# The 2018 Ethiopian Collegiate Programming Contest

# Problem E

## Panokseon

Time Limit: 1 Second

Admiral Yi Sun-sin ordered to build the special battleship, called Panokseon, to prepare the war in the Joseon Dynasty. To test its performance, he decided to have a battleship race with Joseon navy soldiers. Admiral Yi numbered $n$ soldiers from 1 to $n$, lined up in that order. He assigned the soldiers to the ships such that soldiers assigned to a ship have consecutive numbers, and the sum of their weights must not exceed the weight limit $W$ of the ship. He did not mind the number of ships used for this assignment since he built enough number of ships. The point he cared about is the fairness of the race. He thought the fairness would be guaranteed if the soldiers' weight sums are well balanced over the ships. In other words, soldiers should be evenly assigned to the ships for their weights.

More precisely, the emptiness of a ship that one or more soldiers are assigned to is defined as the square of the difference of $W$ and the sum of weights of the soldiers of the ship. The unfairness of an assignment is the maximum emptiness of the ships in the assignment. Admiral Yi wanted to guarantee the high fairness by such an assignment for the race whose unfairness is minimum, i.e., the fairness is maximized.

For instance, we are given a weight sequence $(10, 20, 30)$ of 3 soldiers with $W = 50$. An assignment $\{[1], [2], [3]\}$ that each soldier is assigned to an individual ship has the unfairness value of $\max\{(50-10)^2, (50-20)^2, (50-30)^2\} = 1600$. We can also consider two other assignments using two ships, $\{[1, 2], [3]\}$ and $\{[1], [2, 3]\}$, whose unfairness values are $\max\{(50-30)^2, (50-30)^2\} = 400$ and $\max\{(50-10)^2, (50-50)^2\} = 1600$, respectively. All three soldiers cannot be assigned to one ship because their weight sum is over $W = 50$. Thus the minimum unfairness value is $400$, and the fairest assignment is that the first two soldiers are assigned to the one ship and the third soldier to the other ship alone.

Given a weight limit $W$ of the battleship and the weights of $n$ soldiers numbered 1 to $n$, write a program to find a fairest assignment for the battleship race.

### Input

Your program is to read from standard input. The input starts with a line containing two integers, $W$ ($1 \leq W \leq 10^9$) and $n$ ($1 \leq n \leq 500{,}000$), where $W$ is the weight limit of the battleship and $n$ is the number of Joseon navy soldiers. The second line contains a sequence of $n$ weights of soldiers, ordered by the soldiers' numbers from 1 to $n$. The weights are integers between 1 and $W$, inclusively. You can assume that no single soldier weighs more than $W$.

### Output

Your program is to write to standard output. Print exactly one line which contains the minimum unfairness for the input.

The following shows sample input and output for two test cases.

| **Sample Input 1** | **Output for the Sample Input 1** |
|---|---|
| 50 3<br>10 20 30 | 400 |

| **Sample Input 2** | **Output for the Sample Input 2** |
|---|---|
| 5 4<br>1 3 1 3 | 1 |