Question 0 Enumeration (50 Marks)

Program Name:	PROGRAM0.EXE
Input:	Standard Input
Output:	Standard Output
Maximum Execution Time:	1 second

Write a program to read an integer N and output N^2 integers in the format specified below.

Input

The input contains an integer N ($1 \leq N \leq 10$).

Output

The output consists of N lines, each containing N integers, separated by a single space. The N^{th} number in the i^{th} row is $N - i + 1$. For the other integers, each of them is greater than the one on its right by $N - 1$.

Sample Input

```
4
```

Sample Output

```
13 10 7 4
12 9 6 3
11 8 5 2
10 7 4 1
```

Question 1 Nuclear Reactor (100 Marks)

Program Name:	PROGRAM1.EXE
Input:	Standard Input
Output:	Standard Output
Maximum Execution Time:	1 second

Nuclear energy is becoming more and more popular. As a physician, Dr. Jones wants to do some experiments with it. That's why he creates a nuclear reactor and starts happily with his experiment with uranium particles.

The nuclear reactor can be represented by a coordinate system bounded by (0, 0) and (N, N). There are totally M particles inside the reactor. The x-coordinates and y-coordinates of all particles are integers. There could be more than one particle at the same point. Moreover, each particle has a strength S_i.

To Dr. Jones' excitement, he discovers that everything will explode when the total strength of the particles exceeds a critical value, thus a large amount of energy will be produced. He is so happy that he sings loudly and dances crazily, but he forgot that he is in the laboratory together with the nuclear reactor. That means when the reactor explodes, he will die too!

As the assistant to Dr. Jones, you quickly insert a separator into the nuclear reactor in order to stop the reaction. A separator is either vertical (parallel to y-axis) or diagonal to the right (pointing NE and SW). You must find a suitable place (which means the intersection with x-axis must be an integer coordinate) to insert the separator such that the strength of the particles will be equally divided in the two sides of the separator. For the particles lying exactly on the separator, they will be absorbed by the separator and you need not consider them.

Input

The first line has two integers: N, M and Dir. Dir is either 0 or 1. 0 means that you must put a vertical separator; 1 means that you must put a diagonal separator.

Then M lines follow, each line has three integers: X_i, Y_i and S_i, representing the X,Y coordinates of the particle and its strength.

Output

Output one integer *a*, which is the line intersection with x-axis at *a*.
If *Dir* is 1, *a* can be smaller than 0 or greater than *N*.
If there is more than one answer, output any one.
If there is no answer, output "`OH NO`" (without quote)

Sample Input 1

```
4 5 0
1 1 3
2 1 3
0 3 1
4 4 2
3 4 2
```

Sample Output 1

```
2
```

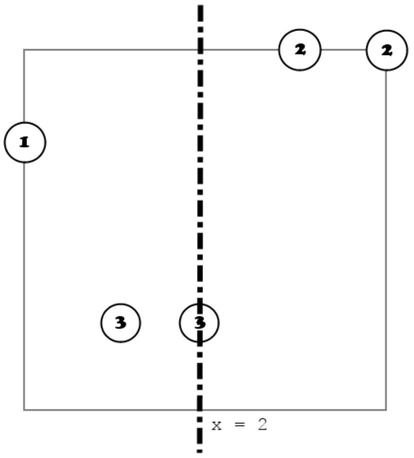
Sample Input 2

```
4 5 1
1 1 3
2 1 3
0 3 1
4 4 2
3 4 2
```

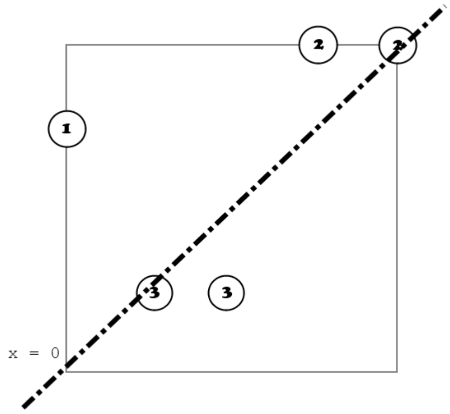
Sample Output 2

```
0
```

Explanation



Sample 1) Both sides have weight 4



Sample 2) Both sides have weight 3

Constraints

For all test data,

- $3 \le N \le 100$
- $1 \le M \le 10^6$
- $0 \le X_i, Y_i \le N$
- $1 \le S_i \le 1000$

