left child of c, which is the right child of d) and then another b are in column -1. Sorted, they are printed as 'bbd'.

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Languages:	C, CPP 4.3.2, CPP 6.3, CPP14, JAVA, PYTH, PYTH 3.5

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