Croatian Open Competition in Informatics

Round 5, February 13th 2021

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Tasks

Task	Time limit	Memory limit	Points
Šifra	1 second	512 MiB	50
Po	1 second	512 MiB	70
Magenta	1 second	512 MiB	110
Planine	2 seconds	512 MiB	110
Sjeckanje	2 seconds	512 MiB	110
Total			450

Task Šifra

Knight Borna is trying to decipher secret letters of his enemies. He recently came into possession of a special piece of paper that is used for the cipher. The paper contains a single word, made up of lowercase letters and digits.

The secret code is the number of distinct integers that appear in the word, when all letters are replaced with whitespace. The integers are written without leading zeroes.

Since Borna is not very good with numbers, he turned to you for help.

Input

The first line contains a word of length between 1 and 100. The word contains only lowercase letters and digits. All integers in it have at most three digits.

Output

Output the secret code.

Scoring

In test cases worth 25 points all integers will be pairwise distinct.

Examples

input	input	input
abc123abc2a3a1	borna123vitez	as23dkrf23smk1asd23sam9
output	**output**	**output**
4	1	3

Task Po

Tinky Winky left a sequence of n zeroes in the Tubbytronic Superdome, and left for a walk with Dipsy. When he came back, he saw that a misdeed has been done. The sequence was changed, and Po was smiling mischeviously in the corner of the room.

Oh dear! Po, what have you done?! – asked Tinky Winky in horror.

I enhanced the sequence! – replied Po.

After cross-examination, it was established that Po did a number of *enhancements* on the sequence. In every enhancement, she took a **segment** of a sequence and **increased** all elements in the segment by some positive integer. Also, every two segments were either disjoint or one was completely contained in other.

How many enhancements have you done, Po? – Laa-Laa inquired.

*I really don't know! I'm only sure I did the **minimum** number of enhancements possible to get this sequence!* – said Po exhaustedly.

Then it surely must be m! – proclaimed Noo-Noo. [1]

What number did Noo-Noo say?

Input

The first line contains an integer n ($1 \le n \le 100\,000$), the length of the sequence.

The second line contains n nonnegative integers a_i ($0 \le a_i \le 10^9$), the sequence after Po's enhancements.

Output

Output m, the minimum possible number of enhancements.

Scoring

In test cases worth 30 points, it holds $1 \le n \le 1000$.

Examples

input	input	input
3 2 2 2	5 2 3 3 3 2	6 1 2 3 2 1 3
output	**output**	**output**
1	2	4

Clarification of the second example:

Po first increased all elements of the sequence by 2, and then increased the middle three by 1.

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[1] Noo-Noo is the Teletubies' vacuum cleaner pet.

Task Magenta

Paula and Marin are playing a game on a tree. Not on a real tree, of course. That would be **dangerous**. Although, who can say that a connected graph with n nodes, marked by integers from 1 to n, and $n - 1$ edges, is completely safe?

Before the game started, Paula colored some edges blue, and Marin colored some edges red. If some edge was colored by both, its final color is magenta. All edges were colored by at least one of them.

Paula's piece starts the game in node a, and Marin's piece in node b. Players alternate moves, and Paula goes first. When it's their turn, the player must move their piece to some adjacent node which doesn't also contain the opponents piece. Also, Paula can't use red edges, and Marin can't use blue edges, while both can use magenta edges. The player who can't make a move loses.

Paula and Marin both play optimally. If they realize that the game can run forever, they will declare a draw. Determine the outcome of the game!

Input

The first line contains an integer n ($2 \le n \le 100\ 000$), the number of nodes.

The second line contains integers a and b ($1 \le a, b \le n$, $a \ne b$), initial nodes of Paula and Marin.

The next $n - 1$ lines describe the edges. Each line is of the form "x y $color$", where x and y ($1 \le x, y \le n$) are the endpoints, and $color$ is `plava` (Croatian for *blue*), `crvena` (Croatian for *red*) or `magenta`.

Output

Output `Paula` if Paula will win, `Marin` if Marin will win, or `Magenta` if it's a draw.

Scoring

Subtask	Points	Constraints
1	30	$2 \le n \le 100$
2	30	All colors are `magenta`.
3	50	No additional constraints.

Examples

| input	input	input
3 1 3 3 2 magenta 2 1 magenta	5 3 5 1 2 magenta 1 3 magenta 2 4 plava 2 5 crvena	5 1 4 2 1 plava 1 3 crvena 5 2 plava 4 1 magenta
output	**output**	**output**
Paula	Marin	Magenta

Clarification of the first example:

Paula will move to node 2, and then Marin can't make a move.

