7057 Trie

Little Bob studied Trie in Data Structure class. He learned that Trie is a rooted tree to store some strings. There is a character on each edge of a Trie. (In this problem, the valid characters are lowercase Latin letters.)

Bob draws a Trie with n nodes, and the nodes are numbered with integers from 1 to n. The number of the root node is always 1.

He uses S_i to denote the string concatenated with characters on the path from the root to node i. It can be seen that S_1 is the empty string. Furthermore, for a set $P \subseteq \{1, 2, \ldots, n\}$, $S_P = \{S_i | i \in P\}$.

Bob defines a kind of trait on this Trie. The trait can be described with a set $P \subseteq \{1, 2, \ldots, n\}$. We say a string a has this trait, if and only if there exists a string $b \in S_P$ such that a ends with b. Here string a ends with string b means the last $|b|$ characters of a is exactly b. (Note that every string ends with the empty string).

Bob also defines a mapping f on $P \subseteq \{1, 2, \ldots, n\}$, and $f(P)$ is also a subset of $\{1, 2, \ldots, n\}$. $i \in f(P)$ if and only if there exists $j \in P$ such that S_j ends with S_i.

Initially, there is no traits been defined. Bob will add traits whenever he wants. Let D_i denote the number of traits that S_i has until now. Note that D_i may change when a new trait is added.

Besides adding new traits, Bob may also ask you something about his Trie. In each query, Bob will give you a set $P \subseteq \{1, 2, \ldots, n\}$, and you need to compute

$$\sum_{i \in f(P)} D_i.$$

Are you willing to do this for Bob?

Input

The first line contains an integer T ($T \leq 5$), denoting the number of the test cases.

For each test case, the first line contains an integer n ($1 \leq n \leq 10^5$).

From the second to the n-th line, this $n - 1$ lines describe Bob' s Trie. The i-th line contains an integer u ($u < i$), and a lowercase letter c, which means that the father of node i is node u and the character on that edge is c. We ensure that for each node i, letters on edges connecting i and its children are all different.

The next line contains an integer m ($m \leq 10^5$), which means there are m operations.

The next m lines describe all operations. In each line, the first integer indicates the type of this operation. 1 means Bob will add a new trait and 2 means Bob is asking you a question. The second integer k is the size of set P, and the next k integers are the elements of P. We ensure that these k integers are different, and they are all between 1 and n. The total size of the m sets will not be larger than $5 \cdot 10^5$.

Output

For each test case, output the answer for each query operation, one answer in a line.

Sample Input

```
1
6
1 a
```

```
1 b
1 c
3 a
3 b
5
1 2 3 4
2 2 5 6
1 2 2 3
2 2 4 5
2 1 6
```

Sample Output

```
2
3
4
```