A. Circle Metro

time limit per test: 1 second
memory limit per test: 256 megabytes
input: standard input
output: standard output

The circle line of the Roflanpolis subway has n stations.

There are two parallel routes in the subway. The first one visits stations in order $1 \to 2 \to \ldots \to n \to 1 \to 2 \to \ldots$ (so the next stop after station x is equal to $(x+1)$ if $x < n$ and 1 otherwise). The second route visits stations in order $n \to (n-1) \to \ldots \to 1 \to n \to (n-1) \to \ldots$ (so the next stop after station x is equal to $(x-1)$ if $x > 1$ and n otherwise). All trains depart their stations simultaneously, and it takes exactly 1 minute to arrive at the next station.

Two toads live in this city, their names are Daniel and Vlad.

Daniel is currently in a train of the **first** route at station a and will exit the subway when his train reaches station x.

Coincidentally, Vlad is currently in a train of the **second** route at station b and he will exit the subway when his train reaches station y.

Surprisingly, all numbers a, x, b, y are distinct.

Toad Ilya asks you to check if Daniel and Vlad will ever be at the same station at the same time during their journey. In other words, check if there is a moment when their trains stop at the same station. Note that this includes the moments when Daniel or Vlad enter or leave the subway.

Input

The first line contains five space-separated integers n, a, x, b, y ($4 \le n \le 100$, $1 \le a, x, b, y \le n$, all numbers among a, x, b, y are distinct) — the number of stations in Roflanpolis, Daniel's start station, Daniel's finish station, Vlad's start station and Vlad's finish station, respectively.

Output

Output "YES" if there is a time moment when Vlad and Daniel are at the same station, and "NO" otherwise. You can print each letter in any case (upper or lower).

Examples

input
```
5 1 4 3 2
```
output
```
YES
```

input
```
10 2 1 9 10
```
output
```
NO
```

Note

In the first example, Daniel and Vlad start at the stations $(1, 3)$. One minute later they are at stations $(2, 2)$. They are at the same station at this moment. Note that Vlad leaves the subway right after that.

Consider the second example, let's look at the stations Vlad and Daniel are at. They are:

- initially $(2, 9)$,
- after 1 minute $(3, 8)$,
- after 2 minutes $(4, 7)$,
- after 3 minutes $(5, 6)$,
- after 4 minutes $(6, 5)$,
- after 5 minutes $(7, 4)$,
- after 6 minutes $(8, 3)$,
- after 7 minutes $(9, 2)$,
- after 8 minutes $(10, 1)$,
- after 9 minutes $(1, 10)$.

After that, they both leave the subway because they are at their finish stations, so there is no moment when they both are at the same station.

B. Pairs

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Toad Ivan has m pairs of integers, each integer is between 1 and n, inclusive. The pairs are $(a_1, b_1), (a_2, b_2), \ldots, (a_m, b_m)$.

He asks you to check if there exist two integers x and y ($1 \leq x < y \leq n$) such that in each given pair at least one integer is equal to x or y.

Input

The first line contains two space-separated integers n and m ($2 \leq n \leq 300\,000$, $1 \leq m \leq 300\,000$) — the upper bound on the values of integers in the pairs, and the number of given pairs.

The next m lines contain two integers each, the i-th of them contains two space-separated integers a_i and b_i ($1 \leq a_i, b_i \leq n, a_i \neq b_i$) — the integers in the i-th pair.

Output

Output "YES" if there exist two integers x and y ($1 \leq x < y \leq n$) such that in each given pair at least one integer is equal to x or y. Otherwise, print "NO". You can print each letter in any case (upper or lower).

Examples

input

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

output

```
NO
```

input

```
5 4
1 2
2 3
3 4
4 5
```

output

```
YES
```

input

```
300000 5
1 2
1 2
1 2
1 2
1 2
```

output

```
YES
```

Note

In the first example, you can't choose any x, y because for each such pair you can find a given pair where both numbers are different from chosen integers.

In the second example, you can choose $x = 2$ and $y = 4$.

In the third example, you can choose $x = 1$ and $y = 2$.

