TLE '17 Contest 5 P6 - Circuits

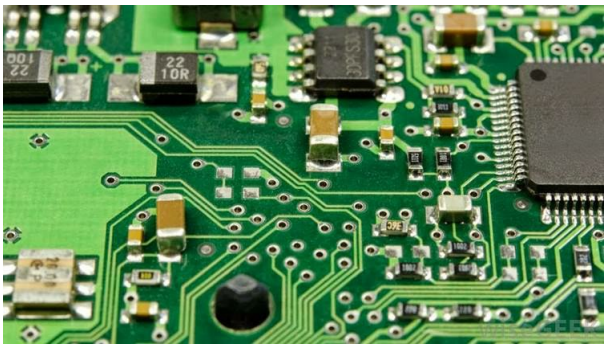
There is a circuit with N input gates, and M MOOSE gates.

A MOOSE gate computes the negation of the AND of the inputs. That is, it outputs 0 if both inputs are 1, otherwise it outputs 1.

The gates are numbered $1, \ldots, N+M$ starting with the N input gates. Gate number $N+M$ is the output gate.

Each MOOSE gate's input is from two gates with smaller IDs.

At the moment all inputs have the same value x, which is unknown, but can either have the value 0 or 1.



A generic circuit.

You want to change as many of the inputs to fixed values (0 or 1) instead of x as possible so that the output of the circuit (the value of gate $N+M$) is the same as the output before fixing any inputs. That is, if y_0 is produced when $x=0$ and y_1 is produced when $x=1$, then the fixed circuit should still produce y_0 when $x=0$ and y_1 when $x=1$. Output one such optimal choice of hard-wiring.

Constraints

For all subtasks:

$1 \leq N \leq 10^5$

$1 \leq M \leq 2 \times 10^5$

Subtask	Points	Additional Constraints
1	10	$N \leq 5, M \leq 50$
2	30	$N \leq 2 \times 10^2, M \leq 2 \times 10^4$
3	60	No additional constraints.

Input Specification

The first line of input will contain two space-separated integers, N and M.

The next line of input will contain $2M$ space-separated integers. The $2i-1^{th}$ and $2i^{th}$ integers specify the inputs to gate $N+i$. These integers are guaranteed to be positive and less than i.

Output Specification

Output a single line with N characters, denoting an optimal assignment. The i^{th} character can either be `0`

(set to false), `1` (set to true), or `x` (set to x). If there are multiple solutions, output any of them.

Sample Input 1

```
2 1
1 2
```

Sample Output 1

```
x1
```

Sample Input 2

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

Sample Output 2

```
10x
```

Sample Input 3

```
4 18
1 1 2 2 5 6 1 2 7 8 9 9 3 3 4 4 11 12 3 4 13 14 15 15 10 10 16 16 17 18 10 16 19 20 21
21
```

Sample Output 3

```
0000
```