Find Maximum Index Product

HackerRank

You are given a list of N numbers $a_1, a_2, \ldots, a_n$. For each element at position i ($1 \leq i \leq N$), we define $Left(i)$ and $Right(i)$ as:
$Left(i)$ = closest index j such that j < i and $a_j > a_i$. If no such j exists then $Left(i)$ = 0.
$Right(i)$ = closest index k such that k > i and $a_k > a_i$. If no such k exists then $Right(i)$ = 0.

We define $IndexProduct(i)$ = $Left(i)$ * $Right(i)$. You need to find out the maximum $IndexProduct(i)$ among all i.

Input Format

The first line contains an integer N, the number of integers. The next line contains the N integers describing the list a[1..N].

Constraints

$1 \leq N \leq 10^5$
$1 \leq a_i \leq 10^9$

Output Format

Output the maximum $IndexProduct$ among all indices from 1 to N.

Sample Input

```
5
5 4 3 4 5
```

Sample Output

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8
```

Explanation

We can compute the following:

$$IndexProduct(1) = 0$$
$$IndexProduct(2) = 1 \times 5 = 5$$
$$IndexProduct(3) = 2 \times 4 = 8$$
$$IndexProduct(4) = 1 \times 5 = 5$$
$$IndexProduct(5) = 0$$

The largest of these is 8, so it is the answer.