

Swap Nodes [Algo] ★

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A binary tree is a tree which is characterized by one of the following properties:

- It can be empty (null).
- It contains a root node only.
- It contains a root node with a left subtree, a right subtree, or both. These subtrees are also binary trees.

In-order traversal is performed as

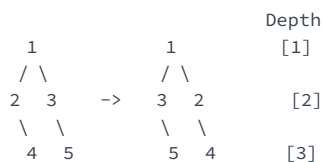
1. Traverse the left subtree.
2. Visit root.
3. Traverse the right subtree.

For this in-order traversal, start from the left child of the root node and keep exploring the left subtree until you reach a leaf. When you reach a leaf, back up to its parent, check for a right child and visit it if there is one. If there is not a child, you've explored its left and right subtrees fully. If there is a right child, traverse its left subtree then its right in the same manner. Keep doing this until you have traversed the entire tree. You will only store the values of a node as you visit when one of the following is true:

- it is the first node visited, the first time visited
- it is a leaf, should only be visited once
- all of its subtrees have been explored, should only be visited once while this is true
- it is the root of the tree, the first time visited

Swapping: Swapping subtrees of a node means that if initially node has left subtree L and right subtree R, then after swapping, the left subtree will be R and the right subtree, L.

For example, in the following tree, we swap children of node 1.



In-order traversal of left tree is 2 4 1 3 5 and of right tree is 3 5 1 2 4.

Swap operation:

We define depth of a node as follows:

- The root node is at depth 1.
- If the depth of the parent node is d, then the depth of current node will be d+1.

Given a tree and an integer, k, in one operation, we need to swap the subtrees of all the nodes at each depth h, where $h \in [k, 2k, 3k, \dots]$. In other words, if h is a multiple of k, swap the left and right subtrees of that level.

You are given a tree of n nodes where nodes are indexed from $[1..n]$ and it is rooted at 1. You have to perform t swap operations on it, and after each swap operation print the in-order traversal of the current state of the tree.

Function Description

Complete the swapNodes function in the editor below. It should return a two-dimensional array where each element is an array of integers representing the node indices of an in-order traversal after a swap operation.

swapNodes has the following parameter(s):

- indexes: an array of integers representing index values of each **node[i]**, beginning with **node[1]**, the first element, as the root.
- queries: an array of integers, each representing a **k** value.

Input Format



The first line contains n , number of nodes in the tree.

Each of the next n lines contains two integers, a b , where a is the index of left child, and b is the index of right child of i^{th} node.

Note: -1 is used to represent a null node.

The next line contains an integer, t , the size of *queries*.

Each of the next t lines contains an integer *queries*[i], each being a value k .

Output Format

For each k , perform the swap operation and store the indices of your in-order traversal to your result array. After all swap operations have been performed, return your result array for printing.

Constraints

- $1 \leq n \leq 1024$
- $1 \leq t \leq 100$
- $1 \leq k \leq n$
- Either $a = -1$ or $2 \leq a \leq n$
- Either $b = -1$ or $2 \leq b \leq n$
- The index of a non-null child will always be greater than that of its parent.

Sample Input 0

```
3
2 3
-1 -1
-1 -1
2
1
1
```

Sample Output 0

```
3 1 2
2 1 3
```

Explanation 0

As nodes 2 and 3 have no children, swapping will not have any effect on them. We only have to swap the child nodes of the root node.

```

  1   [s]      1   [s]      1
 / \    ->  / \    ->  / \
2  3 [s]    3  2 [s]    2  3
```

Note: [s] indicates that a swap operation is done at this depth.

Sample Input 1

```
5
2 3
-1 4
-1 5
-1 -1
-1 -1
1
2
```

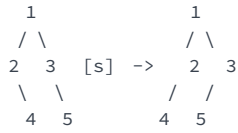
Sample Output 1

```
4 2 1 5 3
```

Explanation 1

Swapping child nodes of node 2 and 3 we get





Sample Input 2

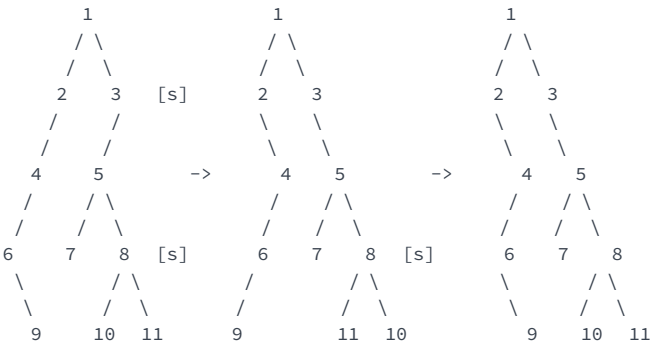
```
11
2 3
4 -1
5 -1
6 -1
7 8
-1 9
-1 -1
10 11
-1 -1
-1 -1
-1 -1
2
2
4
```

Sample Output 2

```
2 9 6 4 1 3 7 5 11 8 10
2 6 9 4 1 3 7 5 10 8 11
```

Explanation 2

Here we perform swap operations at the nodes whose depth is either 2 or 4 for $K = 2$ and then at nodes whose depth is 4 for $K = 4$.



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```
68         return result;
69     }
70 }
71
72 for (let i = 0; i < indexesLen; i++) {
73     createNode(indexes[i][0], nodes[i], "left");
74     createNode(indexes[i][1], nodes[i], "right");
75 }
76
77 for (let i = 0; i < queriesLen; i++) {
78     const jump = queries[i];
79     for (let k = 0; k < nodes.length; k++) {
80         const node = nodes[k];
81         if ((0 === node.depth % jump) && node.data !== jump) {
```

```
82         //console.log('swapNode', node.data, jump);
83         swapNode(k);
84     }
85 }
86 response.push(inOrder(nodes[0]));
87 }
88 return response;
89 }
90
91 function main() {
92     const ws = fs.createWriteStream(process.env.OUTPUT_PATH);
```

Line: 29 Col: 30

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Run Code

Submit Code

Congratulations!

You have passed the sample test cases. Click the submit button to run your code against all the test cases.

✔ Sample Test case 0

✔ Sample Test case 1

✔ Sample Test case 2

Input (stdin)

1	3
2	2 3
3	-1 -1
4	-1 -1
5	2
6	1
7	1

Your Output (stdout)

1	3 1 2
2	2 1 3

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