Problem F. Rooks

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	256 mebibytes

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