CMPUT 275 - Tangible Computing
Interview Problem: Pair Hunt

Description

You are doing an internship at Walmart and your supervisor wants you to write a program to find if there are pairs of products whose total cost equals a given amount T. The idea is that they want to pair up distinct products to offer a "two for T" sale where for T dollars you buy two distinct products whose individual prices add up to T. Your supervisor wants you to do an initial feasibility analysis where you need to find a pair whose total cost equals the given T. The trouble is that Walmart has a gazillion products, so your code needs to run fast.

Input

The input contains two lines, the first contains two space-separated integers n and T, where $2 \leq n \leq 250,000$ and $0 \leq T \leq 2 \cdot 10^9$. Here, n is the number of distinct items sold and T is the target price.

The next line contains n integers $p_1, p_2, \ldots, p_n$ indicating the prices of the items. These prices are distinct and satisfy $0 \leq p_1 < \ldots < p_n \leq 10^9$.

Output

Print a single line, either "YES" or "NO", responding to the question, "is there a pair (i, j) with $1 \leq i < j \leq n$ such that $p_i + p_j = T$".

Target Running Time

The target running time is $O(n)$, and there is a very natural algorithm that can solve the problem with this running time. However, we will consider any solution for full credit if the running time bound is at least as good as $O(n \log n)$.

Sample Input 1

```
8 56
1 2 7 8 34 67 89 100
```

Sample Output 1

```
NO
```

Explanation: No two prices sum to 56.

Sample Input 2

```
8 56
1 2 7 28 34 67 89 100
```

Sample Output 2

```
NO
```

Explanation: While 28+28 = 56, one cannot pair up a product with itself.

Sample Input 3

```
4 13
3 4 5 8
```

Sample Output 3

```
YES
```

Explanation: 5+8 = 13.

Sample Input 4

```
8 11
3 4 5 6 7 8 10 11
```

Sample Output 4

```
YES
```

Explanation: All of 6+5, 3+8 and 7+4 sum to 11.

Grading Comments
Despite the fact this appears similar to a morning problem, it will be graded like a weekly exercise. In particular:

- Style matters. Use appropriate comments, proper indentation, etc. Include a file header. Consult the style guide on eClass.

- You must adhere exactly to the output specification: for example, if you output in the wrong order or print extra whitespaces then you will receive a deduction. The test centre must accept the output without any presentation error.

- You were only give a few test cases in the test centre files on eClass. We will test your solution on additional test cases that adhere to the input specification.

- Partial credit may be obtained if your solution works on some inputs but not all inputs in the described range.

- Adhere closely to the submission instructions for the weekly exercise. See the eClass code submission link for details.