A. In Search of an Easy Problem

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

When preparing a tournament, Codeforces coordinators try treir best to make the first problem as easy as possible. This time the coordinator had chosen some problem and asked n people about their opinions. Each person answered whether this problem is easy or hard.

If at least one of these n people has answered that the problem is hard, the coordinator decides to change the problem. For the given responses, check if the problem is easy enough.

Input

The first line contains a single integer n ($1 \le n \le 100$) — the number of people who were asked to give their opinions.

The second line contains n integers, each integer is either 0 or 1. If i-th integer is 0, then i-th person thinks that the problem is easy; if it is 1, then i-th person thinks that the problem is hard.

Output

Print one word: "EASY" if the problem is easy according to all responses, or "HARD" if there is at least one person who thinks the problem is hard.

You may print every letter in any register: "EASY", "easy", "EaSY" and "eAsY" all will be processed correctly.

Examples

input

```
3
0 0 1
```

output

```
HARD
```

input

```
1
0
```

output

```
EASY
```

Note

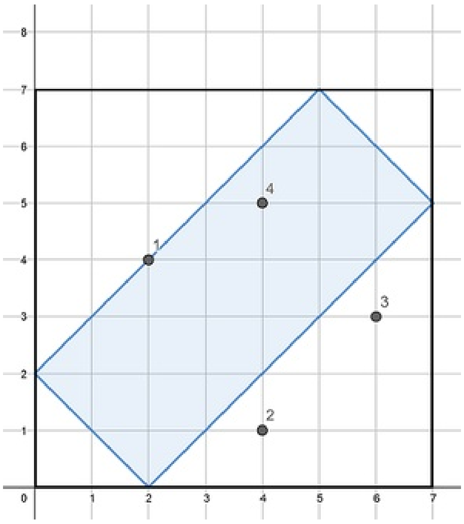
In the first example the third person says it's a hard problem, so it should be replaced.

In the second example the problem easy for the only person, so it doesn't have to be replaced.

B. Vasya and Cornfield

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

Vasya owns a cornfield which can be defined with two integers n and d. The cornfield can be represented as rectangle with vertices having Cartesian coordinates $(0, d), (d, 0), (n, n - d)$ and $(n - d, n)$.



An example of a cornfield with $n = 7$ and $d = 2$.

Vasya also knows that there are m grasshoppers near the field (maybe even inside it). The i-th grasshopper is at the point (x_i, y_i). Vasya does not like when grasshoppers eat his corn, so for each grasshopper he wants to know whether its position is inside the cornfield (including the border) or outside.

Help Vasya! For each grasshopper determine if it is inside the field (including the border).

Input

The first line contains two integers n and d ($1 \le d < n \le 100$).

The second line contains a single integer m ($1 \le m \le 100$) — the number of grasshoppers.

The i-th of the next m lines contains two integers x_i and y_i ($0 \le x_i, y_i \le n$) — position of the i-th grasshopper.

Output

Print m lines. The i-th line should contain "YES" if the position of the i-th grasshopper lies inside or on the border of the cornfield. Otherwise the i-th line should contain "NO".

You can print each letter in any case (upper or lower).

Examples

input

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

output

```
YES
NO
NO
YES
```

input

```
8 7
4
4 4
2 8
8 1
6 1
```

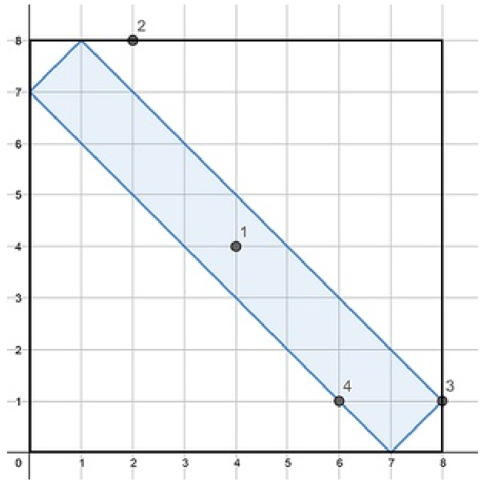
output

```
YES
NO
YES
YES
```

Note

The cornfield from the first example is pictured above. Grasshoppers with indices 1 (coordinates $(2, 4)$) and 4 (coordinates $(4, 5)$) are inside the cornfield.

The cornfield from the second example is pictured below. Grasshoppers with indices 1 (coordinates $(4, 4)$), 3 (coordinates $(8, 1)$) and 4 (coordinates $(6, 1)$) are inside the cornfield.



C. Vasya and Golden Ticket

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

Recently Vasya found a golden ticket — a sequence which consists of n digits $a_1 a_2 \ldots a_n$. Vasya considers a ticket to be lucky if it can be divided into two or more non-intersecting segments with equal sums. For example, ticket 350178 is lucky since it can be divided into three segments 350, 17 and 8: $3+5+0=1+7=8$. Note that each digit of sequence should belong to **exactly** one segment.

