A. Translation

time limit per test: 2 seconds
memory limit per test: 64 megabytes
input: standard input
output: standard output

Martians use the English alphabet to communicate. However, they have an entirely different language, but it's based on a one-to-one (bijective) mapping of letters from Martian to English. Be careful though, lower-case and upper-case letters in English aren't necessarily the same in Martian. For example, the word "CARS" in Martian translates to "Unil" in English, whereas the word "cars" in Martian translates to "EPFL".

The Martians have invaded Earth! But, we have intercepted their communications. Help us translate their messages to English.

Input

The first line of the input contains an integer n $(1 \le n \le 100)$.

The second line contains a sentence in Martian, consisting of n space-separated words each consisting of lower-case and upper-case English letters. The total number of letters in the sentence is at most 10^5.

Output

Print, on a single line, n space-separated words representing the English translation of the sentence.

Do not print any leading or trailing spaces, and end your output with a newline character.

Examples

input

```
1
CARS
```

output

```
Unil
```

input

```
1
cars
```

output

```
EPFL
```

input

```
3
IuVEJxTXs UvOHhng yZKfAYmaqolM
```

output

```
vpVZzBNtL SCubWma ocIYneAPqxDs
```

input

```
3
NtGQibw djPrCpek FWzL
```

output

```
hRkMGgJ fHrFUQTj XOwd
```

input

```
3
aySBaPyb RM gzYMynY
```

output

```
PolyProg is awesome
```

Problem B — limit 1 second

Islands

You are mapping a faraway planet using a satellite.

Your satellite has captured an image of the planet's surface. The photographed section can be modeled as a grid. Each grid cell is either land, water, or covered by clouds. Clouds mean that the surface could either be land or water, but we can't tell.

An island is a set of connected land cells. Two cells are considered connected if they share an edge.

Given the image, determine the minimum number of islands that is consistent with the given information.

Input

The first line of input contains two space-separated integers n and m ($1 \leq n, m \leq 50$).

Each of the next n lines contains m characters, describing the satellite image. Land cells are denoted by 'L', water cells are denoted by 'W', and cells covered by clouds are denoted by 'C'.

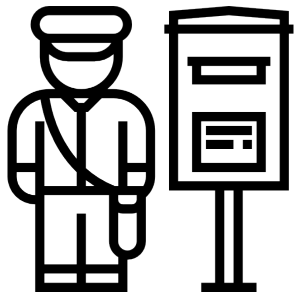
Output

Print, on a single line, a single integer indicating the minimum number of islands that is consistent with the given grid.

Sample Input	Sample Output
4 5 CCCCC CCCCC CCCCC CCCCC	0

PROBLEM C — LIMIT 1 SECOND

Postman



A postman delivers letters to his neighbors in a one-dimensional world.

The post office, which contains all of the letters to begin with, is located at $x = 0$, and there are n houses to which the postman needs to deliver the letters. House i is located at position x_i, and there are m_i letters that need to be delivered to this location. But the postman can only carry k letters at once.

The postman must start at the post office, pick up some number of letters less than or equal to his carrying capacity, and then travel to some of the houses dropping off letters. He must then return to the post office, repeating this process until all letters are delivered. At the end he must return to the post office.

The postman can travel one unit of distance in one unit of time.

What is the minimum amount of time it will take the postman to start at the post office, deliver all the letters, and return to the post office?

Input

The first line of input contains two space-separated integers n ($1 \leq n \leq 1{,}000$) and k ($1 \leq k \leq 10^7$).

Each of the next n lines contains two space-separated integers x_i ($|x_i| \leq 10^7$) and m_i ($1 \leq m_i \leq 10^7$).

Output

Print, on a single line, the minimum amount of time it will take to complete the mail delivery route.

Sample Input	Sample Output
4 10 -7 5 -2 3 5 7 9 5	42

Sample Input	Sample Output
7 1 9400000 10000000 9500000 10000000 9600000 10000000 9700000 10000000 9800000 10000000 9900000 10000000 10000000 10000000	1358000000000000

D. Revolutionary Roads

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: input.txt
output: output.txt

Governments of different countries like to boast about their achievements. For instance, the President of Flatland has announced that his country has the most advanced road system. He said the degree of a country road system development is equal to the amount of cities in the largest *connected* subset of cities. A subset of cities is called *connected* if it is possible to get from any city of the subset to all other cities of the subset.

Not to lag behind the neighbors Berland's President decided to undertake a reform and modernize roads in his country. All the roads in Berland are one-way, each of them connects a pair of cities in one direction. There is at most one road in each direction between any two given cities.

Since there is little money in the budget, President's plans aren't very ambitious. He can turn at most one of all given one-way roads into a two-way road. And he wants to do it in such a way that the resulting road system degree of development in Berland becomes as high as possible. Let's say the maximum degree of development, which can be achieved by this action, is equal to w.

A road is called *revolutionary* if, after it is changed from one-way to two-way, the degree of road system development becomes equal to w. Your task is to find all *revolutionary* roads.

Input

The first line of input contains a pair of numbers n, m ($1 \le n \le 1000$, $0 \le m \le 20000$), where n — the number cities, m — the number of roads. The following m lines contain descriptions of the roads. Each line contains a pair of integers a_i, b_i ($1 \le a_i, b_i \le n$, $a_i \ne b_i$), representing a one-way road from city a_i to city b_i. Cities are numbered from 1 to n.

Output

Write w to the first line of output. To the second line write t — number of roads in the required subset. To the third line write indices of the roads in this subset. Roads are numbered from 1 to m according to their order in the input file.