There are 4 batches of test data, each worth 25%. Here are the additional constraints

Batch 1:

- $Dir = 0$
- $S_i = 1$ for all i
- $1 \le M \le 1000$

Batch 2:

- $Dir = 0$

Batch 3:

- $Dir = 1$
- $S_i = 1$ for all i
- $1 \le M \le 1000$

Batch 4:

- $Dir = 1$

Question 2 Spectrum Identification (100 Marks)

Program Name:	PROGRAM2.EXE
Input:	Standard Input
Output:	Standard Output
Maximum Execution Time:	1 second

Dr. Jones has been studying in spectrums for a long time and he knows that each element has a unique spectrum. When he observes a new spectrum from an unknown element, he tries to match the spectrum of that unknown element with the spectrum of a known element in order to check if the unknown element has been discovered. Due to the limitation of the equipments, Dr. Jones can only observe spectrum lines of three colours: Black (`B`), White (`W`) and Grey (`G`).

The 'full spectrum' of an element is composed of the repetitions of its 'basic spectrum'. Given the 'basic spectrum' of a known element, you are asked to compute the difference between the full spectrum of the given element and the observed spectrum. The difference between two spectrums is simply the total number of corresponding spectrum lines with different colours.

Any spectrum lines in the 'basic spectrum' can be the start of the 'full spectrum'. For example, 'basic spectrum' '`WBGB`' is able to generate 4 different 'full spectrum'.
If the full spectrum starts with the first '`W`', it will be `WBGBWBGB`...;
If the full spectrum starts with the first '`B`', it will be `BGBWBGBW`...;
If the full spectrum starts with the first '`G`', it will be `GBWBGBWB`...;
If the full spectrum starts with the second '`B`', it will be `BWBGBWBG`....

Dr. Jones wonders what the minimum difference between the spectrum of the known element and the observed spectrum is. Can you help him?

Input

The first line contains an integer: N, the number of spectrum lines in the observed spectrum.
The second line has N characters: S_i represents the colour of the i^{th} spectrum line in the observed spectrum.
The third line has an integer M, the number of spectrum lines the 'basic spectrum' of a known element has.
The fourth line has M characters: P_i represents the colour of the i^{th} spectrum line in the 'basic spectrum'.

Output

One integer represents the minimum difference.

Sample Input

```
9
BWWGWWBGG
4
WBGB
```

Sample Output

```
3
```

Explanation

There are 4 possible starting spectrum lines of the ‘basic spectrum’.

`WBGBWBGBW` – the difference for this scheme is 8

`BGBWBGBWB` – the difference for this scheme is 7

`GBWBGBWBG` – the difference for this scheme is 7

`BWBGBWBGB` – the difference for this scheme is 3

Therefore, the fourth configuration of the basic spectrum is the optimal configuration. The difference between it and the observed spectrum is therefore 3.

Constraints

For all test data,

- $1 \leq N \leq 2 \times 10^5$
- $1 \leq M \leq 2000$
- S_i and P_i can only contain ‘`B`’, ‘`W`’ or ‘`G`’

For test data which consists of 50% of the score

- $1 \leq M \leq 10$

For some other test data which consists of 25% of the score

- S_i and P_i can only contain ‘`B`’ or ‘`W`’

Question 3   Gravity Game (100 Marks)

Program Name:	PROGRAM3.EXE
Input:	Standard Input
Output:	Standard Output
Maximum Execution Time:	1 second

Dr. Jones is a scientist with great ambitions. One day, he thought "Newton discovered gravity, why don't I *create* gravity?" Thanks to his talent, he finally created the gravity control machine!

