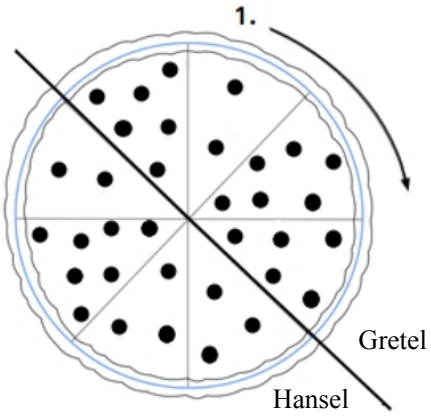
TASK	FUNGHI	ZMIJA	TRAKTOR	ZGODAN	JABUKE	DIVLJAK
input	standard input (*stdio*)					
output	standard output (*stdout*)					
time limit	1 second	1 second	2 seconds	1 second	2 seconds	4 seconds
memory limit	32 MB	32 MB	32 MB	32 MB	128 MB	768 MB
score	**50**	**80**	**100**	**120**	**140**	**160**
	total 650					

Problems translated from Croatian by: **Paula Gombar**

After having eaten all the cookies from the wicked witch's house, Hansel and Gretel ordered a jumbo pizza. The pizza arrived shortly, cut into eight pieces. Hansel and Gretel are going to split the pizza in half so that each of them gets a complete pizza "half-circle" or, in other words, four consecutive pieces.

Gretel really likes mushrooms and wants to get as many as she can. Given the fact that some pizza slices contain less and some more mushrooms, Gretel has asked Hansel to split the pizza so that her pieces contain as many mushrooms as possible.

Help Hansel and Gretel! They will tell you how many mushrooms there are on each of the eight pizza slices, and your job is to find **the largest total number of mushrooms Gretel can get**. The following image depicts the optimal division for the second test sample below (1. denotes the first slice given in the input data):



INPUT

Each of the eight lines of input contains the integer $\check{S}_i$ ($0 \leqslant \check{S}_i \leqslant 50$, $i = 1, 2, \ldots, 8$). These numbers are, respectively, the amount of mushrooms on pizza slices, where the slices are given in clockwise order.

OUTPUT

The first and only line of output must contain the required number.

SAMPLE TESTS

input	input
5 2 1 4 5 1 2 3	2 6 5 3 3 7 2 6
output	**output**
12	19

Mirko is making a clone of the popular computer game "Snake". In the game, you control the movement of a snake on a screen with dimensions of $R \cdot S$ pixels. The objective of the game is to collect all the apples.

Unfortunately, Mirko's implementation isn't that great and the gameplay is different than the original. Here is a description of Mirko's game:

- unlike the original, the apples don't appear randomly on the screen, but instead you know the positions of all apples at the beginning of the game
- at the beginning of the game, the snake is located in the lower left pixel of the screen and is facing right
- there are two buttons in the game, denoted with A and B
- when you press the button A, the snake moves forward by 1 pixel in the direction which it is currently facing. If that move would cause the snake to go off screen, nothing happens.
- when you press the button B, the snake moves up by 1 pixel and changes the direction it's facing by 180°
- when the snake moves to a pixel containing an apple, it eats the apple but doesn't grow like in the original game

You have the following task: for given positions of apples at the beginning of the game, determine **the smallest number of button presses** it takes for the snake to collect **all the apples**.

INPUT

The first line of input contains the integers R and S ($2 \leqslant R, S \leqslant 1\,000$), the height and width of the screen.

Each of the following R lines contains exactly S characters. These characters represent the content of the screen. Pixels with apples on them are denoted with 'J' and empty pixels are denoted with '.'.

The lower left corner contains the character 'Z' that represents the snake in its initial position.

OUTPUT

The first and only line of output must contain the required minimal number of button presses.

SAMPLE TESTS

input	**input**	**input**
5 5 ...J. ..... J..J. J.... Z....	5 5 ..... J...J .J.J. .JJJ. Z....	3 4 ...J .... Z...
output	**output**	**output**
7	15	5

Clarification of the first example: The shortest sequence of button presses needed for the snake to collect all the apples is BBAAABB.

Mirko got a supercool new tractor for Christmas that can even pick mushrooms! The mushrooms grow on a square-shaped meadow that can be placed in a coordinate plane so that its lower left edge is located at $(1, 1)$ and its upper right edge at $(10^5, 10^5)$.

Initially, there are no mushrooms on the meadow, but in total N will grow in a way that each second exactly one new mushroom grows on an empty space on the meadow.

Economical Mirko wants to ride his tractor *only once* and pick at least K mushrooms. His ride begins at one of the points on the meadow and he can move only in directions parallel to its sides or diagonals. Mirko's tractor is super fast and **travels great distances in negligible time**. Because of the enormous speed, Mirko *can't make turns* during the ride.

Help Mirko and determine **the minimal number of seconds** after which he can pick the wanted number of mushrooms.

INPUT

The first line of input contains the integers N ($2 \leqslant N \leqslant 10^6$) and K ($2 \leqslant K \leqslant N$), the number of mushrooms that will grow and the number of mushrooms Mirko wants to pick.

Each of the following N lines contains two integers X_i and Y_i ($1 \leqslant X_i, Y_i \leqslant 10^5$), the coordinates of the i^{th} mushroom grown on that meadow.

OUTPUT

The first and only line of output must contain the required minimal number of seconds. If Mirko can't pick K mushrooms in one ride, output -1.

SCORING

In test cases worth 50% of total points, it will hold $1 \leqslant X_i, Y_i \leqslant 300$.

SAMPLE TESTS

input	**input**	**input**
4 3 1 2 3 4 3 2 4 5	7 4 3 1 2 2 4 1 3 2 2 3 1 4 1 3	5 2 1 1 2 1 1 2 1 3 1 4
output	**output**	**output**
4	6	2

Clarification of the first example: Mirko begins his ride at point $(1, 2)$ and moves towards the mushroom located at $(4, 5)$.

