Programación Competitiva

Semana i (2018) – Contest #1

Problema 1 - Alternating Sum

You are given two integers a and b. Moreover, you are given a sequence $s_0, s_1, \ldots, s_n$. All values in s are integers 1 or -1. It's known that sequence is k-periodic and k divides $n+1$. In other words, for each $k \le i \le n$ it's satisfied that $s_i = s_{i-k}$.

Find out the non-negative remainder of division of $\sum_{i=0}^{n} s_i a^{n-i} b^i$ by 10^9+9.

Note that the modulo is unusual!

Input

The first line contains four integers n, a, b and k $(1 \le n \le 10^9, 1 \le a, b \le 10^9, 1 \le k \le 10^5)$.

The second line contains a sequence of length k consisting of characters '+' and '-'.

If the i-th character (0-indexed) is '+', then $s_i = 1$, otherwise $s_i = -1$.

Note that only the first k

members of the sequence are given, the rest can be obtained using the periodicity property.

Output

Output a single integer — value of given expression modulo 10^9+9.

Examples

Input
```
2 2 3 3
+-+
```
Output
```
7
```

Input
```
4 1 5 1
-
```
Output
```
999999228
```

Note

In the first example:

$(\sum_{i=0}^{n} s_i a^{n-i} b^i) = 2^2 3^0 - 2^1 3^1 + 2^0 3^2 = 7$

In the second example:

$(\sum_{i=0}^{n} s_i a^{n-i} b^i) = -1^4 5^0 - 1^3 5^1 - 1^2 5^2 - 1^1 5^3 - 1^0 5^4 = -781 \equiv 999999228 \pmod{10^9+9}$.

Problema 2 - Cutting Rectangle

A rectangle with sides A and B is cut into rectangles with cuts parallel to its sides. For example, if p horizontal and q vertical cuts were made, $(p+1)\cdot(q+1)$ rectangles were left after the cutting. After the cutting, rectangles were of n different types. Two rectangles are different if at least one side of one rectangle isn't equal to the corresponding side of the other. Note that the rectangle can't be rotated, this means that rectangles $a\times b$ and $b\times a$ are considered different if $a\neq b$.

For each type of rectangles, lengths of the sides of rectangles are given along with the amount of the rectangles of this type that were left after cutting the initial rectangle.

Calculate the amount of pairs $(A;B)$ such as the given rectangles could be created by cutting the rectangle with sides of lengths A and B. Note that pairs $(A;B)$ and $(B;A)$ are considered different when $A\neq B$.

Input

The first line consists of a single integer n $(1\leq n\leq 2\cdot 10^5)$ — amount of different types of rectangles left after cutting the initial rectangle.

The next n lines each consist of three integers w_i,h_i,c_i $(1\leq w_i,h_i,c_i\leq 10^{12})$ — the lengths of the sides of the rectangles of this type and the amount of the rectangles of this type.

It is guaranteed that the rectangles of the different types are different.

Output

Output one integer — the answer to the problem.

Examples

Input
```
1
1 1 9
```
Output
```
3
```

Input
```
2
2 3 20
2 4 40
```
Output
```
6
```

Input
```
2
1 2 5
2 3 5
```
Output
```
0
```

Problema 3 - Weird Subtraction Process

You have two variables a and b. Consider the following sequence of actions performed with these variables:

1. If $a = 0$ or $b = 0$, end the process. Otherwise, go to step 2;
2. If $a \geq 2 \cdot b$, then set the value of a to $a - 2 \cdot b$, and repeat step 1. Otherwise, go to step 3;
3. If $b \geq 2 \cdot a$, then set the value of b to $b - 2 \cdot a$, and repeat step 1. Otherwise, end the process.

Initially the values of a and b are positive integers, and so the process will be finite.

You have to determine the values of a and b after the process ends.

Input

The only line of the input contains two integers n and m ($1 \leq n, m \leq 10^{18}$). n is the initial value of variable a, and m is the initial value of variable b.

Output

Print two integers — the values of a and b after the end of the process.

Examples

Input
```
12 5
```
Output
```
0 1
```

Input
```
31 12
```
Output
```
7 12
```

Note

Explanations to the samples:

1. $a = 12, b = 5 \longrightarrow a = 2, b = 5 \longrightarrow a = 2, b = 1 \longrightarrow a = 0, b = 1$;
2. $a = 31, b = 12 \longrightarrow a = 7, b = 12$.

Problema 4 - Primal Sport

Alice and Bob begin their day with a quick game. They first choose a starting number $X_0 \geq 3$ and try to reach one million by the process described below.
Alice goes first and then they take alternating turns. In the i-th turn, the player whose turn it is selects a prime number smaller than the current number, and announces the smallest multiple of this prime number that is not smaller than the current number.
Formally, he or she selects a prime $p < X_{i-1}$ and then finds the minimum $X_i \geq X_{i-1}$ such that p divides X_i. Note that if the selected prime p already divides X_{i-1}, then the number does not change.
Eve has witnessed the state of the game after two turns. Given X_2, help her determine what is the smallest possible starting number X_0. Note that the players don't necessarily play optimally. You should consider all possible game evolutions.

Input

The input contains a single integer X_2 ($4 \leq X_2 \leq 10^6$). It is guaranteed that the integer X_2 is composite, that is, is not prime.

Output

Output a single integer — the minimum possible X_0.

