PROBLEM 5

Pairing Cards

Time and memory limits: 1 second, 256 MB

You have found an unusual deck of N cards, where N is an even integer. Each card has an integer value written on it, and the ith card has the value A_i.

Your task is to rearrange the N cards into $\frac{N}{2}$ pairs, such that each card belongs to exactly one pair. However, you are only allowed to pair two cards with values A_i and A_j if **at least one** of the following conditions holds:

- The absolute difference of their values is equal to D. That is, $|A_i - A_j| = D$.[1] Or,
- The sum of their values is equal to S. That is, $A_i + A_j = S$.

You are given the integers D and S as part of the input.

Determine whether it is possible to divide the cards into $\frac{N}{2}$ valid pairs according to the rules above.

Subtasks and constraints

Your program will be graded using many secret tests. Every test follows some rules:

- $2 \leq N \leq 200\,000$ and N is even.
- $0 \leq D, S \leq 1\,000\,000$.
- $1 \leq A_i \leq 1\,000\,000$ for all i.
- $A_i \leq A_{i+1}$ for all i. That is, the values are in ascending order.

The secret tests are divided into subtasks. Your program must correctly solve **every test** within a subtask to earn the marks for that subtask:

- For Subtask 1 (20 marks), $S = 0$ and $N \leq 1000$.
- For Subtask 2 (20 marks), $D = 0$ and $N \leq 1000$.
- For Subtask 3 (35 marks), $N \leq 1000$.
- For Subtask 4 (25 marks), no special rules apply.

Input

Your solution must read input and print output. We recommend using the solution templates (which you can find on the competition website) to help you with input and output.

The input follows a specific format:

- The 1st line contains the integers N, D and S.
- The 2nd line contains N integers describing the values on the cards. The ith of these is A_i.

Output

Your program must output `YES` if it is possible to divide the cards into $\frac{N}{2}$ valid pairs, and `NO` otherwise.

[1] The notation $|x|$ denotes the absolute value of x. The absolute value of a number is equivalent to its distance from 0. For example, $|2| = |-2| = 2$. The absolute difference between two numbers is equivalent to the distance between them. For example, the absolute difference between 3 and 7 is $|3 - 7| = |-4| = 4$.

Sample input 1

```
6 2 0
1 1 2 3 3 4
```

Sample output 1

```
YES
```

Sample input 2

```
6 2 0
1 1 3 3 5 5
```

Sample output 2

```
NO
```

Sample input 3

```
8 0 8
1 2 3 4 4 5 6 7
```

Sample output 3

```
YES
```

Sample input 4

```
4 7 8
1 3 5 8
```

Sample output 4

```
YES
```

Explanation

- In the 1st sample case, $D = 2$ and $S = 0$, meaning that each pair must either have an absolute difference of 2 or a sum of 0. You can pair the 1st and 4th cards (values 1 and 3), the 2nd and 5th cards (values 1 and 3), and the 3rd and 6th cards (values 2 and 4). All the pairs have an absolute difference of $D = 2$.
- In the 2nd sample case, it is impossible to pair the cards such that each pair either has an absolute difference of $D = 2$ or a sum of $S = 0$.
- In the 3rd sample case, you can pair the 1st and 8th cards (values 1 and 7), the 4th and 5th cards (values 4 and 4), the 2nd and 7th cards (values 2 and 6), and the 3rd and 6th cards (values 3 and 5). All the pairs have a sum of $S = 8$.
- In the 4th sample case, you can pair the 1st and 4th cards (values 1 and 8), and the 2nd and 3rd cards (values 3 and 5). The 1st pair has a difference of $D = 7$ and the 2nd pair has a sum of $S = 8$.