A - Doors in the Center

Time Limit: 2 sec / Memory Limit: 1024 MiB

Score : 100 points

Problem Statement

Find a length-N string that satisfies all of the following conditions:

- Each character is - or =.
- It is a palindrome.
- It contains exactly one or exactly two =s. If it contains two =s, they are adjacent.

Such a string is unique.

Constraints

- $1 \leq N \leq 100$
- N is an integer.

Input

The input is given from Standard Input in the following format:

```
N
```

Output

Print the answer.

Sample Input 1

```
4
```

Sample Output 1

```
-==-
```

Sample Input 2

```
7
```

Sample Output 2

```
---=---
```

B - Full House 3

Time Limit: 2 sec / Memory Limit: 1024 MiB

Score : 250 points

Problem Statement

We have seven cards. The i-th card $(i = 1, \ldots, 7)$ has an integer A_i written on it.
Determine whether it is possible to choose five of them so that the chosen cards form a full house.

A set of five cards is called a full house if and only if the following conditions are satisfied:

- For different integers x and y, there are three cards with x and two cards with y.

Constraints

- A_i is an integer between 1 and 13, inclusive.

Input

The input is given from Standard Input in the following format:

A_1 A_2 A_3 A_4 A_5 A_6 A_7

Output

If a full house can be formed by choosing five cards, print `Yes`; otherwise, print `No`.

Sample Input 1

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

Sample Output 1

```
Yes
```

For example, by choosing the cards $(1, 1, 1, 4, 4)$, we can form a full house.

Sample Input 2

```
11 12 13 10 13 12 11
```

Sample Output 2

```
No
```

No five cards chosen from the seven cards form a full house.

Sample Input 3

```
7 7 7 7 7 7 7
```

Sample Output 3

```
No
```

Note that five identical cards do not form a full house.

Sample Input 4

```
13 13 1 1 7 4 13
```

Sample Output 4

```
Yes
```

C - Uniqueness

Time Limit: 2 sec / Memory Limit: 1024 MiB

Score : 300 points

Problem Statement

There are N people, labeled 1 to N. Person i has an integer A_i.

Among the people who satisfy the condition "None of the other $N-1$ people has the same integer as themselves," find the one with the greatest integer, and print that person's label.

If no person satisfies the condition, report that fact instead.

Constraints

- $1 \leq N \leq 3 \times 10^5$
- $1 \leq A_i \leq 10^9$
- All input values are integers.

Input

The input is given from Standard Input in the following format:

N
$A_1 \quad A_2 \quad \dots \quad A_N$

Output

If no person satisfies the condition "None of the other $N-1$ people has the same integer as themselves," print `-1`.

Otherwise, among those who satisfy it, print the label of the person whose integer is the largest.

Sample Input 1

```
9
2 9 9 7 9 2 4 5 8
```

Sample Output 1

```
9
```

Those who satisfy the condition are the persons labeled 4, 7, 8, and 9.
Their integers are 7, 4, 5, and 8, respectively, and the person with the largest integer is the person labeled 9.
Thus, the answer is 9.

Sample Input 2

```
4
1000000000 1000000000 998244353 998244353
```

Sample Output 2

```
-1
```

If no person satisfies the condition, print `-1`.

D - Bonfire

Time Limit: 2 sec / Memory Limit: 1024 MiB

Score : 425 points

Problem Statement

There is an infinitely large two-dimensional grid, with a campfire at coordinate $(0, 0)$.
At time $t = 0$, smoke exists only at cell $(0, 0)$.

You are given a length-N string S consisting of N, W, S, E. At times $t = 1, 2, \ldots, N$, the following happen in order:

- Wind blows, and all the smoke present at that time moves as follows:
  - If the t-th character of S is N, smoke in cell (r, c) moves to cell $(r - 1, c)$.
  - If it is W, smoke in cell (r, c) moves to cell $(r, c - 1)$.
  - If it is S, smoke in cell (r, c) moves to cell $(r + 1, c)$.
  - If it is E, smoke in cell (r, c) moves to cell $(r, c + 1)$.
- If there is no smoke in cell $(0, 0)$, new smoke is generated at cell $(0, 0)$.

Takahashi is standing at cell (R, C).
For each integer $1 \leq t \leq N$, determine if smoke exists at cell (R, C) at time $t + 0.5$, and print the response according to the required format.

Constraints

- N is an integer between 1 and 200000, inclusive.
- S is a length N string consisting of N, W, S, E.
- R and C are integers between $-N$ and N, inclusive.
- $(R, C) \neq (0, 0)$

Input

The input is given from Standard Input in the following format:

```
N R C
S
```

Output

Print an N-character string consisting of `0` and `1`.

The t-th character ($1 \leq t \leq N$) should be:

- `1` if smoke exists at cell (R, C) at time $t + 0.5$, and
- `0` otherwise.