Help Vasya! Tell him if the golden ticket he found is lucky or not.

Input

The first line contains one integer n ($2 \le n \le 100$) — the number of digits in the ticket.

The second line contains n digits $a_1 a_2 \ldots a_n$ ($0 \le a_i \le 9$) — the golden ticket. Digits are printed without spaces.

Output

If the golden ticket is lucky then print "YES", otherwise print "NO" (both case insensitive).

Examples

input

```
5
73452
```

output

```
YES
```

input

```
4
1248
```

output

```
NO
```

Note

In the first example the ticket can be divided into 7, 34 and 52: $7=3+4=5+2$.

In the second example it is impossible to divide ticket into segments with equal sum.

D. Vasya and Triangle

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

Vasya has got three integers n, m and k. He'd like to find three integer points (x_1, y_1), (x_2, y_2), (x_3, y_3), such that $0 \le x_1, x_2, x_3 \le n$, $0 \le y_1, y_2, y_3 \le m$ and the area of the triangle formed by these points is equal to $\frac{nm}{k}$.

Help Vasya! Find such points (if it's possible). If there are multiple solutions, print any of them.

Input

The single line contains three integers n, m, k ($1 \le n, m \le 10^9$, $2 \le k \le 10^9$).

Output

If there are no such points, print "NO".

Otherwise print "YES" in the first line. The next three lines should contain integers x_i, y_i — coordinates of the points, one point per line. If there are multiple solutions, print any of them.

You can print each letter in any case (upper or lower).

Examples

input

```
4 3 3
```

output

```
YES
1 0
2 3
4 1
```

input

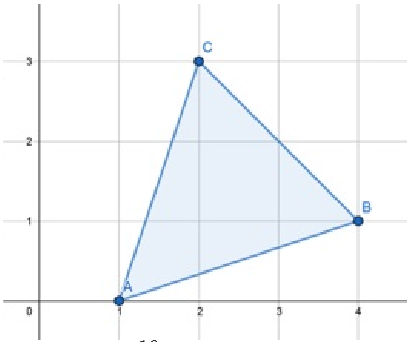
```
4 4 7
```

output

```
NO
```

Note

In the first example area of the triangle should be equal to $\frac{nm}{k} = 4$. The triangle mentioned in the output is pictured below:



In the second example there is no triangle with area $\frac{nm}{k} = \frac{16}{7}$.

E. Vasya and Good Sequences

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

Vasya has a sequence a consisting of n integers $a_1, a_2, \dots, a_n$. Vasya may pefrom the following operation: choose some number from the sequence and swap any pair of bits in its binary representation. For example, Vasya can transform number 6 $(\dots 00000000110_2)$ into 3 $(\dots 00000000011_2)$, 12 $(\dots 000000001100_2)$, 1026 $(\dots 10000000010_2)$ and many others. Vasya can use this operation any (possibly zero) number of times on any number from the sequence.

Vasya names a sequence as *good* one, if, using operation mentioned above, he can obtain the sequence with bitwise exclusive or of all elements equal to 0.

For the given sequence $a_1, a_2, \ldots, a_n$ Vasya'd like to calculate number of integer pairs (l, r) such that $1 \le l \le r \le n$ and sequence $a_l, a_{l+1}, \dots, a_r$ is good.

Input

The first line contains a single integer n $(1 \le n \le 3 \cdot 10^5)$ — length of the sequence.

The second line contains n integers $a_1, a_2, \dots, a_n$ $(1 \le a_i \le 10^{18})$ — the sequence a.

Output

Print one integer — the number of pairs (l, r) such that $1 \le l \le r \le n$ and the sequence $a_l, a_{l+1}, \dots, a_r$ is good.

Examples

input

```
3
6 7 14
```

output

```
2
```

input

```
4
1 2 1 16
```

output

```
4
```

Note

In the first example pairs $(2,3)$ and $(1,3)$ are valid. Pair $(2,3)$ is valid since $a_2 = 7 \to 11$, $a_3 = 14 \to 11$ and $11 \oplus 11 = 0$, where $\oplus$ — bitwise exclusive or. Pair $(1,3)$ is valid since $a_1 = 6 \to 3$, $a_2 = 7 \to 13$, $a_3 = 14 \to 14$ and $3 \oplus 13 \oplus 14 = 0$.

In the second example pairs $(1,2)$, $(2,3)$, $(3,4)$ and $(1,4)$ are valid.

F. Putting Boxes Together

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

There is an infinite line consisting of cells. There are n boxes in some cells of this line. The i-th box stands in the cell a_i and has weight w_i. All a_i are distinct, moreover, $a_{i-1} < a_i$ holds for all valid i.

You would like to put together some boxes. Putting together boxes with *indices* in the segment $[l, r]$ means that you will move some of them in such a way that their *positions* will form some segment $[x, x + (r - l)]$.

