Yet Another Contest 8 P3 - Herobrine

Time limit: 3.0s **Memory limit:** 1G
Java: 5.0s
Python: 5.0s

Andy is addicted to Minecraft. One day, he decides to download a new mod to enhance his gaming experience. The mod adds a million types of ores into the game, numbered from 1 to 10^6, and requires a subset X of distinct ores to be chosen. The mod then provides two new crafting recipes:

1. Combine one ore of each type in X, and summon a Herobrine with power $|X|$, where $|X|$ denotes the size of subset X.
2. Combine two Herobrines with powers A and B into a single Herobrine with power $A + B$.

Note that ingredients are destroyed once they are combined in a recipe.

Andy has to mine for these ores. The mine currently consists of N chambers labelled from 1 to N, and N tunnels labelled from 1 to N. The i-th chamber consists of M_i ores which Andy can mine, $O_{i,1}, O_{i,2}, \ldots, O_{i,M_i}$. The i-th tunnel connects chambers P_i and i ($P_i < i$), with the outside being considered as chamber 0.

Andy decides to begin mining in chamber C. Overhearing his plans, Josh decides to block the C-th tunnel with bedrock. Andy's only chance to escape is to summon a Herobrine to break the bedrock. Therefore, Andy decides to collect all the ores from chambers reachable from chamber C via unblocked tunnels, and to create a single Herobrine with the maximum possible power.

Mike would like to know the power of Andy's Herobrine, but as he is currently looting a village, he has no idea which chamber Andy is in. Therefore, he wants to know: for each value of C between 1 and N, across all possible subsets X, what is the maximum possible power of Andy's Herobrine? Note that X may differ for different values of C.

Constraints

$1 \leq N \leq 10^6$

$0 \leq M_i \leq 2 \times 10^6$

$1 \leq \sum_{i=1}^{N} M_i \leq 2 \times 10^6$

$1 \leq O_{i,j} \leq 10^6$

$0 \leq P_i < i$ for all i

Subtask 1 [20%]

$1 \leq N \leq 1000$

$1 \leq M_i \leq 2000$

$1 \leq \sum_{i=1}^{N} M_i \leq 2000$

Subtask 2 [40%]

$P_i = i - 1$ for all i.

Subtask 3 [40%]

No additional constraints.

Input Specification

The first line contains one integer, N.

The second line contains N integers, $P_1, P_2, \ldots, P_N$.

The i-th of the following N lines contains one integer, M_i, followed by M_i integers, $O_{i,1}, O_{i,2}, \ldots, O_{i,M_i}$.

Output Specification

Output N lines. The i-th line should contain one integer, denoting the maximum possible power of Andy's Herobrine if $C = i$.

Sample Input

```
6
0 1 2 2 3 3
4 1 1 2 2
3 1 2 3
2 2 3
2 1 3
4 1 2 3 4
3 1 3 4
```

Sample Output

```
15
9
8
2
4
3
```

Explanation

Suppose $C = 2$, so that the second tunnel which connects chambers 1 and 2 is blocked with bedrock. Then, Andy can reach all chambers except chamber 1.

In total, Andy can mine 4 ores of type 1, 3 ores of type 2, 5 ores of type 3, and 2 ores of type 4.

If he chooses $X = \{1, 2, 3\}$, then he can create 3 Herobrines of power 3 using the first crafting recipe. Using the second crafting recipe, he can combine two Herobrines to form a Herobrine with power $3 + 3 = 6$. Using the second crafting recipe again, he can combine the two remaining Herobrines to form a single Herobrine with power $3 + 6 = 9$. It can be shown that this choice of X and this sequence of crafting operations is optimal.