Problem F. Rooks

Prof. Pang plays chess against his rival Prof. Shou. They are the only two players in the game. The chessboard is very large and can be viewed as a 2D plane. Prof. Pang placed n_1 rooks and Prof. Shou placed n_2 rooks. Each rook is a point with integer coordinates on the chessboard. One rook is *attacked* by another rook if they satisfy all of the following conditions:

- They are placed by different players.
- They have the same x-coordinate or y-coordinate.
- There is no other rook on the line segment between them.

Help Prof. Pang and Prof. Shou to decide which rooks are attacked.

Input

The first line contains two integers n_1, n_2 ($1 \le n_1, n_2 \le 200000$) separated by a single space denoting the number of rooks placed by Prof. Pang and the number of rooks placed by Prof. Shou.

The i-th ($1 \le i \le n_1$) line of the next n_1 lines contains two integers x, y ($-10^9 \le x, y \le 10^9$) separated by a single space denoting the location (x, y) of the i-th rook placed by Prof. Pang.

The i-th ($1 \le i \le n_2$) line of the next n_2 lines contains two integers x, y ($-10^9 \le x, y \le 10^9$) separated by a single space denoting the location (x, y) of the i-th rook placed by Prof. Shou.

It is guaranteed that the $n_1 + n_2$ rooks placed by the players are distinct (i.e., no two rooks can have the same location).

Output

Output a string with length n_1 on the first line. The i-th ($1 \le i \le n_1$) character should be 1 if the i-th rook placed by Prof. Pang is attacked and 0 otherwise.

Output a string with length n_2 on the second line. The i-th ($1 \le i \le n_2$) character should be 1 if the i-th rook placed by Prof. Shou is attacked and 0 otherwise.

Example

standard input	standard output
3 2 0 0 0 1 1 0 0 -1 -1 0	100 11