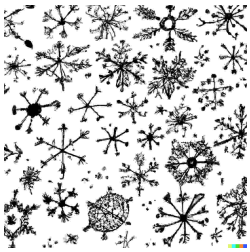
Croatian Open Competition in Informatics

Round 2, December 2nd 2023

Tasks

Task	Time limit	Memory limit	Score
Pahuljice	1 second	512 MiB	50
Pingvin	1 second	512 MiB	70
Dizalo	3 seconds	512 MiB	110
Kuglice	0.5 seconds	512 MiB	110
Zatopljenje	2 seconds	512 MiB	110
Total			450

Task Pahuljice



Lana likes to draw specific snowflakes. A snowflake of size x is defined as follows:

- The center of the snowflake is the character `'+'`.
- Above and below the character `'+'` there is a sequence of x characters `'|'`.
- To the left and right of the character `'+'` there is a sequence of x characters `'-'`.
- On the diagonal from the upper left corner to the center and from the center to the lower right corner of the snowflake there is a sequence of x characters `'\'`.
- On the diagonal from the upper right corner to the center and from the center to the lower left corner of the snowflake there is a sequence of x characters `'/'`.

Sometimes Lana connects several snowflakes, but even then the size of each snowflake is determined separately, regardless of whether the snowflakes share some characters.

```
\|/          \.|./..          \.|./.
-+-          .\|/...          .\|/..
/|\          --+--..          --+---
             ./|\...          ./|\..
             /.|.\|/          /...\.
             ....-+-
             ..../|\
```

On the left is an example of a snowflake of size 1.
In the middle is an example of connected snowflakes, the left one of size 2 *and the right one of size* 1.
On the right is an example of a snowflake of size 1. *It is missing one character* `'|'` *to be of size* 2.

Lana is currently drawing snowflakes on a piece of paper of size $n \times m$. However, she got a bit confused and did not draw all the snowflakes completely in accordance with her usual snowflake shapes. Namely, some snowflakes are missing some characters, so their size is equal to the smallest length of the corresponding character sequence from the center in one of the eight directions. Moreover, she drew some characters that are not part of any snowflake.

Can you help Lana determine the size of the largest snowflake in the drawing?

Input

The first line contains two integers n and m ($1 \leq n, m \leq 50$), the size of the drawing.

In each of the following n lines there are m characters describing the drawing.

The characters that can appear in the drawing are `'+'`, `'-'`, `'\'`, `'|'`, `'/'` and `'.'`.
The ASCII values of these characters are 43, 45, 92, 124, 47 and 46 respectively.

Output

In the first and only line you should output the size of the largest snowflake in the drawing.

Scoring

Subtask	Points	Constraints
1	11	There won't be any snowlake, or the largest snowflake will be of size 1.
2	11	There will be at most one character `'+'` in the drawing.
3	28	No additional constraints.

Examples

input

```
5 6
\.\|/.
---+--
/./|\.
./.|.\
/..|..
```

output

```
1
```

input

```
7 7
\.|./..
.\|/...
--+--..
./|\...
/.|.\|/
....-+-
..../|\
```

output

```
2
```

input

```
7 7
\|/|\|/
-+-|-+-
/|\|/|\
---+---
\|/|\|/
-+-|-+-
/|\|/|\
```

output

```
1
```

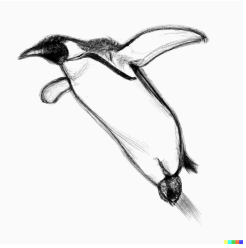
Clarification of the first example:
Only one snowflake is drawn.

In the directions up-left, up and up-right from the center of the snowflake there are sequences of length 1.
In the directions right and down-right from the center of the snowflake there are sequences of length 2.
In the directions left, down-left and down from the center of the snowflake there are sequences of length 3.

Therefore, the size of the snowflake is 1.

Clarification of the second example:
Two connected snowflakes are drawn, the left one of size 2 and the right one of size 1.

Task Pingvin



Zrakoplović the penguin wants to learn how to fly!

The space in which he will learn to fly can be imagined as a cube of dimensions $n \times n \times n$, divided into n^3 unit cubes. Each unit cube can be described with three coordinates (x, y, z), where x, y and z are integers between 1 and n. The coordinate x denotes the distance from the left edge of the space, the coordinate y denotes the distance from the front edge of the space, and the coordinate z denotes the height.

Some of these unit cubes contain clouds, and some do not.

Zrakoplović is afraid of clouds, so he will learn to fly only where there are no clouds. He initially finds himself at a position (x_s, y_s, z_s), such that $z_s = 1$ (i.e. at height 1), and wants to get to position (x_e, y_e, z_e).

