A: Speeding Ticket

Always the troublemaker, Bessie the cow has stolen Farmer John's tractor and taken off down the road!

The road is exactly 100 miles long, and Bessie drives the entire length of the road before ultimately being pulled over by a police officer, who gives Bessie a ticket for exceeding the speed limit, for having an expired license, and for operating a motor vehicle while being a cow. While Bessie concedes that the last two tickets are probably valid, she questions whether the police officer was correct in issuing the speeding ticket, and she wants to determine for herself if she has indeed driven faster than the speed limit for part of her journey.

The road is divided into N segments, each described by a positive integer length in miles, as well as an integer speed limit in the range 1..100 miles per hour. As the road is 100 miles long, the lengths of all N segments add up to 100. For example, the road might start with a segment of length 45 miles, with speed limit 70, and then it might end with a segment of length 55 miles, with speed limit 60.

Bessie's journey can also be described by a series of segments, M of them. During each segment, she travels for a certain positive integer number of miles, at a certain integer speed. For example, she might begin by traveling 50 miles at a speed of 65, then another 50 miles at a speed of 55. The lengths of all M segments add to 100 total miles. Farmer John's tractor can drive 100 miles per hour at its fastest.

Given the information above, please determine the maximum amount over the speed limit that Bessie travels during any part of her journey.

Input

- The first line of the input contains N and M, separated by a space.
- The next N lines each contain two integers describing a road segment, giving its length and speed limit.
- The next M lines each contain two integers describing a segment in Bessie's journey, giving the length and also the speed at which Bessie was driving.

Output

Please output a single line containing the maximum amount over the speed limit Bessie drove during any part of her journey. If she never exceeds the speed limit, please output 0.

Sample Input

```
3 3
40 75
50 35
10 45
40 76
20 30
40 40
```

Sample Output

```
5
```

Sample Explanation

In this example, the road contains three segments (40 miles at 75 miles per hour, followed by 50 miles at 35 miles per hour, then 10 miles at 45 miles per hour). Bessie drives for three segments (40 miles at 76 miles per hour, 20 miles at 30 miles per hour, and 40 miles at 40 miles per hour). During her first segment, she is slightly over the speed limit, but her last segment is the worst infraction, during part of which she is 5 miles per hour over the speed limit. The correct answer is therefore 5.

B: Moodern Art

Having become bored with standard 2-dimensional artwork (and also frustrated at others copying her work), the great bovine artist Picowso has decided to switch to a more minimalist, 1-dimensional style. Her latest painting can be described by a 1-dimensional array of colors of length N ($1 \leqslant N \leqslant 300$), where each color is specified by an integer in the range $1..N$.

To Picowso's great dismay, her competitor Moonet seems to have figured out how to copy even these 1-dimensional paintings! Moonet will paint a single interval with a single color, wait for it to dry, then paint another interval, and so on. Moonet can use each of the N colors as many times as she likes (possibly none).

Please compute the number of such brush strokes needed for Moonet to copy Picowso's latest 1-dimensional painting.

Input

The first line of input contains N. The next line contains N integers in the range $1..N$ indicating the color of each cell in Picowso's latest 1-dimensional painting.

Output

Output the minimum number of brush strokes needed to copy the painting.

Sample Input

```
10
1 2 3 4 1 4 3 2 1 6
```

Sample Output

```
6
```

Sample Explanation

In this example, Moonet may paint the array as follows. We denote an unpainted cell by 0.

- Initially, the entire array is unpainted:
  `0 0 0 0 0 0 0 0 0 0`
- Moonet paints the first nine cells with color 1:
  `1 1 1 1 1 1 1 1 1 0`
- Moonet paints an interval with color 2:
  `1 2 2 2 2 2 2 2 1 0`
- Moonet paints an interval with color 3:
  `1 2 3 3 3 3 3 2 1 0`
- Moonet paints an interval with color 4:
  `1 2 3 4 4 4 3 2 1 0`
- Moonet paints a single cell with color 1:
  `1 2 3 4 1 4 3 2 1 0`
- Moonet paints the last cell with color 6:
  `1 2 3 4 1 4 3 2 1 6`

Note that during the first brush stroke, Moonet could have painted the tenth cell with color 1 in addition to the first nine cells without affecting the final state of the array.

C: Why did the cow cross?

