CSC 225 FALL 2019
ALGORITHMS AND DATA STRUCTURES I
ASSIGNMENT 3
UNIVERSITY OF VICTORIA

Alice and Bob each have an array of integers, namely A and B. A and B have the same size, say n. Alice and Bob have come up with a new definition called **"weird equality"**: two arrays A and B are **weirdly equal** to each other if **at least** one of the following four conditions is met:

1) $A = B$, meaning that the elements in the corresponding indices are the same.

If n is divisible by 2, we divide each of the arrays into 2 parts of equal size. So, A will be divided into A_1 and A_2 (from left to right). Similarly, B is divided into B_1 and B_2. Now, the following conditions are checked and if any of them is satisfied we can still say that the arrays are **weirdly equal** to each other.

2) (A_1 is weird equal to B_1) AND (A_2 is weird equal to B_2)

3) (A_1 is weird equal to B_1) AND (A_1 is weird equal to B_2)

4) (A_2 is weird equal to B_2) AND (A_2 is weird equal to B_1)

Note: if n is not divisible by 2, then conditions 2, 3, and 4 are NOT satisfied.

At the moment, Alice and Bob are thinking day and night to determine whether their arrays satisfy the weird equality or not. Write a program for them to determine this and end their pain!

Input Format

First line has and integer $1 \le n \le 10^4$. Second line has n integers $a_0, a_1, \ldots, a_{n-1}$ of array A, and the third line has n integers $b_0, b_1, \ldots, b_{n-1}$ of array B.

Constraints

$0 \le a_i \le 10^8$

$0 \le b_i \le 10^8$

Output Format

On one line print "YES" if the arrays are weird equal to each other, and "NO" if they are not. This output is case-sensitive and the quotes are just for clarity.

Sample Input 0

```
5
10 11 8 19 11
10 11 8 19 11
```

Sample Output 0

```
YES
```

Explanation 0

In this sample, condition 1 is satisfied since the two arrays are the same.

Sample Input 1

```
8
10 2 8 9 3 7 4 1
10 2 8 9 4 1 4 1
```

Sample Output 1

```
YES
```

Explanation 1

In this sample, condition 2 is satisfied in a recursive manner. In fact, A1 and B1 are the same and so they are weird equal, as well. Moreover, A2 and B2 are weird equal to each other recursively, by condition 4.

Sample Input 2

```
8
10 2 8 9 3 7 4 1
10 10 10 2 3 7 4 1
```

Sample Output 2

```
YES
```

Explanation 2

Similar to the previous sample, the two arrays are weirdly equal, recursively.

Sample Input 3

```
6
10 2 8 9 3 7
10 10 10 9 3 7
```

Sample Output 3

```
NO
```

Explanation 3

The arrays are not exactly the same so condition 1 is not satisfied. To check other conditions, we divide the array in half but none of the conditions are satisfied even recursively.

Submission
You may solve this problem using Java or Python. In either case I want one source file that can read in an input file as described above and return a `YES` or `NO`. The filename must be `weird_equality.py` or `weird_equality.java`.

Evaluation Criteria
The programming assignment will be marked out of 25, based on a combination of automated testing and human inspection. The following score ranges will apply:

Score	Description
0 – 5	Submission does not compile.
5 – 10	Compiles but incorrectly reports YES or NO.
10 – 15	Correctly reports YES or NO but not efficiently $(O(n^2)$ or worse).
15 – 25	Correctly and efficiently ($O(n \log n)$ or better?) reports YES or NO.