In one step you can move any box to a neighboring cell if it isn't occupied by another box (i.e. you can choose i and change a_i by 1, all positions should remain distinct). You spend w_i units of energy moving the box i by one cell. You can move any box any number of times, in arbitrary order.

Sometimes weights of some boxes change, so you have queries of two types:

1. id nw — weight w_{id} of the box id becomes nw.
2. l r — you should compute the minimum total energy needed to put together boxes with indices in $[l, r]$. Since the answer can be rather big, print the remainder it gives when divided by $1000\,000\,007 = 10^9 + 7$. Note that the boxes are not moved during the query, you only should compute the answer.

Note that you should minimize the answer, not its remainder modulo $10^9 + 7$. So if you have two possible answers $2 \cdot 10^9 + 13$ and $2 \cdot 10^9 + 14$, you should choose the first one and print $10^9 + 6$, even though the remainder of the second answer is 0.

Input

The first line contains two integers n and q ($1 \le n, q \le 2 \cdot 10^5$) — the number of boxes and the number of queries.

The second line contains n integers $a_1, a_2, \dots a_n$ ($1 \le a_i \le 10^9$) — the positions of the boxes. All a_i are distinct, $a_{i-1} < a_i$ holds for all valid i.

The third line contains n integers $w_1, w_2, \dots w_n$ ($1 \le w_i \le 10^9$) — the initial weights of the boxes.

Next q lines describe queries, one query per line.

Each query is described in a single line, containing two integers x and y. If $x < 0$, then this query is of the first type, where $id = -x$, $nw = y$ ($1 \le id \le n$, $1 \le nw \le 10^9$). If $x > 0$, then the query is of the second type, where $l = x$ and $r = y$ ($1 \le l_j \le r_j \le n$). x can not be equal to 0.

Output

For each query of the second type print the answer on a separate line. Since answer can be large, print the remainder it gives when divided by $1000\,000\,007 = 10^9 + 7$.

Example

input

```
5 8
1 2 6 7 10
1 1 1 1 2
1 1
1 5
1 3
3 5
-3 5
-1 10
1 4
2 5
```

output

```
0
10
3
4
18
```

```
7
```

Note

Let's go through queries of the example:

1. $1\ 1$ — there is only one box so we don't need to move anything.
2. $1\ 5$ — we can move boxes to segment $[4, 8]$: $1 \cdot |1 - 4| + 1 \cdot |2 - 5| + 1 \cdot |6 - 6| + 1 \cdot |7 - 7| + 2 \cdot |10 - 8| = 10$.
3. $1\ 3$ — we can move boxes to segment $[1, 3]$.
4. $3\ 5$ — we can move boxes to segment $[7, 9]$.
5. $-3\ 5$ — w_3 is changed from 1 to 5.
6. $-1\ 10$ — w_1 is changed from 1 to 10. The weights are now equal to $w = [10, 1, 5, 1, 2]$.
7. $1\ 4$ — we can move boxes to segment $[1, 4]$.
8. $2\ 5$ — we can move boxes to segment $[5, 8]$.

G. Linear Congruential Generator

time limit per test: 2 seconds
memory limit per test: 512 megabytes
input: standard input
output: standard output

You are given a tuple generator $f^{(k)} = (f_1^{(k)}, f_2^{(k)}, \dots, f_n^{(k)})$, where $f_i^{(k)} = (a_i \cdot f_i^{(k-1)} + b_i) \bmod p_i$ and $f^{(0)} = (x_1, x_2, \dots, x_n)$. Here $x \bmod y$ denotes the remainder of x when divided by y. All p_i are primes.

One can see that with fixed sequences x_i, y_i, a_i the tuples $f^{(k)}$ starting from some index will repeat tuples with smaller indices. Calculate the maximum number of different tuples (from all $f^{(k)}$ for $k \geq 0$) that can be produced by this generator, if x_i, a_i, b_i are integers in the range $[0, p_i - 1]$ and can be chosen arbitrary. The answer can be large, so print the remainder it gives when divided by $10^9 + 7$

Input

The first line contains one integer n ($1 \leq n \leq 2 \cdot 10^5$) — the number of elements in the tuple.

The second line contains n space separated prime numbers — the modules $p_1, p_2, \dots, p_n$ ($2 \leq p_i \leq 2 \cdot 10^6$).

Output

Print one integer — the maximum number of different tuples modulo $10^9 + 7$.

Examples

input
```
4
2 3 5 7
```
output
```
210
```

input
```
3
5 3 3
```
output
```
30
```

Note

In the first example we can choose next parameters: $a = [1, 1, 1, 1]$, $b = [1, 1, 1, 1]$, $x = [0, 0, 0, 0]$, then $f_i^{(k)} = k \bmod p_i$.

In the second example we can choose next parameters: $a = [1, 1, 2]$, $b = [1, 1, 0]$, $x = [0, 0, 1]$.