John and Fences

HackerRank

John's house has bizarre fencing. There are N fences. Though the contiguous fences have the constant width of 1 unit but their height varies. Height of these fences is represented by array $H = [h_1, h_2... h_N]$.

John loves his fences but has to finally bow down to his wife's repeated requests of replacing them with the regular fences. Before taking them down, John wants to keep some part of the fences as souvenir. He decides to carve out the largest rectangular area possible where the largest rectangle can be made of a number of contiguous fence. Note that sides of the rectangle should be parallel to X and Y axis.

Let's say there are 6 fences, and their height is, $H = [2, 5, 7, 4, 1, 8]$. Then they can be represented as

```
                   __
8         __      |  |
7        |  |     |  |
6      __|  |     |  |
5     |  |  |__   |  |
4     |  |  |  |  |  |
3   __|  |  |  |  |  |
2  |  |  |  |  |__|  |
1  |__|__|__|__|__|__|
    h1 h2 h3 h4 h5 h6
```

Some possible carvings are as follow:

- If we carve rectangle from *h1, h2 and h3* then we can get the max area of 2x3 = 6 units.
- If we carve rectangle from *h3, h4, h5 and h6*, then max area is 4x1 = 4 units.
- If we carve rectangle from *h2, h3 and h4*, then max area is 4x3 = 12, which is also the most optimal solution for this case.

Input
First line will contain an integer N denoting the number of fences. It will be followed by a line containing N space separated integers, $h_1\ h_2\ ...\ h_N$, which represents the height of each fence.

Output
Print the maximum area of rectangle which can be carved out.

Note

Constraints
$1 \leq N \leq 10^5$
$1 \leq h_i \leq 10^4$

Sample Input

```
6
2 5 7 4 1 8
```

Sample Output

```
12
```

Explanation
John can carve a rectangle of height 4 from fence #2, #3 and #4, whose respective heights are 5, 7 and 4. So this will lead to a rectangle of area 3x4 = 12 units.

Tested by: Lalit Kundu