Join Strings

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You are given a collection of N non-empty strings, $S_1, S_2, \ldots, S_N$. Then you are given $N - 1$ operations to be executed in the order they are given. Each operation is defined by two integers a, b as follows: $S_a \leftarrow S_a + S_b$; $S_b \leftarrow$ ''. That is, S_a takes the value of the concatenation of S_a and S_b, and then S_b becomes the empty string. No operation will access S_b after this operation.

You must compute the last non-empty string that remains at the end of this process.

Input

The first line contains the number of strinfs N, with $1 \leq N \leq 10^5$. The next N lines contains the N strings $S_1, S_2, \ldots, S_N$, in this order, one per line. Each string is a sequence of lowercase letters from "a" to "z". The total number of characters over all the strings is at most 10^6. After the N strings, each of the next $N - 1$ lines contain two integers a and b, separated by a space and such that $a \neq b$ and $1 \leq a, b \leq N$, that define the ith operation.

Output

Print the only non-empty string remaining at the end of the $N - 1$ operations.

Examples

Sample input 1

```
4
cute
cat
kattis
is
3 2
4 1
3 4
```

Sample output 1

```
kattiscatiscute
```

Sample input 2

```
3
howis
this
practicalexam
1 2
1 3
```

Sample output 2

```
howisthispracticalexam
```

Limits

Time limit is 1 second.

Memory limit is 256 megabytes.