Examples

Input
```
14
```
Output
```
6
```

Input
```
20
```
Output
```
15
```

Input
```
8192
```
Output
```
8191
```

Note
In the first test, the smallest possible starting number is $X_0 = 6$. One possible course of the game is as follows:

- Alice picks prime 5 and announces $X_1 = 10$
- Bob picks prime 7 and announces $X_2 = 14$.

In the second case, let $X_0 = 15$.

- Alice picks prime 2 and announces $X_1 = 16$
- Bob picks prime 5 and announces $X_2 = 20$.

Problema 5 - Odds and Ends

Where do odds begin, and where do they end? Where does hope emerge, and will they ever break?

Given an integer sequence $a_1, a_2, ..., a_n$ of length n. Decide whether it is possible to divide it into an odd number of non-empty subsegments, the each of which has an odd length and begins and ends with odd numbers.

A subsegment is a contiguous slice of the whole sequence. For example, $\{3, 4, 5\}$ and $\{1\}$ are subsegments of sequence $\{1, 2, 3, 4, 5, 6\}$, while $\{1, 2, 4\}$ and $\{7\}$ are not.

Input

The first line of input contains a non-negative integer n $(1 \le n \le 100)$ — the length of the sequence.

The second line contains n space-separated non-negative integers $a_1, a_2, ..., a_n$ $(0 \le a_i \le 100)$ — the elements of the sequence.

Output

Output "Yes" if it's possible to fulfill the requirements, and "No" otherwise.

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

Examples

Input
```
3
1 3 5
```
Output
```
Yes
```

Input
```
5
1 0 1 5 1
```
Output
```
Yes
```

Input
```
3
4 3 1
```
Output
```
No
```

Input
```
4
3 9 9 3
```
Output
```
No
```

Programación Competitiva

Semana i (2018) – Contest #1

Problema 6 - Key races

Two boys decided to compete in text typing on the site "Key races". During the competition, they have to type a text consisting of s characters. The first participant types one character in v_1 milliseconds and has ping t_1 milliseconds. The second participant types one character in v_2 milliseconds and has ping t_2 milliseconds.

If connection ping (delay) is t milliseconds, the competition passes for a participant as follows:

1. Exactly after t milliseconds after the start of the competition the participant receives the text to be entered.
2. Right after that he starts to type it.
3. Exactly t milliseconds after he ends typing all the text, the site receives information about it.

The winner is the participant whose information on the success comes earlier. If the information comes from both participants at the same time, it is considered that there is a draw.

Given the length of the text and the information about participants, determine the result of the game.

Input

The first line contains five integers s, v_1, v_2, t_1, t_2 ($1 \le s, v_1, v_2, t_1, t_2 \le 1000$) — the number of characters in the text, the time of typing one character for the first participant, the time of typing one character for the the second participant, the ping of the first participant and the ping of the second participant.

Output

If the first participant wins, print "First". If the second participant wins, print "Second". In case of a draw print "Friendship".

Examples

Input
```
5 1 2 1 2
```
Output
```
First
```

Input
```
3 3 1 1 1
```
Output
```
Second
```

Input
```
4 5 3 1 5
```
Output
```
Friendship
```

Programación Competitiva

Semana i (2018) – Contest #1

Problema 7 - The number on the board

Some natural number was written on the board. Its sum of digits was not less than k. But you were distracted a bit, and someone changed this number to n, replacing some digits with others. It's known that the length of the number didn't change.

You have to find the minimum number of digits in which these two numbers can differ.

Input

The first line contains integer k ($1 \leq k \leq 10^9$).

The second line contains integer n ($1 \leq n < 10^{100000}$).

There are no leading zeros in n. It's guaranteed that this situation is possible.

Output

Print the minimum number of digits in which the initial number and n can differ.

Examples

Input
```
3
11
```
Output
```
1
```

Input
```
3
99
```
Output
```
0
```

Note

In the first example, the initial number could be 12.

In the second example the sum of the digits of n is not less than k. The initial number could be equal to n.

Problema 8 - Unimodal Array

Array of integers is unimodal, if:

- it is strictly increasing in the beginning;
- after that it is constant;
- after that it is strictly decreasing.

The first block (increasing) and the last block (decreasing) may be absent. It is allowed that both of this blocks are absent.

For example, the following three arrays are unimodal: [5, 7, 11, 11, 2, 1], [4, 4, 2], [7], but the following three are not unimodal: [5, 5, 6, 6, 1], [1, 2, 1, 2], [4, 5, 5, 6].

Write a program that checks if an array is unimodal.

Input

The first line contains integer n ($1 \le n \le 100$) — the number of elements in the array.

The second line contains n integers $a_1, a_2, ..., a_n$ ($1 \le a_i \le 1\,000$) — the elements of the array.

Output

Print "YES" if the given array is unimodal. Otherwise, print "NO".

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

Examples

Input
```
6
1 5 5 5 4 2
```
Output
```
YES
```

Input
```
5
10 20 30 20 10
```
Output
```
YES
```

Input
```
4
1 2 1 2
```
Output
```
NO
```

Input

```
7
3 3 3 3 3 3 3
```

Output

```
YES
```

Note

In the first example the array is unimodal, because it is strictly increasing in the beginning (from position 1 to position 2, inclusively), that it is constant (from position 2 to position 4, inclusively) and then it is strictly decreasing (from position 4 to position 6, inclusively).