Problem B. Independent Feedback Vertex Set

Input file:	`standard input`
Output file:	`standard output`

Yukikaze loves graph theory, especially forests and independent sets.

- Forest: an undirected graph without cycles.
- Independent set: a set of vertices in a graph such that for every two vertices, there is no edge connecting the two.

Yukikaze has an undirected graph $G = (V, E)$ where V is the set of vertices and E is the set of edges. Each vertex in V has a vertex weight. Now she wants to divide V into two complementary subsets V_I and V_F such that V_I is an independent set, and the induced subgraph $G[V_F]$ is a forest. The induced subgraph $G[V_F]$ is the graph whose vertex set is V_F and whose edge set consists of all of the edges in E that have both endpoints in V_F. In addition, she wants to maximize the sum of weights of vertices in V_I.

Since this problem is NP-hard for general graphs, she decides to solve a special case of the problem. We can build a special graph by the following steps. Initially, the graph consists of three vertices $1, 2, 3$ and three edges $(1, 2), (2, 3), (3, 1)$. When we add a vertex x into the graph, we select an edge (y, z) that already exists in the graph and connect (x, y) and (x, z). Keep doing this until there are n vertices in the graph.

Input

The first line of the input contains a single integer T ($1 \le T \le 10^3$), indicating the number of test cases.

The first line of each test case contains a single integer n ($4 \le n \le 10^5$), indicating the number of vertices in the graph. It is guaranteed that the sum of n over all test cases won't exceed 10^6.

The second line of each test case contains n positive integers $a_1, a_2, \ldots, a_n$ ($1 \le a_i \le 10^9$), indicating the weights of the vertices.

Initially, the graph consists of three vertices $1, 2, 3$ and three edges $(1, 2), (2, 3), (3, 1)$. The i-th line of the next $n - 3$ lines contains two integers u, v ($1 \le u, v < i + 3$), indicating the addition of a vertex $i + 3$ and two edges $(i + 3, u), (i + 3, v)$ to the graph. It is guaranteed that (u, v) already exists in the graph.

Output

For each test case, print an integer in a single line indicating the maximum sum of weights of vertices in V_I.

Example

standard input	standard output
3 4 3 3 2 2 1 2 4 2 5 5 2 2 3 5 3 1 1 1 1 1 2 1 3	4 5 3