Problem A. Agrarian Reform

Input file:	`agrarian.in`
Output file:	`agrarian.out`
Time limit:	2 seconds
Memory limit:	256 megabytes

The King of Squaredom is planning the agrarian reform. The Squaredom has the form of rectangle of $m \times n$ squares. Squares are identified by pairs (x, y) where x ranges from 1 to m, and y ranges from 1 to n. Each square is either occupied by a peasant's house, or contains a swamp, or is a field. The King would like to assign peasants to fields, so that each peasant was assigned to exactly one field, and each field was assigned as most one peasant.

The King asked his Minister of Agronomy to prepare the list of peasants. After that he would assign them to fields. The Private Counselor of the King has found out the algorithm the King will use to assign peasants to fields.

The King would look through the peasants in order they are listed by the Minister of Agronomy. For each peasant he would find the closest to his house field that has no peasant assigned to it yet. That field would be assigned to this peasant. If there are several such fields, the field which has the smallest x will be chosen, if there are still several such fields, the field which has the smallest y among them will be chosen. The distance between squares (x_1, y_1) and (x_2, y_2) is $|x_1 - x_2| + |y_1 - y_2|$.

The Minister of Agronomy would like to order peasants in such a way that the sum of distances between peasant and the field he is assigned to for all peasants were as small as possible. Help him to find such order.

Input

The first line of the input file contains four integer numbers: m, n, k and s — the size of the field, the number of peasants, and the number of swamps, respectively ($1 \le m, n \le 20$, $1 \le k \le mn/2$, $0 \le s \le mn - 2k$). The following k lines contain coordinates of squares where peasants live, the i-th of these lines contains two integer numbers x_i, y_i ($1 \le x_i \le m$, $1 \le y_i \le n$). No two peasants live in the same square.

The following s lines contain coordinates of squares containing swamps.

Output

Output k numbers — the order in which the Minister of Agronomy should order peasants so that the King assigned them to the fields in the optimal way.

Example

agrarian.in	agrarian.out
3 5 5 0 2 3 2 4 1 3 2 2 3 3	3 4 2 1 5