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Tigers (tyg)

https://szkopul.edu.pl/problemset/problem/qIU-rEjDKpMNvQWNfGOxYrO5/site

Bytonian tigers are amazing creatures and their unique habits always fascinated zoologists and mathematicians. Everybody knows that big tigers might attack and eat small tigers. After all tigers were measured, the study finally showed that that each tiger can be described by type k_i (and the size r_i) that says this tiger will attack any tiger that is at least k_i times smaller. For example, a tiger of size $r_i = 25$ and type $k_i = 3$ will attack tigers of sizes 8 or smaller.

There are n tigers in Bytonian Zoo. It would be safest to just put every tiger to a separate area (also called *run*) but space in the zoo is limited. You need to split tigers into groups so that no tiger would attack a tiger in the same group. Every group will live in a separate area. What is the minimum possible number of areas used?

Input

The first line of the input contains an integer n ($1 \leq n \leq 500\,000$) denoting the number of tigers in the zoo.

The i-th of next n lines contains two integers r_i and k_i ($1 \leq r \leq 10^9$, $2 \leq k \leq 10^6$) denoting respectively size and type of the i-th tiger.

In tests worth 50 points, $k_i = 2$ for all i.

Output

Print one integer — the minimum possible number of areas where you can locate tigers so that none of them would attack the other.

Example

For the following input

```
5
8 3
10 2
15 2
18 2
28 3
```

the correct output is

```
2
```

Explanation: Two areas are enough. You can put tigers of sizes 28, 18 and 15 in one area, and those with sizes 8 and 10 in a second area.

Park (par)

https://szkopul.edu.pl/problemset/problem/vFeShEOnczXpanZEaYQpDnus/site/

Bytonian National Park is famous for its long (and not really wide) mountains that span across the whole park from west to east. There are n peaks numbered from 1 to n. The i-th of them has height w_i.

In order to help tourists in planning their routes, on every peak there should be a guidepost with information what is the highest peak to the west from here and the highest peak to the east from here, both including this peak. Can you find these two numbers for every peak?

Input

The first line of the input contains an integer n ($1 \leq n \leq 10^6$) denoting the length of the mountains (the number of peaks). The i-th of next n lines contains an integer w_i ($1 \leq w_i \leq 10^9$) denoting the height of the i-th peak from the west.

In tests worth 40 points, there is an additional constraint $n \leq 10\,000$.

Output

In the i-th line of the output, print two integers — the highest peak to the west from here (including this peak) and the highest peak to the east from here (including this peak).

Example

For the following input

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

the correct output is

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

Cake (tor)

https://szkopul.edu.pl/problemset/problem/G50OwjoYk8gUak-2HGHGll4o/site

It's Baytek's birthday today. He already blew the candles and he cut the birthday cake into $(n+1)^2$ pieces. Unfortunately, the pieces have various sizes – some are bigger, some are smaller. Baytek will choose his piece first and would like to take the k-th biggest one. That is, there should be $k-1$ pieces not smaller than the chosen one, and $(n+1)^2 - k$ pieces not bigger than the chosen one.

We know that the birthday cake has rectangular shape and Baytek used n horizontal and n vertical cuts. Given the description of cuts, find the area of the piece of cake chosen by Baytek.

Input

The first line of the input contains four integers a, b, n and k ($1 \le a, b \le 10^9$, $0 \le n \le 2 \cdot 10^5$, $1 \le k \le (n+1)^2$), where a and b denote the width and height of cake, n is the number of cuts in each direction, and Baytek wants the k-th biggest piece.

The second line contains n integers $x_1, x_2, \ldots, x_n$ ($0 < x_i < a$) describing vertical cuts. The i-th cut is at distance x_i from the left side of the rectangle. The numbers are increasing ($x_i < x_{i+1}$).

The third line contains n integers $y_1, y_2, \ldots, y_n$ ($0 < y_i < b$) describing horizontal cuts. The i-th cut is at distance y_i from the bottom side of the rectangle. The numbers are increasing ($y_i < y_{i+1}$).

In tests worth 40 points, there is an additional constraint $n \le 1\,000$.

Output

Print a single integer — the area of Baytek's piece.

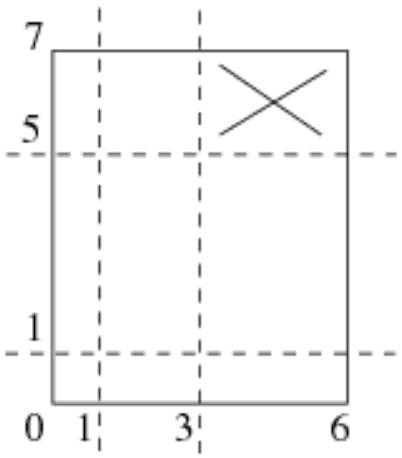
Example

For the following input

```
6 7 2 3
1 3
1 5
```

the correct output is

```
6
```



Highly prime numbers (skr)

https://szkopul.edu.pl/problemset/problem/zuhxhEWkqUBA_QpwCLsYqn68/site

A prime number is a number that has exactly two divisors.

We say that a number is *highly prime* if its every prefix is prime. For example, number 239 is highly prime because numbers 2, 23 and 239 are all prime (all prefixes including the whole number).

Find the number of highly prime numbers in the given interval $[a, b]$.

Input

The first and only line of the input contains two integers a and b ($1 \leq a \leq b \leq 10^{18}$).

In tests worth 50 points, there is an additional constraint $b \leq 10^6$.

Output

Print a single integer — the number of numbers x such that $a \leq x \leq b$ and x is highly prime.

Example

For the following input

```
20 24
```

the correct output is

```
1
```

Matches (zap)

https://szkopul.edu.pl/problemset/problem/ZLG7FB_afACLMh8-zsupw5zV/site

Baytek plays with matches.

One end (called *head*) of every match is coated with a material that is inflammable (it burns easily). Baytek arranged matches in a line and for every match we know if its head is on the left or on the right.

Baytek will ignite the leftmost match. Then a match can ignite the next match if at least one of them touches the other with a head.

What is the minimum possible number of matches that we need to flip (rotate by 180 degrees) so that all matches would burn after Baytek ignites the first match?

Input

The first line of the input contains an integer n ($1 \leq n \leq 10^6$). Matches are numbered 1 through n from left to right.

The second lines contains n integers $x_1, x_2, \ldots, x_n$. If $x_i = 0$, the i-th match has head on the left, and otherwise ($x_i = 1$) the head on the right.

In tests worth 50 points, there is an additional constraint $n \leq 10\,000$.

Output

Print a single integer — the number of matches we need to flip.

Example

For the following input

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

the correct output is

```
2
```

Matches are arranged as shown in the drawing below. If we don't flip anything, only first three matches will burn. One optimal solution (but not necessarily the only one) is to flip the last two matches, so they would be pointed to the left.