To test the function of the machine, he performs an experiment. He puts a special ball into a box which has many obstacles inside. The ball can measure the total distance rolled. In his experiment, he sets the direction of gravity to North, East, South or West and then the ball will roll towards that direction until it hits an obstacle or the boundary. Once the ball stops rolling, he sets the direction of gravity again. Note that the new direction may be the same as the original one.

To show that the machine works, he needs to know the distance the ball rolled. He now assigns this job to his assistant, or you. Given the configuration of the box, the initial position of the ball and the gravity sequence, please calculate the total distance rolled by the ball.

Input

The first line contains three integers, *N*, *M* and *C*, which are the width, length of the box and the length of the sequence of the directions of gravity generated by the gravity control machine respectively.

Each of the next *N* lines contains *M* characters. '`.`' means free space and '`#`' means obstacles in the box.

The next line contains two integers, the row number and the column number of the initial position of the ball. It is guaranteed to be a free space.

The last line contains a string with *C* characters. Each character will be '`N`', '`S`', '`E`' or '`W`', which are the directions of gravity from North, South, East and West respectively.

Output

A single integer, the total distance rolled by the ball. The distance is guaranteed to be smaller than 2^{31}.

Sample Input

```
3 4 4
#...
....
.##.
3 1
NENW
```

Sample Output

```
7
```

Constraints

For all test data,

- $1 \leq N, M \leq 1000$
- $1 \leq C \leq 10^6$

For 50% test data,

- $1 \leq N,M \leq 100$
- $1 \leq C \leq 1000$

Question 4 Circular Circuit (100 Marks)

Program Name:	PROGRAM4.EXE
Input:	Standard Input
Output:	Standard Output
Maximum Execution Time:	1 second

You probably don't know what a circular circuit is. It is one of the inventions by Dr. Jones. This circuit requires a great amount of energy to operate therefore it is very, very difficult to set up. Thanks to the nuclear reactor he created, he can generate enough power in his laboratory and set up a circular circuit.

In a circular circuit, there are N electronic components, which lie in a circle. Each component has an operating voltage. A component is called *stable* if the difference of operating voltage between its right component and its left component is not greater than C. It is dangerous if there is any unstable component because the circuit will explode!

For the sake of safety, Dr. Jones designed a circular circuit with no unstable electronic components. Unfortunately, he lost the plan. As the assistant of Dr. Jones, you would like to assist him to reconstruct the plan.

You are given the operating voltage of all components. Please help him to recover the configuration with no unstable component. If there is more than one solution, you may output any one of them. It is guaranteed the solution exists.

Input

The first line contains 2 integers N and C.

The second line contains N integers V_i, the operating voltage of the i^{th} component.

Output

Output N integers in a line, describing the operating voltage of the components in clockwise order in a stable circuit. You may start from any point.

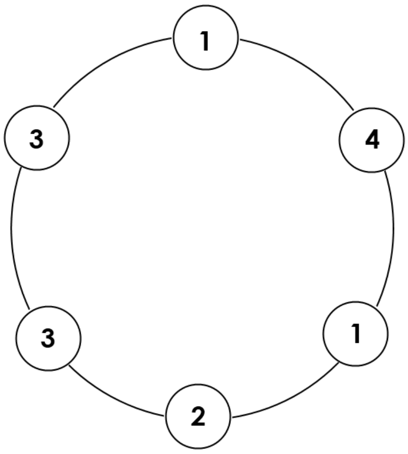
Sample Input

```
6 2
3 1 3 4 2 1
```

Sample Output

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

Explanation



Here is the stable configuration described in the sample output.

Constraints

For the first 25% test data,

- $N \leq 10$
- $1 \leq V_i \leq 3$

For the second 25% test data,

- $N \leq 10$
- $1 \leq V_i \leq 1000$

For the third 25% test data,

- $N \leq 1000$
- $1 \leq V_i \leq 3$

For the last 25% test data,

- $N \leq 1000$
- $1 \leq V_i \leq 1000$