

[A3] Sensor Logs (50 pts)

Time Limit: 1s
Memory Limit: 512MB

Problem Description

The nuclear launch codes have been stolen! The general calls in all of the staff to the boardroom. “Has the base been sealed?” He asks one of the soldiers who nods in response. “We can’t let those codes get to NELOC or else we could lose the war. No one leaves until I find the impostor!”

“Good thing we have someone from MI7 here to figure it out. So how is it going Agent Blanc?” He provides you with a blueprint of the base made up of four rooms (labelled with letters) and three corridors (labelled with numbers). Room A also contains the entrance to the building and everyone starts there at the beginning of the day. A visualization of the room and corridor layout is depicted below:

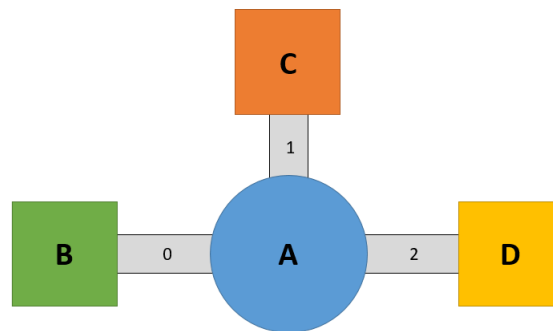


Figure 1: High-quality image of the base blueprints

You then take a look at the corridor access logs which automatically records people whenever they pass through a corridor. Note that these sensors only trigger when a person moves into a room that he did not come from. A sample log is located below, which tells us that employee ID 0 passed Corridor 0 into Room B, then Employee ID 2 passed Corridor 2 into Room D, and lastly Employee ID 0 passed Corridor 0 again to Room A:

```
0 0
2 2
0 0
```

From reading the blueprints earlier, you recall that a series of vents are built into the building that connects all of the corridors to one another. This allows an intruder to enter a corridor, go through the vents to a different corridor, then trigger the access sensor in that corridor.

You sift through the ventilation sensor logs and notice that an alarm was triggered that might signal movement in the vents. Unfortunately, these logs do not include the time and place the vents were entered from. In addition, one of the staff also tells you that rats in the vents may also trigger the alarm accidentally (meaning no actual person entered the vents). With the knowledge that the impostor may have jumped between two corridors using the vents, identify who the impostors are (if any).

Input Specification

Input consists of a single test case. The first line contains two space separated integers N and M , the number of people and the number of lines in the access logs, respectively.

M lines then follow containing two space separated integers e_i and c_i , the first denoting the employee ID of someone who passed through the corridor identified by the second integer. Note that employee IDs are unique per person and assigned in increasing order from 0 to $N - 1$.

Output Specification

Output a single line containing a string of length N . For each person, print 1 if suspicious and 0 if innocent, in order of increasing ID from 0 to $N - 1$.

Constraints

$$1 \leq N \leq 1000$$

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

$$0 \leq e_i \leq N - 1$$

$$c_i \in \{0, 1, 2\}$$

Sample Input

```
3 5
0 0
0 0
1 1
0 2
1 2
```

Sample Output

```
010
```

Explanation

Based on the logs, Employee ID 0 moved from Room A to Room B, Room B to Room A, then finally Room A to Room D. This path is valid and can be conducted without passing a vent. Therefore Employee ID 0 is innocent.

For Employee ID 1, he first moved from Room A into Room C. Afterward, he appeared to be in Corridor 2 which is not directly reachable from Room C. The only way this can be true is by using the vents to travel to Corridor 2. Therefore Employee ID 1 is an impostor.

Lastly, we see no logs on the movement of Employee ID 2; he just stayed in Room A which makes him innocent.