C. Increasing by Modulo

time limit per test: 2.5 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Toad Zitz has an array of integers, each integer is between 0 and $m - 1$ inclusive. The integers are $a_1, a_2, \ldots, a_n$.

In one operation Zitz can choose an integer k and k indices $i_1, i_2, \ldots, i_k$ such that $1 \leq i_1 < i_2 < \ldots < i_k \leq n$. He should then change a_{i_j} to $((a_{i_j}+1) \bmod m)$ for each chosen integer i_j. The integer m is fixed for all operations and indices.

Here $x \bmod y$ denotes the remainder of the division of x by y.

Zitz wants to make his array non-decreasing with the minimum number of such operations. Find this minimum number of operations.

Input

The first line contains two integers n and m ($1 \le n, m \le 300\,000$) — the number of integers in the array and the parameter m.

The next line contains n space-separated integers $a_1, a_2, \ldots, a_n$ ($0 \le a_i < m$) — the given array.

Output

Output one integer: the minimum number of described operations Zitz needs to make his array non-decreasing. If no operations required, print 0.

It is easy to see that with enough operations Zitz can always make his array non-decreasing.

Examples

input

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

output

```
0
```

input

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

output

```
1
```

Note

In the first example, the array is already non-decreasing, so the answer is 0.

In the second example, you can choose $k=2$, $i_1 = 2$, $i_2 = 5$, the array becomes $[0, 0, 1, 3, 3]$. It is non-decreasing, so the answer is 1.

D. Good Triple

time limit per test: 4 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Toad Rash has a binary string s. A binary string consists only of zeros and ones.

Let n be the length of s.

Rash needs to find the number of such pairs of integers l, r that $1 \le l \le r \le n$ and there is at least one pair of integers x, k such that $1 \le x, k \le n$, $l \le x < x + 2k \le r$, and $s_x = s_{x+k} = s_{x+2k}$.

Find this number of pairs for Rash.

Input

The first line contains the string s ($1 \le |s| \le 300\,000$), consisting of zeros and ones.

Output

Output one integer: the number of such pairs of integers l, r that $1 \le l \le r \le n$ and there is at least one pair of integers x, k such that $1 \le x, k \le n$, $l \le x < x + 2k \le r$, and $s_x = s_{x+k} = s_{x+2k}$.

Examples

input

```
010101
```

output

```
3
```

input

```
11001100
```

output

```
0
```

Note

In the first example, there are three l, r pairs we need to count: 1, 6; 2, 6; and 1, 5.

In the second example, there are no values x, k for the initial string, so the answer is 0.

E. And Reachability

time limit per test: 3 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Toad Pimple has an array of integers $a_1, a_2, \ldots, a_n$.

We say that y is reachable from x if $x < y$ and there exists an integer array p such that $x = p_1 < p_2 < \ldots < p_k = y$, and $a_{p_i} \, \& \, a_{p_{i+1}} > 0$ for all integers i such that $1 \leq i < k$.

Here $\&$ denotes the bitwise AND operation.

You are given q pairs of indices, check reachability for each of them.

Input

The first line contains two integers n and q ($2 \leq n \leq 300\,000$, $1 \leq q \leq 300\,000$) — the number of integers in the array and the number of queries you need to answer.

The second line contains n space-separated integers $a_1, a_2, \ldots, a_n$ ($0 \leq a_i \leq 300\,000$) — the given array.

The next q lines contain two integers each. The i-th of them contains two space-separated integers x_i and y_i ($1 \leq x_i < y_i \leq n$). You need to check if y_i is reachable from x_i.

Output

Output q lines. In the i-th of them print "Shi" if y_i is reachable from x_i, otherwise, print "Fou".

Example

input

```
5 3
1 3 0 2 1
1 3
2 4
1 4
```

output

```
Fou
Shi
Shi
```

Note

In the first example, $a_3 = 0$. You can't reach it, because AND with it is always zero. $a_2 \, \& \, a_4 > 0$, so 4 is reachable from 2, and to go from 1 to 4 you can use $p = [1, 2, 4]$.