PIB '20 P6 - Rotational Top Trees

Time limit: 1.5s **Memory limit:** 256M

You are given a one-indexed tree of N nodes and $N-1$ edges. Each node has a weight w_i.

Your friend asks you Q questions with regards to the structure of the tree of the following forms:

- `1 r k` If the *root* of the tree is node r, what is the heaviness of the k^{th} heaviest subtree in the tree, where the heaviness of a subtree is the *sum* of all the weights in that subtree?
- `2 r k` If the *root* of the tree is node r, what is the heaviness of the k^{th} heaviest subtree in the tree, where the heaviness of a subtree is the *maximum* of all the weights in that subtree?

It is guaranteed that $1 \leq r, k \leq N$. Recall that there are always exactly N subtrees in a tree. The k^{th} heaviest subtree is out of *all* the subtrees, not just ones rooted at the children of the root.

Can you answer these questions for your friend?

Input Specification

The first line will contain two integers N, Q $(1 \leq N, Q \leq 10^5)$.

The next line will contain N integers, w_i $(|w_i| \leq 10^9)$.

The next $N-1$ lines will each contain two integers, u_i, v_i $(1 \leq u_i, v_i \leq N)$, indicating that nodes u_i and v_i are connected by an edge. It is guaranteed that the entire tree is connected.

The next Q lines will each contain a question as defined above.

Output Specification

For each question, output the heaviness of the k^{th} heaviest subtree if the root of the tree is node r, where the definition of heaviness is dependent on the query form.

Subtasks

Subtask 1 [14%]

$N \leq 2000$

Subtask 2 [39%]

There will only be type `1` queries.

Subtask 3 [47%]

No additional constraints.

Sample Input for Subtask 1

```
7 5
5 3 -2 4 -1 0 -2
1 2
1 3
2 7
3 4
3 5
5 6
1 1 3
2 1 3
1 4 5
2 5 7
2 7 4
```

Sample Output for Subtask 1

```
1
4
0
-2
4
```

Sample Input for Subtask 2

```
6 4
-2 -1 5 -3 2 4
1 2
1 3
3 4
4 5
4 6
1 4 5
1 4 1
1 6 2
1 6 6
```

Sample Output for Subtask 2

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

Sample Input for Subtask 3

```
20 10
13 17 -7 -14 -5 11 -10 3 -4 8 -17 3 5 5 1 6 5 -9 0 -19
2 1
3 2
4 3
5 3
6 2
7 2
8 7
9 6
10 2
11 1
12 2
13 4
14 6
15 1
16 13
17 8
18 11
19 13
20 10
2 13 3
2 13 6
2 1 18
1 16 9
1 11 10
2 1 2
2 6 15
2 12 15
1 5 8
2 4 4
```

Sample Output for Subtask 3

```
17
11
-9
-2
1
17
0
0
3
13
```