Cell Automaton

We have a sufficiently large 2-dimensional grid of cells. The grid is paved with square cells from the top to the bottom and from the left to the right.

There is a cell, which is the origin of the coordinates. Let (x, y) denote the cell one arrives at when one moves from the origin to the right direction for the distance of x cells and to the upward direction for the distance of y cells. Here, the left direction for the distance of a cells means the right direction for the distance of $-a$ cells. Similarly, the downward direction for the distance of a cells means the upward direction for the distance of $-a$ cells.

At time 0, the cells $(X_1, Y_1), (X_2, Y_2), \ldots, (X_N, Y_N)$ are black, and all of the other cells are white.

For $t = 0, 1, 2, \ldots$, the colors of the cells at time $t + 1$ are determined by the colors of the cells at time t in the following way.

- If a cell is black at time t, then the cell becomes gray at time $t + 1$.
- If a cell is gray at time t, then the cell becomes white at time $t + 1$.
- A cell which is white at time t becomes black at time $t + 1$ if at least one of the 4 adjacent cells (i.e. the 4 cells which share the edges) is black at time t. Otherwise, it remains white at time $t + 1$.

You have Q queries. For the j-th $(1 \leq j \leq Q)$ query, you should answer the number of black cells at time T_j.

Write a program which, given the information of the colors of the cells at time 0 and queries, answers the queries.

Input

Read the following data from the standard input.

N Q
X_1 Y_1
X_2 Y_2
$\vdots$
X_N Y_N
T_1
T_2
$\vdots$
T_Q

Output

Write Q lines to the standard output. The j-th line should contain the number of black cells at time T_j.

Constraints

- $1 \leq N \leq 100\,000$.
- $1 \leq Q \leq 500\,000$.
- $|X_i| \leq 10^9$ $(1 \leq i \leq N)$.
- $|Y_i| \leq 10^9$ $(1 \leq i \leq N)$.
- $(X_i, Y_i) \neq (X_j, Y_j)$ $(1 \leq i < j \leq N)$.
- $0 \leq T_j \leq 10^9$ $(1 \leq j \leq Q)$.
- $T_j < T_{j+1}$ $(1 \leq j \leq Q - 1)$.
- Given values are all integers.

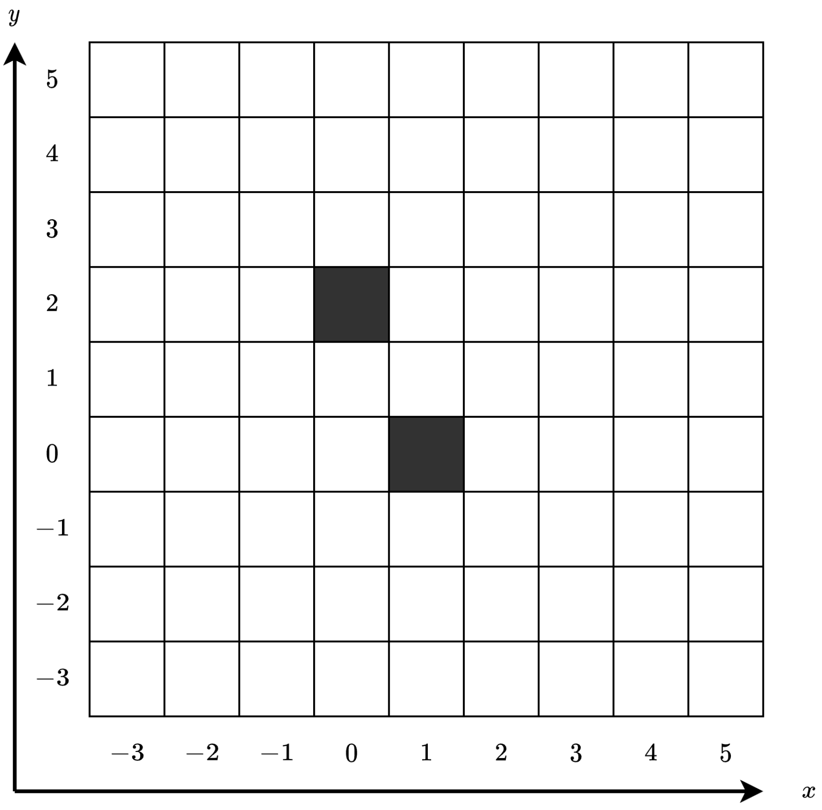
Subtasks

1. (4 points) $|X_i| \leq 50$ $(1 \leq i \leq N)$, $|Y_i| \leq 50$ $(1 \leq i \leq N)$, $T_j \leq 50$ $(1 \leq j \leq Q)$.
2. (12 points) $|X_i| \leq 1\,000$ $(1 \leq i \leq N)$, $|Y_i| \leq 1\,000$ $(1 \leq i \leq N)$, $T_j \leq 1\,000$ $(1 \leq j \leq Q)$.
3. (8 points) $X_i = Y_i$ $(1 \leq i \leq N)$, $Q = 1$.
4. (8 points) $X_i = Y_i$ $(1 \leq i \leq N)$.
5. (17 points) $N \leq 2\,000$, $Q = 1$.
6. (25 points) $N \leq 2\,000$.
7. (26 points) No additional constraints.

