

OIG V

Park

<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 heighest peak to the west from here and the heighest 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 at least 40 points, there is an additional constraint $n \leq 10\,000$.

Output

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

<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 ($1 \leq a, b \leq 10^9, 0 \leq n \leq 2 \cdot 10^5, 1 \leq k \leq (n+1)^2$), 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.

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

Output

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

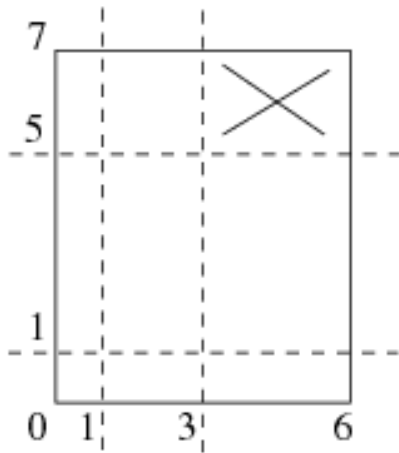
Example

For the following input

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

the correct output is

6



Highly prime numbers

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

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

We say that ... TODO