Sample Input 1

```
6 -2 1
NNEEWS
```

Sample Output 1

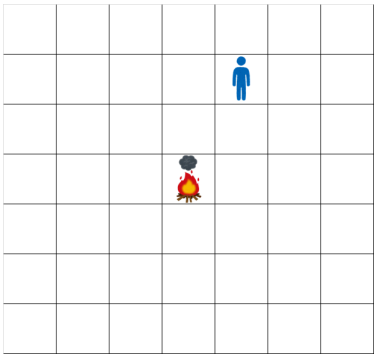
```
001010
```

At times $1.5, 2.5, 4.5, 6.5$, there is no smoke at cell $(-2, 1)$. At times $3.5, 5.5$, there is smoke at cell $(-2, 1)$.
Hence, output `001010`.

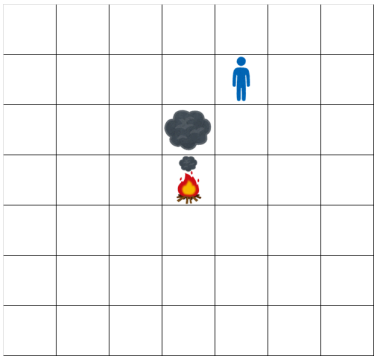
In the figures below, taking cell $(0, 0)$ with the campfire as a reference, cell (r, c) is drawn:

- $-r$ cells up if $r < 0$,
- r cells down if $r \geq 0$,
- $-c$ cells left if $c < 0$,
- c cells right if $c \geq 0$.

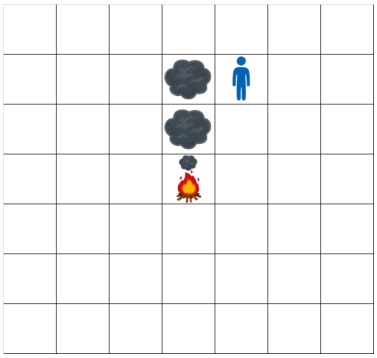
The grid at time 0.5 looks like:



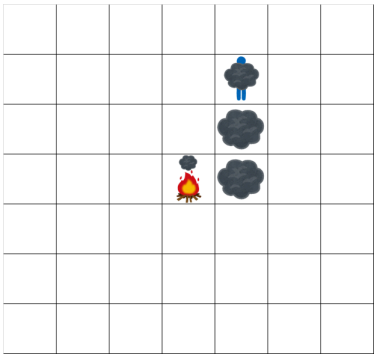
The grid at time 1.5 looks like:



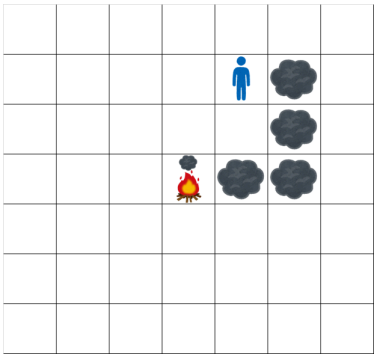
The grid at time 2.5 looks like:



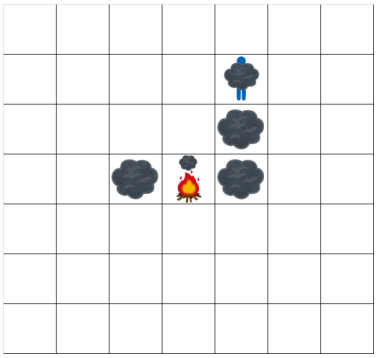
The grid at time 3.5 looks like:



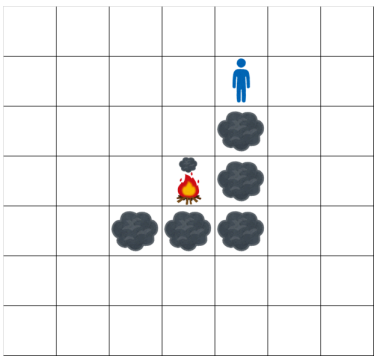
The grid at time 4.5 looks like:



The grid at time 5.5 looks like:



The grid at time 6.5 looks like:



Sample Input 2

```
10 1 2
NEESESWEES
```

Sample Output 2

```
0001101011
```

Sample Input 3

```
20 -1 -2
WWNNWSWEWNSWWENSNWWN
```

Sample Output 3

```
00100111111000101111
```

E - Tree Game

Time Limit: 2 sec / Memory Limit: 1024 MiB

Score : 425 points

Problem Statement

This problem is an **interactive problem** (in which your program and the judge system communicate via input and output).

You are given a tree G with N vertices numbered 1 to N. The i-th edge connects vertices U_i and V_i.