Why did the cow cross the road? Well, one reason is that Farmer John's farm simply has a lot of roads, making it impossible for his cows to travel around without crossing many of them.

FJ's farm is arranged as an $N \times N$ square grid of fields ($3 \leqslant N \leqslant 100$), with a set of $N-1$ north-south roads and $N-1$ east-west roads running through the interior of the farm serving as dividers between the fields. A tall fence runs around the external perimeter, preventing cows from leaving the farm. Bessie the cow can move freely from any field to any other adjacent field (north, east, south, or west), as long as she carefully looks both ways before crossing the road separating the two fields. It takes her T units of time to cross a road ($0 \leqslant T \leqslant 1,000,000$).

One day, FJ invites Bessie to visit his house for a friendly game of chess. Bessie starts out in the north-west corner field and FJ's house is in the south-east corner field, so Bessie has quite a walk ahead of her. Since she gets hungry along the way, she stops at every third field she visits to eat grass (not including her starting field, but including possibly the final field in which FJ's house resides). Some fields are grassier than others, so the amount of time required for stopping to eat depends on the field in which she stops.

Please help Bessie determine the minimum amount of time it will take to reach FJ's house.

Input

The first line of input contains N and T. The next N lines each contain N positive integers (each at most 100 000) describing the amount of time required to eat grass in each field. The first number of the first line is the north-west corner.

Output

Print the minimum amount of time required for Bessie to travel to FJ's house.

Sample Input

```
4 2
30 92 36 10
38 85 60 16
41 13 5 68
20 97 13 80
```

Sample Output

```
31
```

Sample Explanation

The optimal solution for this example involves moving east 3 squares (eating the "10"), then moving south twice and west once (eating the "5"), and finally moving south and east to the goal.

D: Do You Know Your ABCs?

Farmer John's cows have been holding a daily online gathering on the "mooZ" video meeting platform. For fun, they have invented a simple number game to play during the meeting to keep themselves entertained.

Elsie has three positive integers A , B, and C ($A \leqslant B \leqslant C$). These integers are supposed to be secret, so she will not directly reveal them to her sister Bessie. Instead, she gives Bessie seven (not necessarily distinct) integers in the range $1..10^9$, claiming that they are A, B, C, $A+B$, $B+C$, $C+A$, and $A+B+C$ in some order.

Given a list of these seven numbers, please help Bessie determine A, B, and C. It can be shown that the answer is unique.

Input

The only line of input consists of seven space-separated integers.

Output

Print A, B, and C separated by spaces.

Sample Input

```
3 8 12 5 4 7 9
```

Sample Output

```
3 4 5
```

E: The Bucket List

Farmer John is considering a change in how he allocates buckets for milking his cows. He thinks this will ultimately allow him to use a small number of total buckets, but he is not sure how many exactly. Please help him out!

Farmer John has N cows ($1 \leqslant N \leqslant 100$), conveniently numbered $1..N$. The i-th cow needs to be milked from time s_i to time t_i, and requires b_i buckets to be used during the milking process. Several cows might end up being milked at the same time; if so, they cannot use the same buckets. That is, a bucket assigned to cow i's milking cannot be used for any other cow's milking between time s_i and time t_i. The bucket can be used for other cows outside this window of time, of course. To simplify his job, FJ has made sure that at any given moment in time, there is at most one cow whose milking is starting or ending (that is, the s_i's and t_i's are all distinct).

FJ has a storage room containing buckets that are sequentially numbered with labels 1, 2, 3, and so on. In his current milking strategy, whenever some cow (say, cow i) starts milking (at time s_i), FJ runs to the storage room and collects the b_i buckets with the smallest available labels and allocates these for milking cow i.

Please determine how many total buckets FJ would need to keep in his storage room in order to milk all the cows successfully.

Input

The first line of input contains N. The next N lines each describe one cow, containing the numbers s_i, t_i, and b_i, separated by spaces. Both s_i and t_i are integers in the range 1..1 000, and b_i is an integer in the range 1..10.

Output

Output a single integer telling how many total buckets FJ needs.

Sample Input

```
3
4 10 1
8 13 3
2 6 2
```

Sample Output

```
4
```

Sample Explanation

In this example, FJ needs 4 buckets: He uses buckets 1 and 2 for milking cow 3 (starting at time 2). He uses bucket 3 for milking cow 1 (starting at time 4). When cow 2 arrives at time 8, buckets 1 and 2 are now available, but not bucket 3, so he uses buckets 1, 2, and 4.

