TUYMAADA-2018. INFORMATICS
Day One

A. Liberdance

Time limit: 2 seconds
Memory limit: 256 megabytes

Inhabitants of the planet Liberloun love to dance. The ballroom of the main Liberloun palace is a $h \times w$ rectangle, where h is the height and w is the width of the rectangle. Cells of this rectangle are enumerated from 1 to hw as shown in the picture.

1	2	...	w
w+1	w+2	...	2*w
...	...	...	...
(h-1)*w+1	...	...	h*w

The dance that is going to happen is really simple and only consists of one movement, that is repeated k times. In the beginning each cell is occupied by one dancer. Then, one movement consists of every dancer moving to an adjacent cell. The direction only depends on the cell itself regardless of the dancer standing there.

The staff of Liberloun's main palace are preparing for a closing ceremony of Liberloun International Science Games, and are asking for your help. Help the dancers figure out their positions after k dance movements.

Input

First line contains 3 integers h, w, and k ($1 \leqslant h,\ w \leqslant 100,\ 0 \leqslant k \leqslant 10^9$, hw is even) — ballroom size and number of movements. Next h lines contain the movement description. Each line has w characters «L», «R», «D» or «U», corresponding to moving left, right, down and up. Direction from each cell leads to another cell of the rectangle. There is exactly one cell leading to any particular cell.

Output
Output the final dancers' position in the following format: each of h lines should contains w dancers numbers, standing in the corresponding cell.

Example

standard input	standard output
3 4 3 DLRD DUUL RURL	10 9 4 8 6 5 3 7 2 1 12 11

Scoring
This problem contains two subtasks. Points for a subtask are awarded only if solution passes all the tests from this subtask and preceding subtasks.

Subtask 1 (points: 50)
$k \leqslant 100$.

Subtask 2 (points: 50)
No additional limitations.

B. Festival of the Stars

Time limit: 1 second
Memory limit: 256 megabytes

Your spaceship is damaged and in need of repairs. The closest planet where you can repair your ship is called Y. Unfortunately, a purification season has been announced on the planet. During the purification season, the planet closes off its spaceports from the outside world. It is known that the spaceports will reopen on the day of the next Stars Festival.

The ancient culture of Y numbers the days "from the creation of the world". The Festivals of the Stars are held on such days that each digit k in the number of the day appears in it exactly k times. For example, on day 333212 there is a Festival of the Stars.

Determine when the spaceports of planet will open, knowing today's number in the calendar of Y.

Input
A single integer N ($0<N<10^{45}$), today's number in the calendar of Y.

Output
A single integer, the number of the day when the next Festival of the Stars will be held.

Scoring
This problem contains three subproblems. Points will be awarded for a subproblem only if all the tests in it pass. Subproblems are evaluated independently.

Subtask 1 (points: 30)
$N \leqslant 2^{31}$.

Subtask 2 (points: 70)
No additional limitations.

Examples

standard input	standard output
19	22
22	122

C. A Game of Words

Time limit: 2 seconds
Memory limit: 256 megabytes

In a popular Russian game of *Words*, several players take turns saying words from a certain set so that the first letter of the next word is the same as the last letter of the previous word. The first word is chosen randomly. Commonly used word sets include, for example, the names of cities, plants, or animals.

Vasya loves this game, however, he noticed that in certain cases, some words from the set cannot be called no matter how the players make their moves. Now Vasya is curious to find the minimal number of new words that must be added to the set so that for any choice of two words, let us call them *initial* and *target*, the players can make moves starting with the initial word to eventually call the target word.

Input
The first line contains two numbers N and M ($1 \leqslant N, M \leqslant 100\,000$), the number of letters in the alphabet and the number of words, respectively. The following M lines describe the words from the set, each ith line containing the number of the first and last letter of the word with number i. The letters of the alphabet are numbered from 1 to N.

Output
Output a single integer, the minimal number of words that must be added to the set.

Scoring
This problem contains three subproblems. Points will be awarded for a subproblem only if all the tests in it pass. Subproblems are evaluated independently.

Subtask 1 (points: 30)
$N, M \leqslant 20$.

Subtask 2 (points: 30)
No additional limitations on N and M. For every letter of the alphabet the set contains a word beginning and/or ending with that letter.

Subtask 3 (points: 30)
No additional limitations.

Example

standard input	standard output
9 11 1 2 2 3 3 1 4 5 5 6 6 4 7 8 8 9 9 7 1 4 1 7	2

D. Volcanoes

Time limit: 2 seconds
Memory limit: 256 megabytes

Scientists have long been interested in volcanic activity on a certain island. The island is an $M \times M$ square, composed of unit cells. Its rows and columns are numbered from 1 to M.

For each volcano its location and the day of the initial eruption are known. The volcanoes spew lava which on the first day only occupies the cell of the initial eruption, on the second day expands to floods a 3×3 square, on the third day floods a 5×5 square, and so on. All these squares are centered on the cell of the initial eruption. Volcanoes do not influence each other and the lava from each one flows independently from the lave of the others.

For further research, a station needs to be place on the island. The station occupies one cell. Find the maximum number of days the station can operate. The station ceases operation when its cell is flooded by lava.

Input
The first line contains 2 integers N and M ($1 \leqslant N,\ M \leqslant 150\,000$), the number of volcanoes and the size of the island. The following N lines describe volcanoes, with each ith of the containing 3 integers x_i, y_i, t_i ($1 \leqslant x_i, y_i \leqslant M, 1 \leqslant t_i \leqslant 150\,000$) — the coordinates and the day of the initial eruption of the ith volcano. Eruption locations do not repeat. It is guaranteed that the station will be operational for at least one day.

Output
Output the maximum number of days that a station placed on the island can operate.

Scoring
This problems contains four subproblems. Points for a subtask are awarded only if solution passes all the tests from this subtask. Subproblems are evaluated independently.

Subtask 1 (points: 10)
$N = 1$.

Subtask 2 (points: 20)
$1 \leqslant N,\ M \leqslant 100$.

Subtask 3 (points: 30)
$1 \leqslant N,\ M \leqslant 2\,000$.

Subtask 4 (points: 40)
No additional limitations.

Example

standard input	standard output
5 10 5 1 1 6 10 3 1 10 1 10 8 2 10 4 2	5