Examples

input

```
5 4
1 2
2 3
1 3
4 1
```

output

```
3
1
3
```

input

```
3 4
1 2
2 1
1 3
3 1
```

output

```
3
4
1 2 3 4
```

E. Explode 'Em All

time limit per test: 1 second
memory limit per test: 512 megabytes
input: input.txt
output: output.txt

The prime minister of Berland decided to build a new city in the country. It's hard to describe the excitement of all Berland citizens, but indeed this is great news from the economic, social and cultural standpoints.

The land in Berland is occupied almost entirely and it's very hard to find free space for construction, so it was decided to build the city on a stony terrain. The map of this terrain is represented as an $n \times m$ grid, where each cell of the grid is either an empty space or a rock.

Of course, before construction is started, the given terrain must be completely cleared from rocks. As you may guess, you were hired to complete this mission. Your goal is to destroy all rocks by dropping bombs from a plane. A bomb can be dropped on any cell of the map, and you are free to select where you want to drop each bomb. When a bomb targeted for cell (i, j) reaches the ground, it destroys all rocks in row i and also all rocks in column j of the grid. If cell (i, j) contains a rock, this rock is also destroyed.

Please help the prime minister of Berland to find the minimum number of bombs required to completely clear the given terrain from rocks.

Input

The first line of input contains two integers n and m $(1 \le n, m \le 25)$ — the number of rows and columns correspondingly. Each of the next n lines contains m characters describing the terrain. An empty space is denoted by "`.`", while a rock is denoted by "`*`".

Output

Write a single integer to the output — the minimum numbers of bombs required for destroying all rocks on the terrain.

Examples

input

```
8 10
..........
..***..*.*
.*.......*
.*.......*
.*.......*
.....*****
..........
.........*
```

output

```
2
```

input

```
3 4
....
....
....
```

output

```
0
```

Note

In the first sample test it's only required to drop 2 bombs from a plane: one bomb to cell (2,2) and another bomb to cell (6, 10). Row and column indices in this explanation are 1-based.

Problem F Exploring Pyramids

Input file:	`exploring.in`
Output file:	`exploring.out`

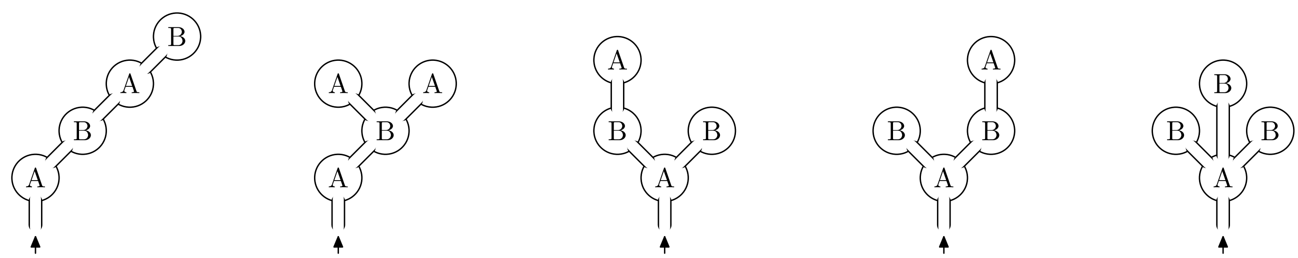
Archaeologists have discovered a new set of hidden caves in one of the Egyptian pyramids. The decryption of ancient hieroglyphs on the walls nearby showed that the caves structure is as follows. There are n caves in a pyramid, connected by narrow passages, one of the caves is connected by a passage to the outer world. The system of the passages is organized in such a way, that there is exactly one way to get from outside to each cave along passages. All caves are located in the basement of the pyramid, so we can consider them being located in the same plane. Passages do not intersect. Each cave has its walls colored in one of several various colors.

The scientists have decided to create a more detailed description of the caves, so they decided to use an exploring robot. The robot they are planning to use has two types of memory — the output tape, which is used for writing down the description of the caves, and the operating memory organized as a stack.

The robot first enters the cave connected to the outer world along the passage. When it travels along any passage for the first time, it puts its description on the top of its stack. When the robot enters any cave, it prints the color of its walls to its output tape. After that it chooses the leftmost passage among those that it has not yet travelled and goes along it. If there is no such passage, the robot takes the passage description from the top of its stack and travels along it in the reverse direction. The robot's task is over when it returns to the outside of the pyramid. It is easy to see that during its trip the robot visits each cave at least once and travels along each passage exactly once in each direction.

The scientists have sent the robot to its mission. After it returned they started to study the output tape. What a great disappointment they have had after they have understood that the output tape does not describe the cave system uniquely. Now they have a new problem — they want to know how many different cave systems could have produced the output tape they have. Help them to find that out.

Since the requested number can be quite large, you should output it modulo 1 000 000 000. Please note, that the absolute locations of the caves are not important, but their relative locations are important, so the caves (c) and (d) on the picture below are considered different.



(a) (b) (c) (d) (e)

Input

The input file contains the output tape that the archaeologists have. The output tape is the sequence of colors of caves in order the robot visited them. The colors are denoted by capital letters of the English alphabet. The length of the tape does not exceed 300 characters.

Output

Output one integer number — the number of different cave systems (modulo 1 000 000 000) that could produce the output tape.

Sample input and output

`exploring.in`	`exploring.out`
`ABABABA`	`5`
`AB`	`0`