Tinkoff Internship Warmup Round 2018 and Codeforces Round #475 (Div. 2)

A. Splits

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

Let's define a split of $$$n$$$ as a nonincreasing sequence of positive integers, the sum of which is $$$n$$$.

For example, the following sequences are splits of $$$8$$$: $$$[4, 4]$$$, $$$[3, 3, 2]$$$, $$$[2, 2, 1, 1, 1, 1]$$$, $$$[5, 2, 1]$$$.

The following sequences aren't splits of $$$8$$$: $$$[1, 7]$$$, $$$[5, 4]$$$, $$$[11, -3]$$$, $$$[1, 1, 4, 1, 1]$$$.

The weight of a split is the number of elements in the split that are equal to the first element. For example, the weight of the split $$$[1, 1, 1, 1, 1]$$$ is $$$5$$$, the weight of the split $$$[5, 5, 3, 3, 3]$$$ is $$$2$$$ and the weight of the split $$$[9]$$$ equals $$$1$$$.

For a given $$$n$$$, find out the number of different weights of its splits.

Input

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

Output

Output one integer — the answer to the problem.

Examples

input
```
7
```
output
```
4
```

input
```
8
```
output
```
5
```

input
```
9
```
output
```
5
```

Note

In the first sample, there are following possible weights of splits of $$$7$$$:

Weight 1: [$$$\textbf 7$$$]

Weight 2: [$$$\textbf 3$$$, $$$\textbf 3$$$, 1]

Weight 3: [$$$\textbf 2$$$, $$$\textbf 2$$$, $$$\textbf 2$$$, 1]

Weight 7: [$$$\textbf 1$$$, $$$\textbf 1$$$, $$$\textbf 1$$$, $$$\textbf 1$$$, $$$\textbf 1$$$, $$$\textbf 1$$$, $$$\textbf 1$$$]

B. Messages

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

There are n incoming messages for Vasya. The i-th message is going to be received after t_i minutes. Each message has a cost, which equals to A initially. After being received, the cost of a message decreases by B each minute (it can become negative). Vasya can read any message after receiving it at any moment of time. After reading the message, Vasya's bank account receives the current cost of this message. Initially, Vasya's bank account is at 0.

Also, each minute Vasya's bank account receives $C \cdot k$, where k is the amount of received but unread messages.

Vasya's messages are very important to him, and because of that he wants to have all messages read after T minutes.

Determine the maximum amount of money Vasya's bank account can hold after T minutes.

Input

The first line contains five integers n, A, B, C and T ($1 \le n, A, B, C, T \le 1000$).

The second string contains n integers t_i ($1 \le t_i \le T$).

Output

Output one integer — the answer to the problem.

Examples

input
```
4 5 5 3 5
1 5 5 4
```
output
```
20
```

input
```
5 3 1 1 3
2 2 2 1 1
```
output
```
15
```

input
```
5 5 3 4 5
1 2 3 4 5
```
output
```
35
```

Note

In the first sample the messages must be read immediately after receiving, Vasya receives A points for each message, $n \cdot A = 20$ in total.

In the second sample the messages can be read at any integer moment.

In the third sample messages must be read at the moment T. This way Vasya has $1, 2, 3, 4$ and 0 unread messages at the corresponding minutes, he gets 40 points for them. When reading messages, he receives $(5 - 4 \cdot 3) + (5 - 3 \cdot 3) + (5 - 2 \cdot 3) + (5 - 1 \cdot 3) + 5 = -5$ points. This is 35 in total.

C. Alternating Sum

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

You are given two integers a and b. Moreover, you are given a sequence $s_0, s_1, \dots, s_{n}$. 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 $k \leq i \leq n$ it's satisfied that $s_{i} = s_{i - k}$.

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

Note that the modulo is unusual!

Input

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

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:

$$$(\sum \limits_{i=0}^{n} s_{i} a^{n - i} b^{i})$$$ = $$$2^{2} 3^{0} - 2^{1} 3^{1} + 2^{0} 3^{2}$$$ = 7

In the second example:

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

D. Destruction of a Tree

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

You are given a tree (a graph with n vertices and $n - 1$ edges in which it's possible to reach any vertex from any other vertex using only its edges).