At the moment, he is perfecting the skill of flying in directions that are parallel to one of the axes of space (i.e. in the direction of the x-axis, y-axis or z-axis), and in one wing flap he can cross at most one unit cube.

Before he decides to fly, Zrakoplović wants to know how many wing flaps he needs to get to the desired position. While he is preparing for the flight, help him answer that question.

Input

The first line contains an integer n ($1 \leq n \leq 100$), the dimension of the space in which Zrakoplović learns to fly.

The second line contains three integers x_s, y_s and z_s ($1 \leq x_s, y_s \leq n, z_s = 1$), the start position of Zrakoplović.

The third line contains three integers x_e, y_e and z_e ($1 \leq x_e, y_e, z_e \leq n$), the end position of Zrakoplović.

This is followed by n binary matrices of dimensions $n \times n$ that describe the space, where the i-th matrix describes the space at height i. The upper-left corner has the coordinates $(1, 1, i)$. The row and column of the matrix correspond to the x and y coordinates, respectively.

`'0'` denotes a unit cube in which there are no clouds, and `'1'` denotes a unit cube in which there are clouds.

The start and end position of Zrakoplović will not be a cloud.

Output

In the first and only line, print the smallest number of wing flaps that Zrakoplović must make to reach the desired position. If Zrakoplović cannot reach the desired position, print `'-1'`.

Scoring

Subtask	Points	Constraints
1	7	$n = 2$
2	16	There are no clouds.
3	22	All positions with z-coordinate greater than 1 will be clouds.
4	25	No additional constraints.

Examples

input

```
2
1 1 1
1 1 2
00
10
01
00
```

output

```
1
```

input

```
3
2 3 1
1 1 1
000
010
000
111
111
111
111
111
111
```

output

```
3
```

input

```
3
2 1 1
3 2 2
000
010
110
010
001
001
101
110
000
```

output

```
3
```

Clarification of the first example:
Zrakoplović can reach the desired position in one wing flap by moving in the direction of the z-axis for one unit cube.

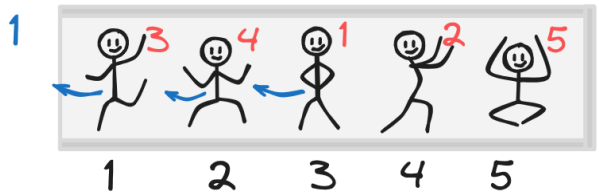
Clarification of the third example:
Zrakoplović can reach the desired position in three wing flaps by first moving to position $(2, 1, 2)$, then to $(2, 2, 2)$ and finally to $(3, 2, 2)$.

Task Dizalo

In one city there is a tall skyscraper with n floors. There are n people waiting for an elevator on the ground floor. The i-th person wants to go to the floor a_i. There is no pair of people who want to go to the same floor.

The skyscraper has one elevator that is large enough for all people to fit in, but it is so narrow that two people cannot stand side by side; they must be one behind the other.

Everybody got in the elevator, but they had not thought about the order in which they have to exit it! Initially, the i-th person is at position i, looking from the elevator door. If a person wants to exit the elevator, everybody in front of them (closer to the door) must temporarily exit the elevator too. When returning back in the elevator, they **can reorder themselves** as they wish. People who are behind (further to the door) the person who wants to exit **will not exit** the elevator.



The illustration above shows the starting order of people in the elevator in the first example. The elevator is on floor 1, and the person in position 3 wants to exit. For them to exit, persons at positions 1 and 2 must exit too.

Mirko is viewing the situation they are in and contemplating. He wants to know how many exits from the elevator would there be be if the people returning to the elevator always returned optimally. If a person exits the elevator multiple times, each time is counted separately.

Mirko is an experienced coder, and he can solvee this problem quite easily. His happiness is short-lived, because next to him is his friend Slavko. Slavko came up with q questions: *If the person at* ***position*** x_i *were not in the elevator, how many exits would there be then?*

Mirko is interested in an answer before Slavko's first question and after every question. Note that for each question, **all the people from previous questions are also not considered to be in the elevator.** Mirko started solving the problem but soon realized that even for him, this would not be quite easy. Help him solve this problem!

Note: The elevator will always move from the first floor to the n-th floor and stop at every floor on which someone wants to exit.

Input

The first line contains two non-negative integers n and q ($0 \leq q < n \leq 10^5$), the number of people/floors and the number of questions.

The second line contains n integers a_i ($1 \leq a_i \leq n, a_i \neq a_j$ for each $i \neq j$), where a_i is the floor on which the i-th person wants to exit the elevator. The sequence (a_i) is a **permutation**.

