6_植樹問題 (Tree Planting Problem)

(4 分/4 分/12 分)

時間限制: 6 seconds

記憶體限制: 1024 MB

題目敘述

最近一位資工系的學生 Chyen 愛上了植樹，於是他上網買了一批種子，希望能種出一棵美麗的樹。

根據說明書，這些種子能種出一棵有著 N 個節點的樹，節點編號為 1 到 N，有 $N-1$ 條邊連接著這 N 個點，使得 N 個點是連通的，且第 i 個點上有一個固定的點權 C_i。

Chyen 用買來的種子嘗試種植了很多次，但每次都不能種出和說明書上一模一樣的樹，只能種植出說明書上的樹的一部分，更具體的說，Chyen 種出的樹會包含 1 到 N 的某些節點（至少一個點），並且這些節點在說明書上的樹上是連通的（也就是說明書上的樹的一個連通塊）。

Chyen 是一個熱愛數字的人，他非常在意每棵樹上的點權總和。並且他很好奇，在所有他可能種出的相異的樹中，點權總和第 K 小的樹點權總和為多少？

請你寫一個程式幫助 Chyen 來解決這個問題。如果無法種出 K 種不一樣的樹，請輸出 "-1" 來告訴 Chyen。

注意：Chyen 可能可以種出多棵點權一樣的樹，但只要這棵樹包含的節點（1 到 N 的某個非空子集i）和另一棵樹不同，這樣就視為相異的樹。

輸入格式

輸入的第一行包含兩個正整數 N、K，代表樹的節點數量、Chyen 想找出第幾小的點權總和。

第二行包含 N 正整數 $C_1, C_2, \ldots, C_N$，代表每個點的點權。

接下來的 $N-1$ 行，每行包含兩個正整數 u, v 代表樹上的一條邊。

輸出格式

輸出一個整數，代表第 K 小的樹點權總和。如果無法種出 K 種不一樣的樹，請輸出 "-1"。

資料範圍

- $1 \le N \le 2 \times 10^5$
- $1 \le K \le 2 \times 10^5$
- $1 \le C_i \le 10^9 \ (\forall i \in [1, N])$

子任務

- 子任務 1 滿足 $1 \le N, K \le 200$。
- 子任務 2 滿足 給定的樹是一條鏈。
- 子任務 3 無額外限制。

測試範例

輸入範例 1

```
5 10
1 1 1 1 1
1 2
2 3
3 4
4 5
```

輸出範例 1

```
3
```

輸入範例 2

```
7 20
8 2 1 7 1 10 2
3 7
7 6
6 1
3 5
1 2
1 4
```
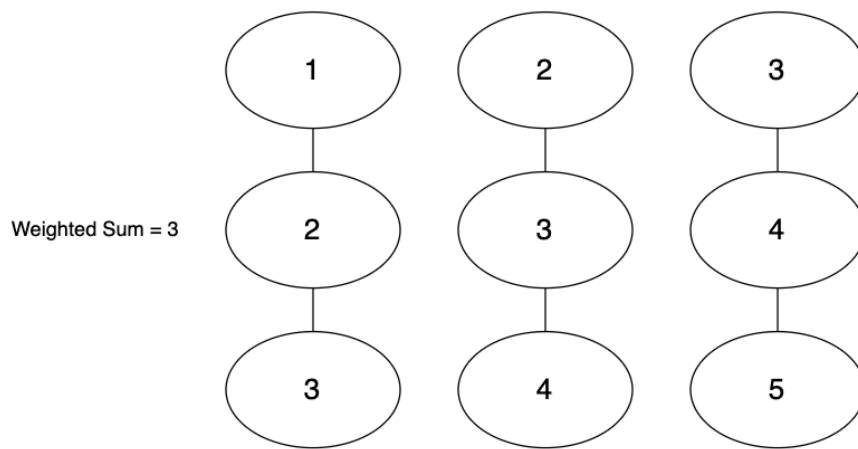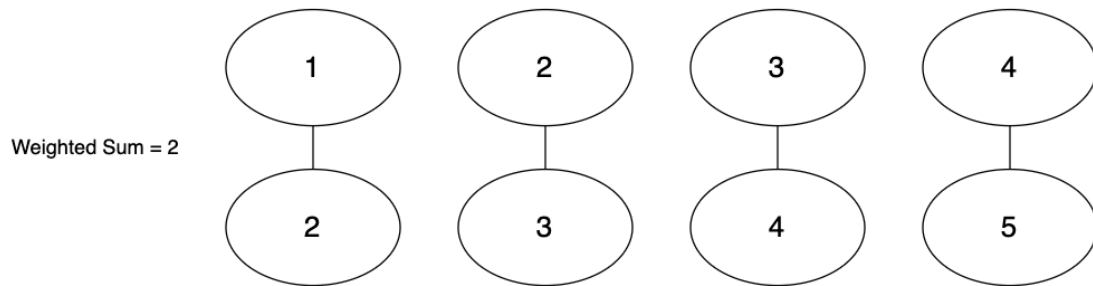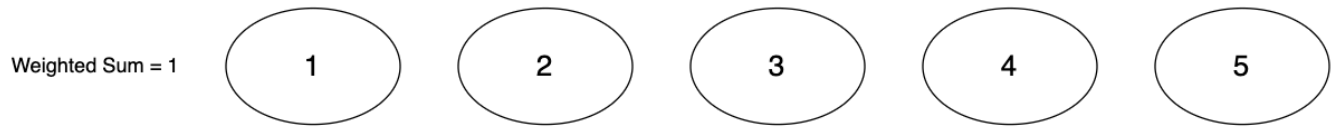
輸出範例 2

```
21
```

