

# TLE '17 Contest 5 P6 - Circuits

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

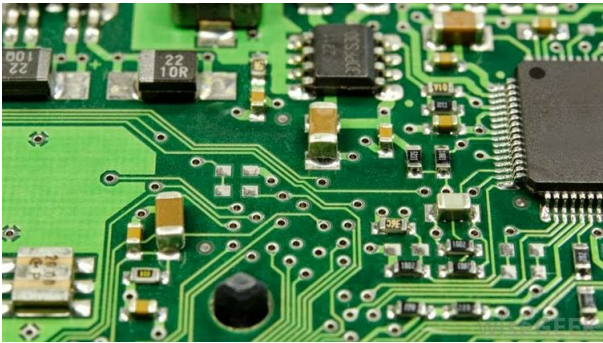
A MOOSE gate computes the negation of the AND of the inputs. That is, it outputs 0 if both inputs are 1, otherwise it outputs 1.

The gates are numbered  $1, \dots, N + M$  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.

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.



*A generic circuit.*

## 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

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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

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```
2 1
1 2
```

## Sample Output 1

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```
x1
```

## Sample Input 2

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

## Sample Output 2

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```
10x
```

## Sample Input 3

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```
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

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