An integer is considered handsome if every two of its consecutive digits are of different parity. For a given integer N, what is its closest handsome number?

Please note: Numbers consisting of only one digit are handsome numbers. The distance of two numbers is the absolute value of their difference.

INPUT

The first and only line of input contains the positive integer N that consists of at most thousand digits and is not handsome.

OUTPUT

The first and only line of output must contain the required closest handsome number. If two closest numbers exist, output both, separated by space.

SCORING

In test cases worth 56 points, it will hold $N < 10^9$.

SAMPLE TESTS

input	**input**
13	5801001
output	**output**
12 14	5810101

It is often heard that the apple doesn't fall far from the tree. But is that really so?

The National Statistics Department has tracked the falling of apples in a fruit garden for G consecutive years. The fruit garden can be represented as a matrix with dimensions $R \cdot S$. Each field of the matrix can contain more than one apple tree.

Interestingly enough, each year there was exactly one apple fall, so the Department decided to write down G pairs of numbers (r_i, s_i) that denote the row and column of the location where the apple fell during the i^{th} year. Moreover, **by next year**, a new tree grew at that location.

Your task is to determine the squared distance between the nearest tree and the apple that fell, measured in unit fields of the matrix (we assume it is that tree from which the apple fell).

The distance between fields (r_1, s_1) and (r_2, s_2) in the matrix are calculated as:

$$d((r_1, s_1), (r_2, s_2)) = \sqrt{(r_1 - r_2)^2 + (s_1 - s_2)^2}$$

INPUT

The first line of input contains two integers, R and S ($1 \leqslant R, S \leqslant 500$), the number of rows and columns of the matrix.

Each of the following R lines contains S characters 'x' or '.'. The character '.' denotes an empty field, and the character 'x' denotes a field with at least one tree.

The fruit garden will initially contain at least one tree.

After that, an integer G ($1 \leqslant G \leqslant 10^5$) follows, the number of years the fruit garden has been under observation.

Each of the following G lines describes the falls of the apples. Each line contains a pair of integers (r_i, s_i) that denote the row and column of the location where the apple fell in the i^{th} year.

OUTPUT

Output G numbers, the required squared distances from the task, each in its own line.

SCORING

In test cases worth 30% of total points, it will hold $G \leqslant 500$.

SAMPLE TESTS

input	input	input
3 3 x.. ... ... 3 1 3 1 1 3 2	3 3 x.. ... ... 3 1 3 1 1 3 2	5 5 ..x.. ....x 4 3 1 5 3 4 5 3 5
output	**output**	**output**
4 0 5	4 0 5	8 8 4 1

Clarification of the first example: The closest apple to the one that fell in the first year is the apple in the field (1,1). The apple that fell in the second year fell on the exact field where the tree is located, so the squared distance is 0. The apple that fell in the third year is equally distant to all three existing trees in the fruit garden.

Nowadays, there are a lot of unusual people. We won't go into details, but instead focus on a certain type, to us personally the most interesting people. Of course, we're talking about barbarians!

There are a lot of barbarians, but only a few of them are truly important. This story has N important barbarians, denoted with integers from 1 to N. Each of them has their own stone tablet with their word written on it, consisting of only lowercase letters of the English alphabet.

Our barbarians are playing an interesting game with their good friend Tarzan.

The game is played in Q rounds. There are two round types and each is determined by Tarzan:

- 1^{st} type: Tarzan shows the word P to the barbarians.
- 2^{nd} type: Tarzan asks the barbarian denoted with S the following question: "Out of all the words I've shown you so far, how many of them are such that the word on your stone tablet is their consecutive substring?"

Given the fact that the barbarians go wild a lot and aren't really able to pay attention and keep up with what's happening in the game, they need your help. Help the barbarians answer each of Tarzan's questions correctly.

INPUT

The first line of input contains the integer N ($1 \leqslant N \leqslant 10^5$), the number of barbarians.

Each of the following N lines contains a single word consisting of only lowercase letters of the English alphabet, the i^{th} word corresponding to the word on the stone tablet of barbarian denoted with i.

After that, the integer Q ($1 \leqslant Q \leqslant 10^5$) follows, the number of rounds in the game.

The following Q lines describe the round of the game, the i^{th} line describing the i^{th} round of the game. Each line will contain the integer O. In the case when O is equal to 1, it denotes the first type of round and the shown word P follows in the same line, consisting of only lowercase letters of the English alphabet.

In the case when O is equal to 2, it denotes the second type of round and the number S ($1 \leqslant S \leqslant N$) follows in the same line, the label of the barbarian whom Tarzan asked the question.

The total length of all words written on the barbarians' stone tablets will not exceed $2 \cdot 10^6$.
The total length of all words that Tarzan shows the barbarians will not exceed $2 \cdot 10^6$.

OUTPUT

For each round of a different form, output a single line. The i^{th} line must contain the correct answer to Tarzan's question in the i^{th} round of type 2.

SCORING

In test cases worth 50% of total points, it will hold $N \leqslant 20\,000$.

SAMPLE TESTS

input

```
3
a
bc
abc
3
1 abca
2 1
2 3
```

output

```
1
1
```

input

```
7
abba
bbaa
b
bbaa
abba
a
ba
7
1 aaabbabbaab
2 7
1 baabaaa
1 aabbbab
2 3
1 aabba
2 3
```

output

```
1
3
4
```

Clarification of the first example: The only word Tarzan has shown is abca. The answer to the first question is, of course, 1 because the word a is a substring of the word abca. The answer to the second question is also 1 because the word abc is a substring of the word abca.