A vertex can be destroyed if this vertex has even degree. If you destroy a vertex, all edges connected to it are also deleted.

Destroy all vertices in the given tree or determine that it is impossible.

Input

The first line contains integer n $(1 \leq n \leq 2 \cdot 10^5)$ — number of vertices in a tree.

The second line contains n integers $p_1, p_2, \ldots, p_n$ $(0 \leq p_i \leq n)$. If $p_i \neq 0$ there is an edge between vertices i and p_i. It is guaranteed that the given graph is a tree.

Output

If it's possible to destroy all vertices, print "YES" (without quotes), otherwise print "NO" (without quotes).

If it's possible to destroy all vertices, in the next n lines print the indices of the vertices in order you destroy them. If there are multiple correct answers, print any.

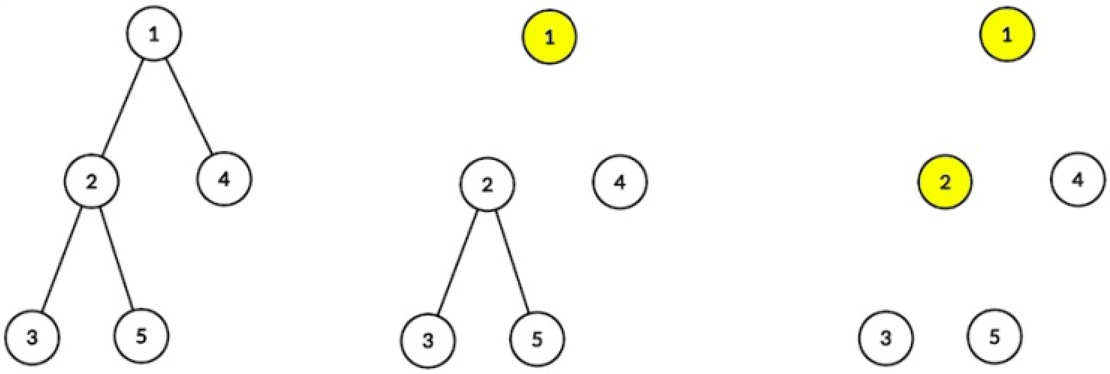
Examples

input
5 0 1 2 1 2
output
YES 1 2 3 5 4

input
4 0 1 2 3
output
NO

Note

In the first example at first you have to remove the vertex with index 1 (after that, the edges (1, 2) and (1, 4) are removed), then the vertex with index 2 (and edges (2, 3) and (2, 5) are removed). After that there are no edges in the tree, so you can remove remaining vertices in any order.



E. Cutting Rectangle

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

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
```

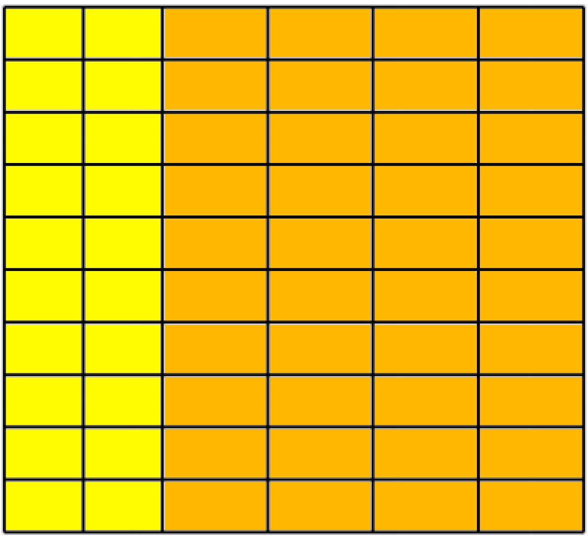
input
```
2
1 2 5
2 3 5
```
output
```
0
```

Note

In the first sample there are three suitable pairs: $(1; 9)$, $(3; 3)$ and $(9; 1)$.

In the second sample case there are 6 suitable pairs: $(2; 220)$, $(4; 110)$, $(8; 55)$, $(10; 44)$, $(20; 22)$ and $(40; 11)$.

Here the sample of cut for $(20; 22)$.



The third sample has no suitable pairs.