Problem A
AibohphobiA

Time limit: 3 seconds

Memory limit: 1024 megabytes

Problem Description

You are given a rectangular grid of M rows and N columns. The rows and columns are indexed from 0 to $M-1$ and from 0 to $N-1$ respectively. In each grid cell (i, j), there is a lowercase letter character $A[i, j]$. This grid represents a maze, and the goal to solve the maze is to find a walk going from $(0, 0)$ to $(M-1, N-1)$. The walk consists of several steps. In each step you can choose one of the four directions (going from a grid cell to a neighboring cell that shares an edge.) Notice that it is okay to revisit a cell multiple times during the walk, including the starting cell $(0, 0)$ and the ending cell $(M-1, N-1)$. If you record all characters along the walk, you'll get a string that represents this walk.

Truckski is not a fan of palindromes, so he would like to find a walk that does not contain *any palindromic substrings* of length at least two, which he called a *good walk*. A string $s_1s_2\cdots s_k$ is called a palindrome, if it reads the same after reversing the string, i.e., $s_1s_2\cdots s_k = s_ks_{k-1}\cdots s_1$. A *substring* of a string can be obtained by removing a (possibly empty) prefix and a (possibly empty) suffix.

Now, there are Q interesting locations $\{(r_i, c_i)\}_{i=1}^{Q}$ that Truckski wishes to visit. For each location (r_i, c_i), can you help Truckski to find the length of the longest good walk that visits the location grid cell (r_i, c_i) at least once? If there are arbitrarily long good walks please output `-1`. If there does not exist any good walk, please output `-2`.

Input Format

The first line contains an integer T, indicating the number of test cases. For each test case, there are two integers M and N in the first line. In each of the following M lines there is a string of length N, the c-th character in the r-th line is the character $A[r, c]$. The next line contains an integer Q. In each of the following Q lines there are two integers r_i and c_i indicating the location of interest.

Output Format

For each interesting location, output the length of the longest good walk that visits this location at least once, or `-1` if the good walk can be arbitrarily long, or `-2` if there does not exist such a good walk.

Technical Specification

- $T \le 20$
- $2 \le M \le 100$
- $2 \le N \le 100$

- $1 \le Q \le 100$
- For all i such that $1 \le i \le Q$, $0 \le r_i < M$ and $0 \le c_i < N$.
- For each grid cell (r, c), $A[r, c] \in \{\texttt{a}, \texttt{b}, \ldots, \texttt{z}\}$ is a lowercase letter.

Sample Input 1

```
3
3 5
abbba
bccab
cabcc
2
0 1
1 0
3 4
aaba
bbaa
abab
1
1 1
4 4
abca
cxxb
bxxc
acba
1
0 1
```

Sample Output 1

```
9
9
-2
-1
```

Note

This problem is not the easiest problem in this contest.