

# Dynamic Short Path

Input file:            **standard input**  
Output file:           **standard output**  
Time limit:            12 seconds  
Memory limit:         1024 megabytes

You are given a weighted directed graph with  $n$  vertices and  $n(n - 1)$  edges. For any pair of two distinct vertices  $1 \leq i, j \leq n$ , there exists an edge with integer weight  $w(i, j)$  where  $0 \leq w(i, j) \leq 2$ .

Process the following  $q$  queries:

- **1 a b**: Let  $dist(a, b)$  be the length of the shortest directed path from vertex  $a$  to vertex  $b$  ( $1 \leq a, b \leq n$ ). Output the value  $\min(dist(a, b), 2)$ .
- **2 a b c**: Update  $w(a, b)$  to  $c$  ( $1 \leq a, b \leq n, 0 \leq c \leq 2, a \neq b$ ).

There are at most 2000 queries of type 2.

## Input

The first line contains two integers  $n$  and  $q$  ( $2 \leq n \leq 600, 1 \leq q \leq 10^6$ ).

The next  $n$  lines contain  $n$  integers. The  $j$ -th integer of the  $i$ -th line is  $w(i, j)$  ( $0 \leq w(i, j) \leq 2$ ).  $w(i, i)$  will be denoted as 0 for all  $i$  even though no such edge exists.

The next  $q$  lines contain several integers denoting the queries in the described form.

There is at least 1 query of type 1.

**There are at most 2000 queries of type 2.**

## Output

For each query of type 1, output a single integer denoting the answer to that query. Each answer should go on its own line.

## Example

| standard input | standard output |
|----------------|-----------------|
| 5 10           | 1               |
| 0 1 2 2 2      | 2               |
| 2 0 2 2 2      | 2               |
| 2 2 0 1 2      | 2               |
| 2 2 2 0 2      | 2               |
| 2 2 2 2 0      | 0               |
| 1 1 2          | 0               |
| 1 2 1          | 2               |
| 1 1 3          | 2               |
| 1 1 4          |                 |
| 1 4 5          |                 |
| 1 5 5          |                 |
| 2 4 5 0        |                 |
| 1 4 5          |                 |
| 1 2 5          |                 |
| 1 1 5          |                 |