

4925 Quick Search

A police unit has dealt with a number of situations where they need to search multiple sites as rapidly as possible with a small group of officers. Figures 1 and 2 are diagrams for two situations. Sites to search are labeled with capital letters. The site labeled A is the common starting point. Some of these locations have connecting paths. Assume each connecting path takes one unit of time to traverse, and individual sites take no time for a visual search.

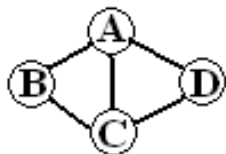


Figure 1

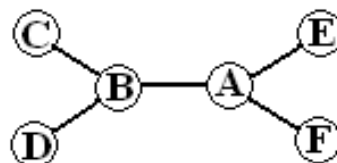


Figure 2

Consider Figure 1. If there are 3 or more officers it takes only one unit of time to search. Different officers follow paths AB, AC, and AD. If there are two officers, the complete search will take two time units. For example one officer could follow the path ABC and the other AD.

Consider Figure 2. If there were 3 officers, they could follow paths ABC, ABD, and AEA and take 3 units of time. With 2 officers they could follow paths ABCBD and AEA, and take 4 units of time.

These are simple enough examples to figure out by hand. For more complicated arrangements they want your programming help.

Input

The input will consist of 1 to 25 data sets, followed by a line containing only '0'.

A dataset is a single line starting with blank separated positive integers s n p , where s is the number of sites to search, n is the number of officers, and p is the number of connecting paths between search sites. Limits are $2 \leq s \leq 10$, $1 \leq n \leq 4$, and $p \leq 20$. The rest of the line contains p pairs of capital letters, indicating paths between sites, each preceded by a blank.

Sites are labeled with the first s capital letters. All sites will be connected by some sequence of connecting paths. The two letters in each letter pair will be in increasing alphabetical order. No letter pair will be repeated.

Output

There is one line of output for each data set, containing only the minimum search time for n officers starting at site A.

Take some care with your algorithm, or else your solution may take too long.

The sample input data sets correspond to the scenarios discussed.

Sample Input

```
4 4 5 AB BC CD AD AC
4 2 5 AB BC CD AD AC
6 3 5 AB BC BD AE AF
6 2 5 AB BC BD AE AF
0
```

Sample Output

1
2
3
4