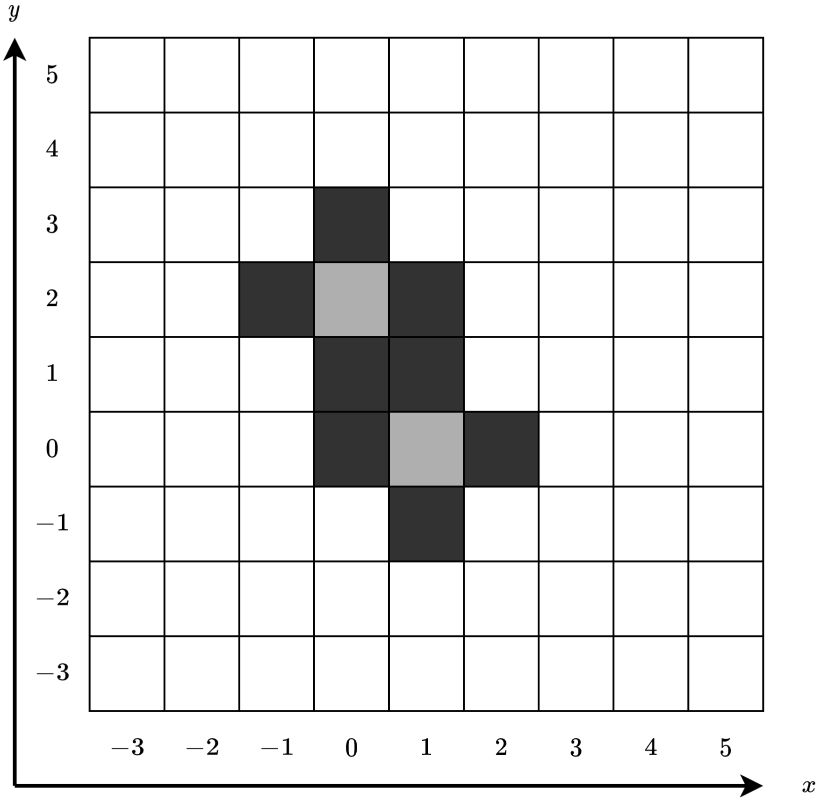
Sample Input and Output

Sample Input 1	Sample Output 1
2 3 0 2 1 0 0 1 2	2 8 12

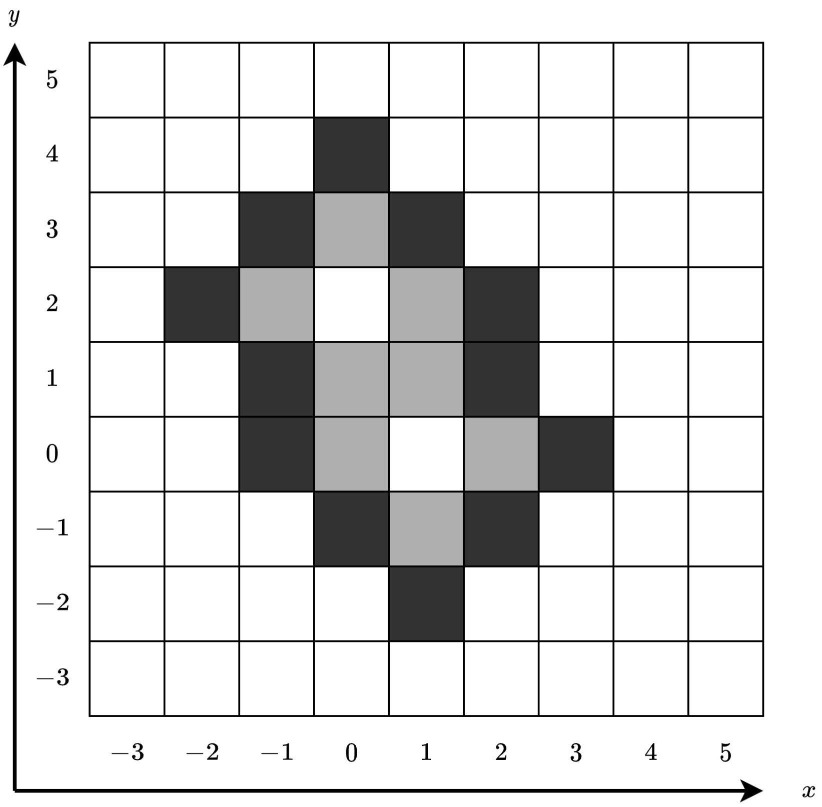
The following figure shows the colors of the cells at time 0. Since there are 2 black cells, the answer to the first query is 2.



The following figure shows the colors of the cells at time 1. Since there are 8 black cells, the answer to the second query is 8.



The following figure shows the colors of the cells at time 2. Since there are 12 black cells, the answer to the third query is 12.



This sample input satisfies the constraints of Subtasks 1, 2, 6, 7.

Sample Input 2	Sample Output 2
3 5 0 0 2 2 5 5 0 1 2 3 4	3 12 21 24 26

This sample input satisfies the constraints of Subtasks 1, 2, 4, 6, 7.

Sample Input 3	Sample Output 3
4 10 -3 -3 3 3 -4 4 4 -4 0 1 2 3 4 5 6 7 8 9	4 16 32 48 56 56 55 56 60 64

This sample input satisfies the constraints of Subtasks 1, 2, 6, 7.