JOI '22 Open P1 - Seesaw

Time limit: 2.0s **Memory limit:** 512M

A straight stick of length 10^9 is placed from the left to the right. You can ignore the weight of the stick. In total, N unit weights are attached to the stick. The positions of the N weights are different from each other. The position of the i-th weight $(1 \leq i \leq N)$ is A_i, i.e., the distance between the i-th weight and the leftmost end of the stick is A_i.

In the beginning, we have a box of width w. We place the stick on the box so that the box supports the range from l to r of the stick $(0 \leq l < r \leq 10^9)$, inclusive, i.e., the range of the stick from the point whose position is l to the point whose position is r. Here, $r = l + w$ is satisfied. We cannot change the values of l and r afterward.

Next, among the weights attached to the stick, we remove the leftmost one or the rightmost one. We shall repeat this operation $N - 1$ times. In this process, including the initial state and the final state, the barycenter of the weights attached to the stick should remain in the range from l to r, inclusive. Here, if m weights are attached to the stick whose positions are $b_1, b_2, \ldots, b_m$, the position of the barycenter is $\frac{b_1+b_2+\cdots+b_m}{m}$.

Given the number of weights N and the positions of the weights $A_1, A_2, \ldots, A_N$, write a program which calculates the minimum possible width w of the box.

Input Specification

Read the following data from standard input. Given values are all integers.

N

$A_1\ A_2 \ldots A_N$

Output Specification

Write one line to the standard output. The output should contain the minimum possible width w of the box. Your program is considered correct if the relative error or the absolute error of the output is less than or equal to 10^{-9}. The format of the output should be one of the following.

- Integer. (Example: 123, 0, -2022)
- A sequence consisting of an integer, the period, a sequence of numbers between 0 and 9. The numbers should not be separated by symbols or spaces. There is no restriction on the number of digits after the decimal point. (Example: 123.4, -123.00, 0.00288)

Constraints

- $2 \leq N \leq 200\,000$.
- $0 \leq A_1 < A_2 < \cdots < A_N \leq 10^9$.

Subtasks

1. (1 point) $N \leq 20$

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2. (33 points) $N \leq 100$.
3. (33 points) $N \leq 2\,000$.
4. (33 points) No additional constraints.

Sample Input 1

```
3
1 2 4
```

Sample Output 1

```
0.8333333333
```

Explanation for Sample 1

Let the width of the box be $\frac{5}{6}$. We put $l = \frac{3}{2}$, $r = \frac{7}{3}$. We perform the following operations.

- In the beginning, the position of the barycenter is $\frac{7}{3}$.
- In the first operation, we remove the rightmost weight (the weight whose position is 4). Then the barycenter becomes $\frac{3}{2}$.
- In the second operation, we remove the leftmost weight (the weight whose position is 1). Then the barycenter becomes 2.

In this process, the barycenter remains in the range from l to r. Since the width of the box cannot be smaller than $\frac{5}{6}$, output $\frac{5}{6}$ in a decimal number.

This sample input satisfies the constraints of all the subtasks.

Sample Input 2

```
6
1 2 5 6 8 9
```

Sample Output 2

```
1.166666667
```

This sample input satisfies the constraints of all the subtasks.