



Croatian Open Competition in Informatics

Round 2, December 3rd 2022

Tasks

Task	Time limit	Memory limit	Score
Tramvaji	1 second	512 MiB	50
Ekspert	1 second	512 MiB	70
Lampice	3 seconds	512 MiB	110
Prijateljice	1 second	512 MiB	110
Kruhologija	2 seconds	512 MiB	110
Total			450



Task Tramvaji

One magical night Patrik and Josip were talking about the number 42 and the meaning of life. They were interrupted by the famous lady voice in the tram: *The next stop is Jordanovac*. Patrik and Josip were distracted by this common sentence and started discussing:

Patrik: It is a very short ride between Joranovac and Maksimir, isn't it?

Josip: It is, but the ride between Mašićeva and Kvatrić is way shorter.

Patrik: Really? I disagree.

Josip: I wonder, which is the shortest ride between all stations?



Paula, a big public traffic transport, was carefully listening to their conversation. The problem of finding the shortest ride interested her so much that she stayed in the tram longer than she intended just to listen to their conversation.

At each station (except for the first one, when they entered the tram) one of the following two things happened:

- Patrik said: t minutes have passed since we entered the tram
- Josip said: From station y to this station t minutes have passed

But before Paula could hear their conclusion about which ride was the shortest, they left the tram! Luckily, Paula remembers all their statements. Now she needs your help! Help her find the duration of the shortest ride and between which two stations the tram drove on that ride.

Input

The first line contains the integer n ($2 \leq n \leq 1000$), the number of tram stations.

The i -th of the following $n - 1$ lines contains the information about station $i + 1$ in one of the following formats:

- **Patrik** t_i – Duration of the ride between station 1 and station $i + 1$ is t_i ($1 \leq t_i \leq 10^9$)
- **Josip** $y_i t_i$ – Duration of the ride between station y and station $i + 1$ is t_i ($y_i < i + 1, 1 \leq t_i \leq 10^9$)

Every station will be in a distinct position.

Output

In one line output three numbers: t, x_1, x_2 , the duration of the shortest ride and the indices of the starting and ending stations of that ride.

If multiple solutions exist, print the one with the smallest indices of the stations.

Scoring

Subtask	Points	Constraints
1	12	$t_i \leq 1000$
2	13	Every sentence was said by Patrik.
3	25	No additional constraints.



Examples

input

```
4
Patrik 3
Patrik 5
Josip 1 7
```

output

```
2 2 3
```

input

```
2
Josip 1 5
```

output

```
5 1 2
```

input

```
5
Patrik 4
Josip 2 4
Josip 2 6
Josip 4 2
```

output

```
2 3 4
```

Clarification of the first example:

The tram drove for 3 minutes from the first to the second station, and 5 from the first to the third. We can conclude that from the second to the third station it took 2 minutes, which is the shortest ride.

Clarification of the third example:

The ride between the fourth and fifth station is also 2 minutes but, because they have greater indices, only the 2 3 4 solution is accepted.



Task Ekspert

The group stage of the World Cup has ended, the teams are ready for the knockout stage, and many experts are trying to figure out the next world champion. One of them is Boris, the man who correctly determined the last four world champions.

Lower the chances of this team because they have a player of Barcelona, raise the chances of that team because they have the captain of Real Madrid... - Boris is calculating - Now I only need to multiply the integers x and y , and then I can announce the next world champion.



The audience suddenly got very quiet. They are impatiently waiting to know if Croatia is going to win.

Boris will multiply x and y using his famous method of four registers.

He has four registers: A, B, C and D. Initially they have the values: x , y , 0 and 1, respectively. The only operation he is allowed to do is summing up two registers (possibly the same) and storing the result in one of the registers. Each of the registers can have the value of at most $2 \cdot 10^{18}$.

He doesn't want the audience to wait too long, so he can make at most **100** of such operations.

Help him determine the operations he needs to do, and in which of the registers will the final result be stored.

Input

The first and only line contains positive integers x and y ($1 \leq x \cdot y \leq 10^{18}$), the numbers Boris needs to multiply.

Output

In the first line output the integer n ($0 \leq n \leq 100$), the number of operations Boris needs to do.

In the i -th of the following n lines output the operation in the format **R1 R2 R3**, where R_j is the label of the register (A, B, C or D), and the operation means the sum of R1 and R2 will be stored in R3.

If there are multiple correct solutions, output any of them. The solution **doesn't** need to have the minimal number of operations.

Scoring

Subtask	Points	Constraints
1	14	$x, y \leq 50$
2	14	$x \cdot y \leq 10^4$
3	42	No additional constraints.



Examples

input

1 2

output

1
A A A
A

input

3 2

output

6
D C C
D C C
D C C
D C C
D C C
D C C
D C C
C

Clarification of the first example:

The values of the registers (A, B, C, D) after the i -th operation are:

0: (1, 2, 0, 1) - initial state

1: (2, 2, 0, 1) - after the operation A A A

The product of 1 and 2 is in the register with label A.