You will play a game with Takahashi using this tree G. First, you decide who is first and who is second. Then, starting from the first player, take turns performing the following operation:

- Choose a pair of integers (i, j) with $1 \leq i < j \leq N$ that satisfies both of the following conditions, then add an edge connecting vertices i and j to G.
  - G does not already have an edge connecting vertices i and j.
  - Adding an edge connecting vertices i and j does not create an odd cycle.

A player who cannot perform this operation loses, and the other player wins. Play this game against Takahashi and win.

▶ What is an odd cycle?

Constraints

- $2 \leq N \leq 100$
- $1 \leq U_i < V_i \leq N$
- The given graph is a tree.
- All input values are integers.

Interaction

This is an interactive problem (in which your program and the judge system communicate via input and output).

First, read N and the edges of G from Standard Input, given in the following format:

$$
\begin{aligned}
&N \\
&U_1\ V_1 \\
&U_2\ V_2 \\
&\vdots \\
&U_{N-1}\ V_{N-1}
\end{aligned}
$$

Then, decide whether you go first or second. If you choose first, print `First`; if second, print `Second`.

Then, the game begins.

On your turn, output the chosen pair (i, j) by printing two integers i and j in this order, separated by a space:

$$i\ j$$

On Takahashi's turn, two integers i, j will be given in order, separated by a space, via Standard Input:

$$i\ j$$

If $(i, j) = (-1, -1)$, it means he can no longer make a move and you win. Immediately terminate your program in this case.
Otherwise, (i, j) is the pair of integers he has chosen.

Notes

- **After each output, be sure to print a newline and flush Standard Output. Otherwise, you may get TLE.**
- **If you produce output in an incorrect format or your program ends prematurely, the judge result is indeterminate.**
- Once the game finishes, terminate your program immediately. Otherwise, the judge result is indeterminate.

Sample Interaction

Input	Output	Explanation
4 1 2 2 3 3 4		First, you receive N and the edges of G.
	First	You choose to go first.
	1 4	You add an edge between vertices 1 and 4.
-1 -1		Takahashi can no longer move, so you win. The judge result will be AC.

F - ABCBA

Time Limit: 2 sec / Memory Limit: 1024 MiB

Score : 500 points

Problem Statement

Find one shortest palindrome that has S as its prefix.

Constraints

- S is a string of length between 1 and 500000, inclusive, consisting of uppercase English letters.

Input

The input is given from Standard Input in the following format:

```
S
```

Output

Print the answer.

If multiple solutions exist, any of them is accepted.

Sample Input 1

```
ABC
```

Sample Output 1

```
ABCBA
```

ABCBA is a shortest palindrome that has $S =$ ABC as its prefix.

Sample Input 2

```
z
```

Sample Output 2

```
z
```

z is a shortest palindrome that has $S =$ z as its prefix.

Sample Input 3

```
TREE
```

Sample Output 3

```
TREERT
```

TREERT is a shortest palindrome that has $S =$ TREE as its prefix.

G - Not Only Tree Game

Time Limit: 2 sec / Memory Limit: 1024 MiB

Score : 600 points

Problem Statement

You are given a simple undirected graph with N vertices and M edges, with vertices labeled 1 to N and edges labeled 1 to M. The i-th edge connects vertices U_i and V_i. Initially, G does not contain an odd cycle.

Takahashi and Aoki will play a game using this graph G. With Aoki going first, they take turns performing the following operation:

- Choose a pair of integers (i, j) with $1 \leq i < j \leq N$ that satisfies both of the following conditions, then add an edge connecting vertices i and j to G.
  - G does not already have an edge connecting vertices i and j.
  - Adding an edge connecting vertices i and j does not create an odd cycle.

A player who cannot perform this operation loses, and the other player wins.

Determine who wins when both players play optimally.

▶ What is an odd cycle?

Constraints

- $1 \leq N \leq 2 \times 10^5$
- $0 \leq M \leq 2 \times 10^5$
- $1 \leq U_i < V_i \leq N$
- The given graph does not contain an odd cycle.
- The given graph does not contain multi-edges.
- All input values are integers.

Input

The input is given from Standard Input in the following format:

$$
\begin{aligned}
&N \quad M \\
&U_1 \quad V_1 \\
&U_2 \quad V_2 \\
&\vdots \\
&U_M \quad V_M
\end{aligned}
$$

Output

If Aoki (the first player) wins, print `Aoki`; otherwise, if Takahashi (the second player) wins, print `Takahashi`.

Sample Input 1

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

Sample Output 1

```
Aoki
```

If Aoki (the first player) adds the edge $(1, 4)$, Takahashi (the second player) cannot move. Thus, Aoki wins.

Sample Input 2

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

Sample Output 2

```
Takahashi
```

No matter how Aoki plays, Takahashi wins.

Sample Input 3

```
9 5
2 9
2 3
4 6
5 7
1 8
```

Sample Output 3

```
Aoki
```