The third line contains q integers x_i ($1 \leq x_i \leq n, x_i \neq x_j$ for each $i \neq j$), Slavko's questions.

Output

In one line, print $q+1$ numbers, where the i-th is the number of exists after $i-1$ questions.

Scoring

Subtask	Points	Constraints
1	16	$n, q \leq 100$
2	19	$n, q \leq 1\,000$
3	29	$q = 0$
4	46	No additional constraints.

Examples

input

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

output

```
9 6 4
```

input

```
7 0
4 5 2 1 6 3 7
```

output

```
13
```

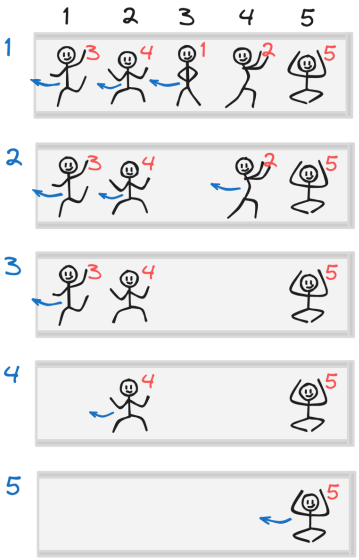
input

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

output

```
5 2 1
```

Clarification of the first example:



The illustration shows the exits from the elevator before the first query.

The elevator is on the first floor, and the person at position 3 wants to exit. But, for them to exit, persons at positions 1 and 2 must exit first, and they return to the elevator at the same positions.

After that, on the second floor, the person at position 4 wants to exit. Again, persons at positions 1 and 2 must exit first, and they return to the elevator at the same positions.

After that, on the third floor, the person at position 1 exits the elevator, without anyone else having to exit the elevator.

After that, on the fourth floor, the person at position 2 exits the elevator, without anyone else having to exit the elevator.

And finally, on the fifth floor, the person at position 5 exits the elevator.

In total, there were $3 + 3 + 1 + 1 + 1 = 9$ exits from the elevator.

Task Kuglice

Christmas time is approaching, the most beautiful time of the year. Our protagonists, Marin and Josip, have returned from Christmas shopping and have started decorating their Christmas tree.

They bought n Christmas ornaments arranged next to each other in an elongated box, and the i-th ornament has the color a_i. The box is open on both sides, so the ornaments can be taken out from both the left and the right side of the box. The box is transparent, so Marin and Josip can see the color of each ornament.

The illustration shows the initial state of the box in the second example. On his first move, Marin can draw either an ornament of color 1 from the left end of the box or an ornament of color 3 from the right end of the box.

Josip came up with a game that would make decorating the tree even more fun, although it's already a lot of fun by itself. The game works as follows: Marin and Josip take turns, and Marin starts the game. The player in turn draws an ornament from the box (either from the left or the right end of the box) and places it on the tree. If they draw an ornament whose color has not been drawn yet, the player scores a point. The game ends when the last ornament is drawn from the box.

The winner of the game is the player who has scored more points, so both Marin and Josip want to maximize their number of points. Since both of them are excellent players, they will play optimally. Your task is to print the result at the end of the game.

Input

The first line contains an integer n ($1 \leq n \leq 3\,000$), the number of ornaments in the box.

The second line contains n integers a_i ($1 \leq a_i \leq n$), the colors of the ornaments in the box.

Output

In the first and only line, print the result of the game, i.e., two numbers connected by the character `':'` (without quotes), Marin's and Josip's scores.

Scoring

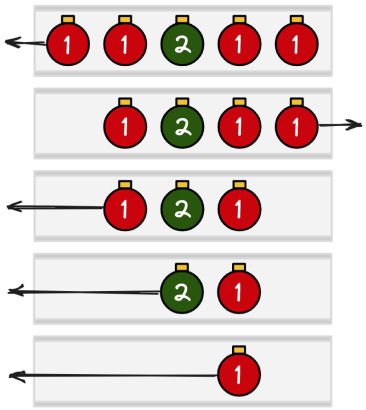
Subtask	Points	Constraints
1	17	$a_i \leq 2$ for all $i = 1, \ldots, n$
2	10	$n \leq 20$
3	26	$a_i \leq 20$ for all $i = 1, \ldots, n$
4	15	$n \leq 300$
5	42	No additional constraints.

Examples

input	output
5 1 1 2 1 1	1:1

input	output
6 1 2 3 1 2 3	2:1

Clarification of the first example:



Marin is first, and he draws an ornament of color 1 from the left end of the box. Marin scores a point.

Josip draws an ornament of color 1 from the right end of the box, but he does not score a point because a ball of color 1 has already been drawn.