Clarification of the second example:

Paula must move to node 1, and then Marin will move to node 2. Paula now can't move to node 2, since Marin is there, so she must return to node 3. Marin moves to node 1 and wins.
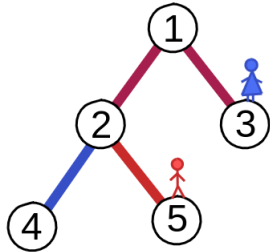
Task Planine

Zoran wanders across his Dalmatian homeland to forget his love woes. He came across a mountain of a specific shape, behind which a young maiden is waiting for him. The mountain can be described with n alternating low and high points, where n is odd. Points at odd indices, **except** the first and the last point, are called *valleys*.

Zoran is afraid of the dark. Even the call of love will not give him courage to cross the mountain at night. As usual, the fairies of Velebit come to the rescue.

We model each fairy by a luminous dot at a fixed height h. A fairy illuminates the valley if and only if the segment connecting the fairy and the valley **does not intersect the interior** of the mountain.
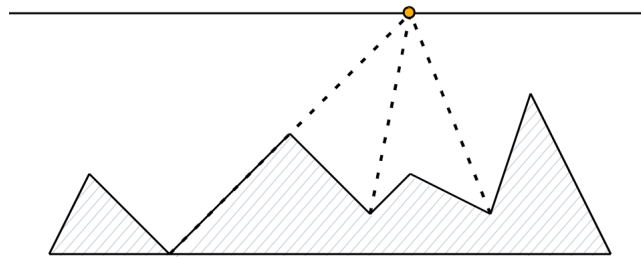
The mountain from the first example, and a fairy illuminating all three valleys.

What is the least number of fairies which can illuminate all the valleys simulaneously?

Input

The first line contains two integers n ($3 \le n < 10^6$, n odd) and h ($1 \le h \le 10^6$), the number of points describing the mountain and the height the fairies live at.

The i-th of the following n lines contains integers x_i and y_i ($-10^6 \le x_i \le 10^6$, $0 \le y_i < h$), the coordinates of the i-th point of the mountain.

It is guaranteed that $x_1 < x_2 < \cdots < x_n$, and $y_1 < y_2$, $y_2 > y_3$, $y_3 < y_4$, ..., $y_{n-1} > y_n$.

Output

Output the least number of fairies such that all valleys are illuminated.

Scoring

Subtask	Points	Constraints
1	20	$y_2 = y_4 = \cdots = y_{n-1}$
2	30	$3 \le n < 2000$
3	60	No additional constraints.

Examples

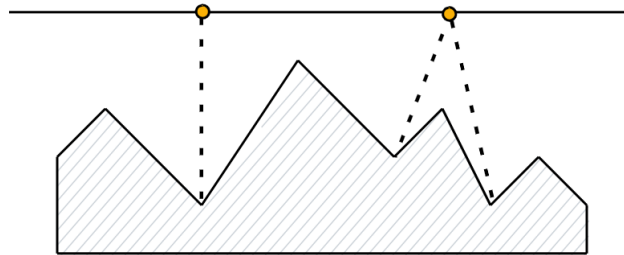| input	input
9 6 0 0 1 2 3 0 6 3 8 1 9 2 11 1 12 4 14 0	9 5 -5 2 -4 3 -2 1 0 4 2 2 3 3 4 1 5 2 6 1
output	**output**
1	2

Clarification of the examples:

The first example is shown in the statement.

It can be shown that the valleys in the second example cannot be illuminated using only one fairy. An example with two fairies is given on the figure below.

Task Sjeckanje

Paula likes to prepare stir fry. In order to make it as yummy as possible, she needs to chop a sequence of n integers into segments of the **maximum** total value.

The *value* of a segment is the **difference of its maximum and minimum**. The value of a chopped sequence is the sum of the values of the segments.

For example if we chop the sequence [1 4 1 5 3 6] into segments [1 4 1] and [5 3 6], the total value is $(4 - 1) + (6 - 3) = 6$.

There will be q updates of the form "add x to the elements on indices $l, l + 1, \ldots, r$". After each update, answer the query "What is the maximum possible value of the chopped sequence?".

Input

The first line contains integers n and q ($1 \leq n, q \leq 200\ 000$), the length of the sequence and the number of updates.

The second line contains n integers a_i ($-10^8 \leq a_i \leq 10^8$), the sequence Paula needs to chop.

Each of the following q lines contains integers l, r ($1 \leq l \leq r \leq n$), and x ($-10^8 \leq x \leq 10^8$), describing an update.

Output

Output q lines, the maximum possible value of the sequence after each update.

Scoring

Subtask	Points	Constraints
1	15	$1 \leq n, q \leq 200$
2	40	$1 \leq n, q \leq 3000$
3	55	No additional constraints.

Examples

input	input
4 3	4 3
1 2 3 4	2 0 2 1
1 2 1	4 4 1
1 1 2	2 2 3
2 3 1	1 3 2
output	**output**
2	2
2	1
0	3

Clarification of the first example:

Possible optimal choppings after each update are respectively: [2 3 3 4], [4 3] [3 4], and [4 4 4 4].