輸入範例 3

```
2 100
1 1
1 2
```

輸出範例 3

```
-1
```

範例說明

在範例 1 中，前 10 小的點權總和依序為：$[1, 1, 1, 1, 1, 2, 2, 2, 2, 3]$，下圖列出點權總和 ≤ 3 的連通塊。

Weighted Sum = 1

| 1 | 2 | 3 | 4 | 5 |

Weighted Sum = 2

| 1 | 2 | 3 | 4 |
| 2 | 3 | 4 | 5 |

Weighted Sum = 3

1	2	3
2	3	4
3	4	5

6_Tree Planting Problem

(4 points/4 points/12 points)

Time Limit: 6 seconds

Memory Limit: 1024 MB

Statement

Recently, a computer science student named Chyen has developed a passion for planting trees. He ordered a batch of seeds online, hoping to grow a beautiful trees.

According to the manual, these seeds can grow into a tree with N nodes, numbered from 1 to N, with $N - 1$ edges connecting these nodes to make them connected. Each node i has a fixed point weight C_i.

Chyen has tried planting multiple times but has only been able to grow part of the tree described in the manual. More specifically, the trees that Chyen grows will contain some of the nodes from 1 to N (at least one node), and these nodes are connected as they are in the tree described in the manual (a connected subgraph).

Chyen, being a lover of numbers, is very interested in the total sum of the point weights on each tree. He is curious about the K-th smallest sum of point weights among all the distinct trees he can grow.

Your task is to write a program to help Chyen solve this problem. If it's not possible to grow K different trees, output "-1" to inform Chyen.

Note: Chyen may grow multiple trees with the same total point weights, but as long as the set of nodes (a non-empty subset of 1 to N) included in one tree is different from that of another, they are considered distinct trees.

Input Format

The first line of the input contains two positive integers N, K, representing the number of nodes in the tree and the Kth smallest sum of point weights Chyen wants to find, respectively.

The second line contains N positive integers $C_1, C_2, \ldots, C_N$, representing the point weight of each node.

The following $N - 1$ lines, each contain two positive integers u, v representing an edge in the tree.

Output Format

Output an integer representing the K-th smallest sum of point weights of the trees. If it is not possible to grow K different trees, output "-1".

Constraints

- $1 \le N \le 2 \times 10^5$
- $1 \le K \le 2 \times 10^5$
- $1 \le C_i \le 10^9 \ \forall i \in [1, N]$

Subtasks

- Subtask 1 satisfies that $1 \le N, K \le 200$.

- Subtask 2 satisfies that the given tree is a chain.

- Subtask 3 has no additional constraints.

Test Cases

Input 1

```
5 10
1 1 1 1 1
1 2
2 3
3 4
4 5
```

Output 1

```
3
```

Input 2

```
7 20
8 2 1 7 1 10 2
3 7
7 6
6 1
3 5
1 2
1 4
```

Output 2

```
21
```

Input 3

```
2 100
1 1
1 2
```

Output 3

```
-1
```

Illustrations

In Example 1, the first 10 smallest sums of point weights in order are: $[1, 1, 1, 1, 1, 2, 2, 2, 2, 3]$. The graph below lists all the connected subgraphs whose point weights are ≤ 3.