Marin draws an ornament of color 1 from the left end of the box. He does not score a point either because a ball of color 1 has already been drawn.

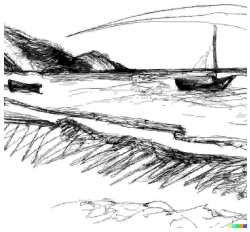
Josip draws an ornament of color 2 from the left end of the box. This is the first ball of color 2 drawn, so Josip scores a point.

Marin draws the last ornament (color 1) from the left end of the box, but it does not earn him a point, and the game ends.

Marin has a total of 1 point (he drew the ornament of color 1 first), and Josip also has a total of 1 point (he drew the ornament of color 2 first).

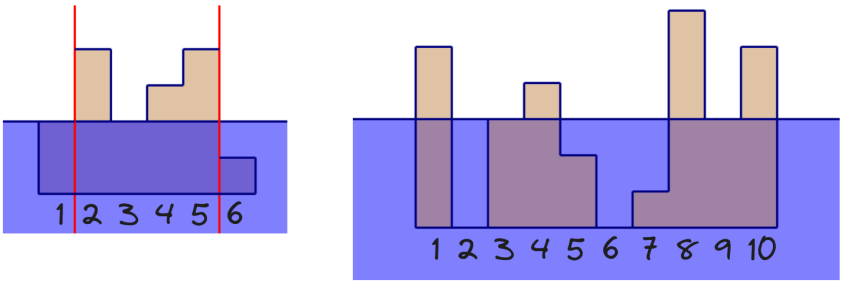
The final result is $1 : 1$.

Task Zatopljenje



It's winter, it has never been colder, and Mr. Malnar is looking at his photos from his last cruise on the Adriatic and recalls unforgettable moments. The TV is on in the background, broadcasting news about the latest proposals for measures to slow down sea level rise. Looking at his photos of the coast, Mr. Malnar asks himself what the photos would have looked like if sea level had risen a certain amount. There are so many pictures, and even more questions, so Mr. Malnar asks for your help.

We imagine the coast as a sequence of n numbers $h_1, h_2, \ldots, h_n$, where the i-th number represents relief height at the i-th point. Mr. Malnar has q queries, where the i-th query is as following: *How many islands would there be between the l_i-th and r_i-th point if the sea level rose by x_i meters?*



The left image shows the first query of the first sample test case, and the right image shows the second query of the second sample test case.
The left islands correspond to intervals $[2, 2]$ and $[4, 5]$.
The right islands correspond to intervals $[1, 1]$, $[4, 4]$, $[8, 8]$ and $[10, 10]$.

An island is defined as the maximal interval where every h_i is **strictly** greater than the sea level. A maximal interval is one that cannot be extended in either direction while keeping the mentioned condition true. Initially, the sea level is at 0 meters.

Input

The first line contains integers n and q ($1 \leq n, q \leq 2 \cdot 10^5$), the length of the sequence and the number of queries.

The second line contains n integers $h_1, h_2, \ldots, h_n$ ($0 \leq h_i \leq 10^9$) that describe the relief of the coast.

In each of the next q lines there are three integers l_i, r_i and x_i ($1 \leq l_i \leq r_i \leq n, 0 \leq x_i \leq 10^9$) that describe the i-th query.

Output

In the i-th of the q lines print the answer to the i-th query. Each of the queries is independent of the others.

Scoring

Subtask	Points	Constraints
1	10	$n, q \leq 2 \cdot 10^3$
2	20	$l_i = 1, r_i = n$ for all $i = 1, 2, \ldots, q$
3	20	There exists an integer p $(1 \leq p \leq n)$ such that the following holds: $h_1 \geq h_2 \geq \cdots \geq h_p$ i $h_p \leq h_{p+1} \leq \cdots \leq h_n$
4	60	No additional constraints.

Examples

input

```
6 3
2 4 2 3 4 1
2 5 2
3 5 3
3 4 4
```

output

```
2
1
0
```

input

```
10 3
5 0 3 4 2 0 1 6 3 5
3 9 1
1 10 3
1 10 2
```

output

```
2
4
3
```

Clarification of the first example:
The first query is shown in the left image in the task description, islands correspond to intervals $[2, 2]$ and $[4, 5]$. In the second query island corresponds to interval $[5, 5]$. In the third query there are no islands because everything is under water.

Clarification of the second example:
In the first query islands correspond to intervals $[3, 5]$ and $[8, 9]$. In the second query (shown in the right image in the task description) islands correspond to intervals $[1, 1]$, $[4, 4]$, $[8, 8]$ and $[10, 10]$, while in the third query islands correspond to intervals $[1, 1]$, $[3, 4]$ and $[8, 10]$.