F: Hill Walk

There are N hills ($1 \leqslant N \leqslant 100\,000$). Each hill takes the form of a line segment from (x_1, y_1) to (x_2, y_2) where $x_1 < x_2$ and $y_1 < y_2$. None of these segments intersect or touch, even at their endpoints, and furthermore, the first hill satisfies $(x_1, y_1) = (0, 0)$.

Bessie the cow starts at $(0, 0)$ on the first hill. Whenever Bessie is on a hill, she climbs up until she reaches the end. Then she jumps off the edge. If she lands on another hill, she continues walking on that hill; otherwise, she falls very far until she lands safely on a cushion of pillows at $y = -\infty$. Each hill $(x_1, y_1) \to (x_2, y_2)$ should be regarded as containing the point (x_1, y_1) but not containing the point (x_2, y_2), so that Bessie will land on the hill if she falls on it from above at a position with $x = x_1$, but she will not land on the hill if she falls on it from above at $x = x_2$.

Please count the total number of hills that Bessie touches at some point during her walk.

Input

- Line 1 contains the integer N, the number of hills.
- Line i+1 contains four integers (x_1, y_1, x_2, y_2) describing hill i. Each integer is in the range 0..1 000 000 000.

Output

A single line containing a single integer, the number of hills Bessie touches on her journey.

Sample Input

```
4
0 0 5 6
1 0 2 1
7 2 8 5
3 0 7 7
```

Sample Output

```
3
```

Sample Explanation

Bessie walks on hills 1, 4, and finally 3.

G: Unique Activities

Time limit: 3 seconds

Emily is tired of having studied at home throughout 2020. She has noticed the same tasks occur over and over: she has to cook and wash the dishes. Then it's time for her class; afterwards she resumes washing the dishes, has to attend another class, washes some more dishes before cooking and washing the dishes for the last time of the day.

There is a part of her day she loves, though: it's when the sequence of activities she is currently carrying out happens only once during her day. She rejoices the most when that activity sequence is unique and really short.

Each activity is represented by an uppercase letter. Given the list of activities Emily has to carry out today, help Emily find the best moment of her day by finding the shortest substring that only occurs once in the input.

If Cooking is C, Dishes is D, and Studying is S, the list of activities in the example above are C D S D S D C D, and the shortest substring that occurs only once is D C. (All the one-letter substrings and the other two-letter substrings occur at least twice).

Input

The input consists of a single line, with a sequence of N uppercase letters (from 'A' to 'Z'). The line is terminated by a newline character which is not considered to be part of the input string.

Output

The output should contain a single line with the shortest substring that happens only once in the input string. If there are multiple shortest substrings (with the same length), output the one that occurs first.

Limits

- $0 < N \leqslant 300\,000$

Sample Input

```
AABAABB
```

Sample Output

```
BA
```

H: Avoiding Speeding Tickets

Bessie has collected too many speeding tickets and she now decides to become a law abiding cow and she will never drive faster than the speed limit.

The road that Bessie intends to take is exactly 100 miles long, and Bessie drives the entire length of the road. The road is divided into N segments, each described by a positive integer length in miles, as well as an integer speed limit in the range 1..100 miles per hour. As the road is 100 miles long, the lengths of all N segments add up to 100. For example, the road might start with a segment of length 45 miles, with speed limit 70, and then it might end with a segment of length 55 miles, with speed limit 60.

Bessie is quite forgetful and she does not always remember what is the current speed limit. To avoid getting a ticket, she intend to drive at a constant speed along all the road. Given the information above, please determine how many hours it will take Bessie to travel the road assuming that she drives the fastest she can.

Input

- The first line of the input contains N.
- The next N lines each contain two integers describing a road segment, giving its length and speed limit in number of miles per hour (always a positive integer).

Output

Please output the number of hours it will take Bessie to travel the road. If the number of hours is not an integer, please output the smallest integer bigger than the number of hours needed.

Sample Input

```
3
40 75
50 35
10 45
```

Sample Output

```
3
```

Sample Explanation

In this example, the road contains three segments (40 miles at 75 miles per hour, followed by 50 miles at 35 miles per hour, then 10 miles at 45 miles per hour). Bessie cannot drive faster than 35 miles per hour which means it will take her around 2.85 hours to drive the road.