



Oski and The Corridor of Solstices

Problem Statement

Oski is exploring the Corridor of Solstices, a legendary underground passage consisting of N ancient shrines arranged in a straight line, numbered from 1 to N . Oski starts at Shrine 1 and his goal is to safely reach the exit at Shrine N .

Each shrine i ($1 \leq i < N$) is separated from the next shrine by a dark, treacherous chasm. To safely cross from Shrine i to Shrine $i + 1$, Oski must Pharos of Helios, a special torch with fire energy which can ignite the bridge mechanism.

The chasm between Shrine i and $i + 1$ has a specific gravitational weight of A_i . To cross it, Oski must tune the energy of his torch to an Intensity Level X .

However, ancient magic places a strict condition:

- Normal Crossing: If the gravity of the chasm is smaller than or equal to the energy intensity of the torch ($A_i \leq X$), Oski can ignite the bridge mechanism and crosses smoothly. This costs him no magical stamina.
- Overloaded Leaping: If the gravity of the chasm exceeds the energy intensity of the torch ($A_i > X$), the magic cannot fully stabilize the platform. Oski is forced to perform an exhausting leap. The heavy gravity inflicts a stamina penalty equal to the absolute difference of the gravity of the current chasm and the energy intensity of the torch ($A_i - X$).

The torch itself is an ancient artifact with physical limitations: its energy intensity cannot be set higher than M ($0 \leq X \leq M$).

Oski starts his journey with a stamina of S . If his accumulated stamina penalties at any point exceed S , he will collapse from exhaustion.

Furthermore, the ruins are highly unstable. Oski is only allowed to perform at most K consecutive overloaded leaps. If he forces himself to leap more than K times in a row without a single normal crossing to rest his muscles, the strain will immediately break his body.

Oski wants to find the minimum possible integer energy intensity of the torch he needs to set before entering the corridor so that he can reach Shrine N safely.

Input Format

The first line contains three integers N , M , S , and K ($2 \leq N \leq 2 \times 10^5$; $1 \leq M \leq 10^9$; $0 \leq S \leq 10^9$; $1 \leq K \leq N$).

The second line contains $N - 1$ space-separated integers $A_1, A_2, \dots, A_{N-1}$ ($1 \leq A_i \leq 10^9$), representing the gravitational weight of each chasm.

Output Format

A single integer representing the minimum possible energy intensity of the torch Oski needs to set before entering the corridor so that he can reach Shrine N safely. If it is impossible to cross even with an infinitely powerful torch, print -1 .

Sample Input 1

```
6 50 10 2
15 30 20 12 40
```

Sample Output 1

```
30
```

Explanation of Sample 1

An initial energy intensity of 30 allows Oski to easily reach the fifth shrine for free as the gravity of the chasms do not exceed 30. At the final chasm with a gravity of 40, he is forced to make a single overloaded leap, which costs him exactly $40 - 30 = 10$ stamina.

Since this penalty matches his maximum stamina limit ($S = 10$) and he only performs 1 leap consecutively ($K = 2$), he safely exits the corridor. Lowering the intensity to 29 would make the final leap cost 11 stamina, causing him to collapse.

Sample Input 2

```
5 100 3 1
10 20 30 40
```

Sample Output 2

```
37
```

Sample Input 3

```
4 30 5 1
10 50 10
```

Sample Output 3

```
-1
```

Explanation of Sample 3

The second chasm has a massive gravitational weight of 50. Even if Oski sets his torch to its absolute maximum allowed intensity of $M = 30$, the chasm weight still exceeds the torch's capacity. This forces an overloaded leap that costs $50 - 30 = 20$ stamina. Because this single penalty heavily exceeds his maximum stamina budget ($S = 5$), Oski will collapse instantly. Since he cannot raise the torch intensity any higher, it is impossible to safely cross the corridor.