Clarification of the second example:

The values of the registers (A, B, C, D) after the i -th operation are:

0: (3, 2, 0, 1) - initial state

1: (3, 2, 1, 1) - after the operation D C C

2: (3, 2, 2, 1) - after the operation D C C

3: (3, 2, 3, 1) - after the operation D C C

4: (3, 2, 4, 1) - after the operation D C C

5: (3, 2, 5, 1) - after the operation D C C

6: (3, 2, 6, 1) - after the operation D C C

The product of 2 and 3 is in the register with label C.

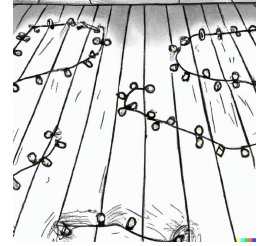


Task Lampice

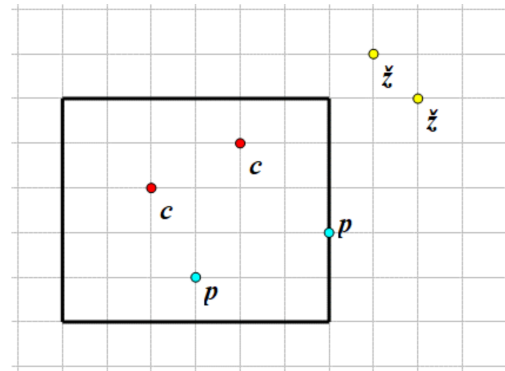
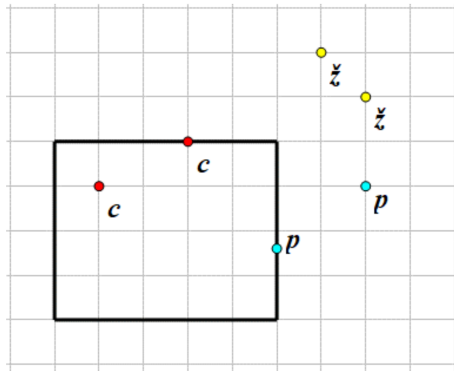
Christmas is coming! Teo has already decided to decorate his terrace.

Teo has a big rectangular-shaped terrace. It is n meters long and m meters wide. Teo has decided to decorate his terrace in a very strange way. Instead of hanging Christmas lights on the edges of his terrace, he will put them on the floor!

Teo has $2k$ lamps, two per each of k colours. He will put each in some position (x_i, y_i) , where x_i represents the distance from the left side of the terrace and y_i from the bottom side.



Proud of how he decorated the terrace, he decided to take the rest of his day off. But soon he got bored, so he returned to the terrace. He started counting nice rectangles on the terrace. A rectangle is nice if for each colour both lamps are either inside or outside of the rectangle. If a lamp is located on the rectangle edge, it is considered to be inside of it.



*The left rectangle is **not** nice. One blue lamp is inside the rectangle, and one is outside.
The right rectangle is nice. Red and blue lamps are inside. Yellow lamps are outside.*

Teo has realized that counting nice rectangles is not an easy job. He is interested in how many nice rectangles are there, whose corners have integer distances from the bottom and left sides of the terrace. All rectangles we consider are **parallel** with terrace sides. This is where you step in! Count the number of nice rectangles.

Input

The first line contains three integers n, m, k ($1 \leq n \leq 150, 1 \leq m \leq 1\,000, 0 \leq k \leq 200\,000$), the length and the width of the terrace, and the number of lamp colours.

The next k lines contain four numbers x_1, y_1, x_2, y_2 ($0 \leq x_1, x_2 \leq n, 0 \leq y_1, y_2 \leq m$), positions of the first and the second lamp of the i -th colour.

Output

In a single line output the number of nice rectangles.



Scoring

Subtask	Points	Constraints
1	26	$x_1 = y_1 = 0$ for each lamp colour
2	12	$n, m \leq 10, k \leq 1\,000$
3	35	$m \leq 150$
4	37	No additional constraints.

Examples

input

```
2 2 1
0 0 1 2
```

output

3

input

```
3 3 0
```

output

36

input

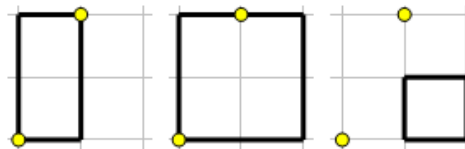
```
3 3 5
0 0 0 0
0 0 1 3
0 0 3 1
1 3 3 1
1 3 3 1
```

output

7

Clarification of the first example:

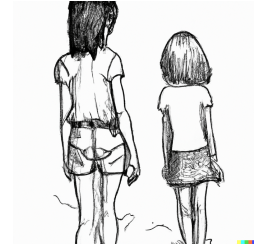
The image shows all nice rectangles from the first example.





Task Prijateljice

One summer night in Krk, Leona and Zoe went for a walk. On their winding path, they found a pile of words! Excited by that, they quickly started collecting them: Leona collected n words, and Zoe m words. After admiring them for a while, they decided to play the following game:



In one move a player says a word from her pile. The player chooses the word in such a way that the following conditions are met: the word is lexicographically greater than the previous word, and it begins with the same letter as the previous word or with the first letter of the English alphabet after it. If a player can't make a move, she loses.

