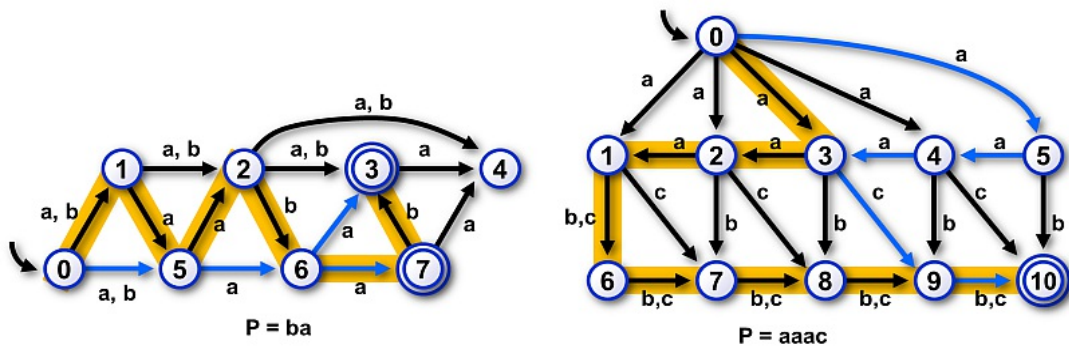


## Words with given prefix

### The task

There is a non-deterministic finite automaton  $A$  which accepts a finite language over an alphabet  $\Sigma$ . There is also a word  $P \in \Sigma^*$ . We want to know the minimum and the maximum possible length of a word accepted by  $A$  which contains  $P$  as a prefix.



**Image 1.** Example 1 (left) and Example 2 (right). Transitions corresponding to selected accepted words with given prefix  $P$  and with minimum resp. maximum lengths are depicted by blue edges resp. black edges on highlighted background.

### Input

The first line contains two positive integers  $N, S$  separated by space and representing (in this order) the number of states in automaton  $A$  and the size of  $\Sigma$ . We suppose that the states of  $A$  are labeled  $0, 1, \dots, N-1$ . Next, there are  $N$  lines specifying the automaton transition table. Each line represents one state. A line starts with the label of the state and a mark which says whether the state is final or not. The mark is either '-' (minus sign) or 'F', final states are marked by 'F', all other states are marked by '-'. Next, the line contains all characters of  $\Sigma$  sorted in ascending order. Each character is followed by a list of states to which the automaton may transit from the current state after reading the corresponding character. The list is not sorted and might be empty. All values on a line are separated by one or more spaces.

The states of  $A$  are listed in ascending order of their labels, we suppose that the state labeled 0 is the start state of  $A$ . The last line of input contains an unempty string  $P$  over  $\Sigma$ . The size  $S$  of alphabet  $\Sigma$  is at most 26 and  $\Sigma$  consists of  $S$  consecutive lower characters of English alphabet 'a', 'b', ..., 'z', always starting from 'a'.

The value of  $N$  and the length of  $P$  both do not exceed 1000, automaton  $A$  is non-deterministic and the language it accepts is finite.

### Output

The output consists of one text line containing two integers separated by space which denote (in this order) the minimum and the maximum possible length of a word over  $\Sigma$  which contains  $P$  as a prefix and is accepted by  $A$ .

### Example 1

#### Input

```
8 2
0 - a 1 5 b 1 5
1 - a 2 5 b 2
2 - a 3 4 b 3 4 6
3 F a 4 b
4 - a b
5 - a 2 6 b
6 - a 3 7 b
7 F a 4 b 3
ba
```

#### Output

```
3 6
```

The automaton and the prefix  $P$  in Example 1 is depicted in Image 1 left.

### Example 2

#### Input

```
11 3
0 - a 1 2 3 4 5 b c
```

```
1 - a      b 6   c 6 7
2 - a 1    b 7   c 8
3 - a 2    b 8   c 9
4 - a 3    b 9   c 10
5 - a 4    b 10  c
6 - a      b 7   c 7
7 - a      b 8   c 8
8 - a      b 9   c 9
9 - a      b 10  c 10
10 F a     b     c
aaac
```

## Output

```
5 8
```

The automaton and the prefix P in Example 2 is depicted in Image 1 right.

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## Public data

The public data set is intended for easier debugging and approximate program correctness checking. The public data set is stored also in the upload system and each time a student submits a solution it is run on the public dataset and the program output to stdout and stderr is available to him/her.

[Link to public data set](#)