DMOPC '19 Contest 7 P4 - Bob and Continued Fractions

Time limit: 2.0s **Memory limit:** 128M

A **continued fraction** is an expression of the form

$$a_1 + \cfrac{1}{a_2 + \cfrac{1}{\ddots + \cfrac{1}{a_n}}}$$

where $a_1, a_2, \ldots, a_n$ are positive integers.

Bob has managed to obtain an array A of N positive integers. He now wants to compute Q continued fractions, the i-th of which uses the elements from indices l_i to r_i (inclusive) in the array, in order. For example, if $A = [1, 4, 5, 2]$, $l_i = 2$, and $r_i = 4$, the answer would be:

$$4 + \frac{1}{5 + \frac{1}{2}} = 4 + \frac{2}{11} = \frac{46}{11}$$

Please help Bob with this task!

Constraints

$1 \leq N, Q \leq 300\,000$
$1 \leq A_i \leq 10^9$
$1 \leq l_i \leq r_i \leq N$

Subtask 1 [10%]

$1 \leq N, Q \leq 1000$

Subtask 2 [90%]

No additional constraints.

Input Specification

The first line of input will contain two space-separated integers, N and Q.
The second line will contain N space-separated integers, A_1 through A_N.
The next Q lines will each contain two space-separated integers, l_i and r_i.

Output Specification

Q lines, each containing two space-separated integers: the numerator and denominator of the i-th continued fraction, **in lowest terms**. Since these numbers may be very large, you may output them mod $10^9 + 7$. However, note that the fraction must be in lowest terms before modding; reducing the fraction after modding may not yield the same result!

Sample Input

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

Sample Output

```
46 11
5 4
5 1
```