They alternate turns, and Leona plays first by saying her lexicographically smallest word. If Leona and Zoe play optimally, determine who wins.

Note: The word A is lexicographically smaller than the word B if the word A is a prefix of the word B or if in the first position in which the words A and B differ the letter in A at that position comes before the letter in B at that position.

Input

The first line contains integers n and m ($1 \leq n, m \leq 10^5$), the number of Leona's words, and the number of Zoe's words.

The following n lines contain Leona's words.

The following m lines contain Zoe's words.

Words from the input contain only lowercase letters of the English alphabet, all words are mutually distinct, their total length is at most 10^6 , and Leona's and Zoe's words are lexicographically sorted.

Output

Output **Leona** or **Zoe**, the name of the winner.

Scoring

Subtask	Points	Constraints
1	20	$n, m \leq 100$, each word contains at most 10 letters
2	30	$n, m \leq 1\,000$
3	60	No additional constraints.



Examples

input

2 1
avokado
dabar
brazil

output

Zoe

input

3 3
ananas
atlas
banana
albatros
cikla
nogomet

output

Leona

input

2 2
hrvatska
zastava
bijeli
galeb

output

Leona

Clarification of the first example:

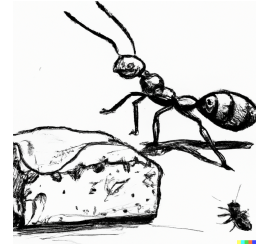
Leona starts with the word avokado, then Zoe continues with her only word brazil. Leona can't make any move so she loses.



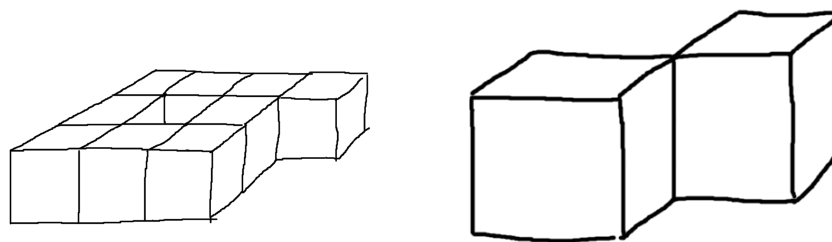
Task Kruhologija

This is an interactive task.

You're an ant, and not just a regular ant, you're an ant obsessed with kruhology! While most other ants are busy watching the Cup, you're currently on a slice of bread magically floating in the air...



The slice of bread can be imagined as a collection of unit cubes whose upper faces are all in the same plane. Let the total number of faces of the slice of bread be n . All unit cubes are connected, in other words, by moving along the faces of the cubes one can go from any face to any other face. For any two cubes sharing just one edge, there is another cube which shares a face with both of those cubes.

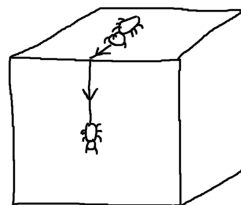


*On the left is the first example.
On the right is a forbidden configuration.*

Currently, you are on some face of some cube and oriented in an unknown way. You don't know anything about the global structure of the slice. You conveniently carry around a marker you stole from high school with which you can leave a tiny mark on each face. You can erase the mark as well! You can repeat any of the following operations q times:

- K - make a step in your current direction
- L - rotate 90° to the left
- D - rotate 90° to the right
- X - if the current face has no mark, make one, else remove it

Notice that you can be directed to the edge of the slice and still make a step forwards. In that case, you will end up on a lateral face of a cube. If you make another step you will end up on the other side of the slice of bread! Because of this in each moment you can do any of the four operations.



Example of moving over an edge.

A *hole* on a slice of bread is defined as a part of space fully surrounded by cubes. The drawn figure has exactly one hole in the middle. Notice that a hole can contain more than one connected "empty" cube and can be of any shape.



You like holes so you are really interested in the number of holes in the slice of bread you are on! Try and find out!

Interaction

This is an interactive task. Your task is to make a solution which will calculate the number of holes in a slice of bread. In every moment you can do one of the four given operations and the grader will output either the number 0 or 1. The number 1 means that the face you have just stepped on is already marked and 0 means the face is unmarked. After outputting an operation and before inputting the grader's response you should *flush* the output.

If you do more than q operations your solution will be considered incorrect. After at most q operations you should output the answer in the following format ' $! g$ ' where g should be the number of holes in the slice of bread.

Scoring

Subtask	Points	Constraints
1	49	$n \leq 40$, $q = 20000$, there is at most one hole in the slice
2	61	$n \leq 200$, $q = 20000$

Examples

input	output	input	output
	X		X
	K		K
0	L	0	K
	L	0	K
	K	0	K
1	X	0	K
	D	1	! 0
	D		
	K		
0	! 1		

Clarification of the first example:

In the first example, you are somewhere on the slice of bread drawn in the statement. The slice has exactly one hole and the correct answer is 1.

Clarification of the second example:

In the second example, you are located on a single unit cube. It has no holes and therefore the answer is 0.