DMOPC '18 Contest 3 P6 - Bob and Suffering

Time limit: 2.5s **Memory limit:** 1G

Bob's teachers have conspired to give Bob a major assessment in each of their classes on the same day! Bob has N classes and has estimated how much he will suffer from each assessment. He has recorded these estimates in an array of N positive integers $v_1, v_2, \ldots, v_N$. He defines the **suffering** of a subarray to be the **product** of the minimum element in this subarray and the total sum of the subarray. Given Q queries of the form `l r`, output the greatest suffering of any subarray contained in the subarray from l to r inclusive where the indices are 1-indexed.

Constraints

$1 \leq v_i \leq 1\,000\,000$
$1 \leq l \leq r \leq N$

Subtask 1 [4%]

$N \leq 3\,000, Q \leq 10$

Subtask 2 [15%]

$N \leq 5\,000, Q \leq 5\,000$

Subtask 3 [17%]

$N \leq 100\,000, Q \leq 100\,000$
There are at most 2 different values of v_i

Subtask 4 [24%]

$N \leq 100\,000, Q \leq 100\,000$
There are at most 20 different values of v_i

Subtask 5 [40%]

$N \leq 200\,000, Q \leq 200\,000$
No additional constraints

Input Specification

The first line will contain two space-separated integers, N and Q.
The next line will contain N space-separated integers, $v_1, \ldots, v_N$.
The next Q lines will each contain a query of the form `l r`.

Output Specification

For each of the Q queries, output a single integer, the largest suffering of a subarray contained in the queried subarray.

Sample Input 1

```
6 4
3 5 2 3 5 1
2 2
1 3
1 4
2 6
```

Sample Output 1

```
25
25
26
30
```

Explanation for Sample 1

For the first query, the subarray $[2, 2]$ gives a suffering of $5 \cdot 5 = 25$.
For the second query, the subarray $[2, 2]$ gives a suffering of $5 \cdot 5 = 25$.
For the third query, the subarray $[1, 4]$ gives a suffering of $2 \cdot (3 + 5 + 2 + 3) = 26$.
For the fourth query, the subarray $[2, 5]$ gives a suffering of $2 \cdot (5 + 2 + 3 + 5) = 30$.

Sample Input 2

```
5 10
1 2 2 3 5
1 2
1 3
1 4
1 5
2 3
2 4
2 5
3 4
3 5
4 5
```

Sample Output 2

```
4
8
14
25
8
14
25
10
25
25
```

Sample Input 3

```
10 12
8 2 5 4 1 5 9 8 7 3
1 10
2 4
3 7
7 9
4 6
2 3
7 7
5 10
3 3
1 4
6 8
2 8
```

Sample Output 3

```
168
36
81
168
25
25
81
168
25
64
136
136
```