

Problem 8: Wordsnake

12 Point(s)

Problem ID: `wordsnake`

Rank: 3

Note

This problem has a challenge version, Problem X: Wordsnake! Both problems are exactly the same except for the additional constraints in the problem statement. However, solutions to one may not necessarily also be valid solutions for the other.

Introduction

You turn in your assignment only to find Mrs. Boomer was just getting started! For tonight's homework, she invented a harder version of Wordsearch, where the words themselves can *bend*! She calls these puzzles *Wordsnakes*.

You run OCR on the puzzle again. But this time, you'll need to write a smarter program to search for words with bends!

Problem Statement

Given the hidden word as an uppercase string **S** and the wordsnake puzzle as an uppercase letter grid of **R** rows and **C** columns, find the hidden word in the puzzle and output a copy of the puzzle with all letters except the letters of the hidden word replaced with #.

The hidden word in the grid is a sequence of adjacent letters with the additional constraints:

- The hidden word can start at any location, and subsequent letters can follow in any of the 4 adjacent letters (up, down, left, right) regardless of where previous letters in the word are
 - This means the word can contain bends, but not self-intersections!
- The word may contain any number of bends

Note that these are not the only constraints. See the constraints section below for more constraints.

Input Format

The first line of input contains a positive integer **T** denoting the number of test cases that follow. For each test case:

- The first line contains a single string **S** denoting the hidden word
- The second line contains two space separated positive integers **R** and **C** denoting the number of rows and columns of the wordsnake puzzle
- The next **R** lines contain **C** uppercase letters each denoting the letters of the wordsnake puzzle itself
- The final line is blank to separate individual test cases

Output Format

For each test case, output the following:

- The first **R** lines should contain **C** symbols in each line denoting the solved wordsnake
 - All letters not part of the hidden word should be replaced with a pound sign #
- The final line should be blank to separate individual test cases

Constraints

$$1 \leq |S| \leq 26$$

In other words, the length of **S** does not exceed 26.

$$1 \leq R, C \leq 300$$

The sum of $R \times C$ across all test cases does not exceed 10^5 .

S contains only letters from the uppercase alphabet: ABCDEFGHIJKLMNOPQRSTUVWXYZ.

S contains at most one of each letter.

S may not be a real English word.

There will be exactly one complete instance of the hidden word in the entire puzzle.

The hidden word can start at any location, and subsequent letters can follow in any of the 4 adjacent letters (up, down, left, right) regardless of where previous letters are. This means the word can contain bends, but not self-intersections!

The word may contain any number of bends.

Sample Test Cases

Sample Input

```
3
ATMOSPHERIC
7 9
RWZMQVRLI
EOYOMMCMC
OAJHJHFPV
XTQROVWBW
MMSIALHSZ
ZOSPHERIC
VOTPTS DHC

AMOGUS
7 10
IEELYLTMDA
OX SUGOMAZJ
TKLRFDNCRO
AQTC LPUFPE
HELPMEIMXX
STUCKINAXX
WORD SNAKEX

ABCDEFGHIJKLMN OPQRSTUVWXYZ
4 13
MTGHIJPCJRSTU
YAFMLKTAYQPXV
QBEGZLMNOPSLW
CCDZVYOSNUZYX
```

Sample Output

```
#####
#####
#A#####
#T#####
#M#####
#OSPHERIC
#####

#####
##SUGOMA##
#####
#####
#####
#####
#####

##GHIJ###RSTU
#AF##K###Q##V
#BE##LMNOP##W
#CD#####ZYX
```

Sample Explanations

For test case 1, we are given a puzzle with 7 rows and 9 columns. The word `ATMOSPHERIC` can be found starting from row 3 column 2 going vertically downward until row 6 column 2. Then, it bends to the right, continuing rightward until row 6 column 8.

For test case 2, the word `AMOGUS` can be found starting from row 2 column 8 going horizontal in reverse from right to left. This is an example of a valid test case whose solution contains no bends.

For test case 3, the word `ABCDEFGHIJKLMN OPQRSTUVWXYZ` can be found starting from row 2 column 2. Then it goes crazy all over the place, making a total of 9 bends.