Introduction and Learning Outcomes

In this assignment and the next videos and readings, you will ...

1. Implement a program for a given computational problem.
2. Find out that it is slow: on large datasets, it takes too long to run.
3. Implement a more efficient program that is able to process even large datasets in less than a second.
4. Use stress testing to locate and fix a bug in the program.

Problem Description

Problem

Given a sequence of non-negative integers $a_0,\ldots,a_{n-1}$, find the maximum pairwise product, that is, the largest integer that can be obtained by multiplying two different elements from the sequence (or, more formally, $\max_{0\le i\ne j\le n-1} a_i a_j$). Different elements here mean a_i and a_j with $i\ne j$ (it can be the case that $a_i=a_j$).

Input format

The first line of the input contains an integer n. The next line contains n non-negative integers $a_0,\ldots,a_{n-1}$ (separated by spaces).

Constraints

$2\le n\le 2\cdot 10^5;\ 0\le a_0,\ldots,a_{n-1}\le 10^5$.

Output format

Output a single number — the maximum pairwise product.

Sample 1

Input:

```
1

2

3

1 2 3
```

Output:

```
1
6
```

Explanation:

$6=2\times3$

Sample 2

Input:

```
1
2
10
7 5 14 2 8 8 10 1 2 3
```

Output:

```
1
140
```

Explanation:

$140=14\times10$

Sample 3

Input:

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

Output:

```
1
```

Starter files

max_pairwise_product.py

MaxPairwiseProduct.java

max_pairwise_product.cpp

What To Do

If you are using Python, Java, or C++, download one of the starter files above and save to your working directory.

In the next sequence of videos and readings, we will go through the process of solving this problem together.