5 Road Service 2

In JOI city, there is a grid-shaped road network consisting of H infinitely long east-west roads and W infinitely long north-south roads. Intersection (i, j) $(1 \leq i \leq H, 1 \leq j \leq W)$ is the intersection where the i-th northernmost east-west road and the j-th westernmost north-south road cross.

Currently, part of the roads is closed due to poor road conditions. Specifically, the status of the roads is as follows:

- The segment in the i-th northernmost east-west road $(1 \leq i \leq H)$ connecting intersection (i, j) and intersection $(i, j + 1)$ $(1 \leq j \leq W - 1)$ is closed if $A_{i,j} = 0$ and passable if $A_{i,j} = 1$.
- The segment in the j-th westernmost north-south road $(1 \leq j \leq W)$ connecting intersection (i, j) and intersection $(i + 1, j)$ $(1 \leq i \leq H - 1)$ is closed if $B_{i,j} = 0$ and passable if $B_{i,j} = 1$.
- The other part of the roads (the part of roads outside the $H \times W$ intersections) is closed.

President K, the mayor of JOI city, decided to make a **repair plan** of the road network. A repair plan consists of zero or more **repairs**. A repair is done by choosing an integer i satisfying $1 \leq i \leq H$ and doing the following:

> For **every** integer j satisfying $1 \leq j \leq W - 1$, make the segment in the i-th northernmost east-west road connecting intersection (i, j) and intersection $(i, j + 1)$ passable (if it is closed).
> The repair takes C_i days. Note that C_i is either 1 or 2.

Since no two repairs in a repair plan can be done in parallel, the **period** of a repair plan is equal to the sum of the time taken by repairs consisting the repair plan.

President K thinks that securing the route between city facilities is important and asks you Q questions. The k-th questions $(1 \leq k \leq Q)$ is as follows:

> Is there a repair plan that makes T_k intersections $(X_{k,1}, Y_{k,1}), (X_{k,2}, Y_{k,2}), \ldots, (X_{k,T_k}, Y_{k,T_k})$ mutually reachable? If so, what is the minimum possible period of such a repair plan?

Write a program which, given the status of the road network, the days taken by repairing each east-west road and the details of the questions by President K, answers all the questions.

Input

Read the following data from the standard input.

$H\ W\ Q$
$A_{1,1}A_{1,2}\cdots A_{1,W-1}$
$A_{2,1}A_{2,2}\cdots A_{2,W-1}$
$\vdots$
$A_{H,1}A_{H,2}\cdots A_{H,W-1}$
$B_{1,1}B_{1,2}\cdots B_{1,W}$
$B_{2,1}B_{2,2}\cdots B_{2,W}$
$\vdots$
$B_{H-1,1}B_{H-1,2}\cdots B_{H-1,W}$
$C_1\ C_2\ \cdots\ C_H$
Query_1
Query_2
$\vdots$
Query_Q

Here, Query_k $(1 \leq k \leq Q)$ is as follows:

T_k
$X_{k,1}\ Y_{k,1}$
$X_{k,2}\ Y_{k,2}$
$\vdots$
$X_{k,T_k}\ Y_{k,T_k}$

Output

Write Q lines to the standard output. In the k-th line $(1 \leq k \leq Q)$, output the minimum possible period, in days, of a repair plan that makes T_k intersections $(X_{k,1}, Y_{k,1}), (X_{k,2}, Y_{k,2}), \ldots, (X_{k,T_k}, Y_{k,T_k})$ mutually reachable if such a repair plan exists. Otherwise, output -1.

Constraints

- $2 \leq H$.
- $2 \leq W$.
- $H \times W \leq 1\,000\,000$.
- $1 \leq Q \leq 100\,000$.
- $A_{i,j}$ is either 0 or 1 ($1 \leq i \leq H, 1 \leq j \leq W-1$).
- $B_{i,j}$ is either 0 or 1 ($1 \leq i \leq H-1, 1 \leq j \leq W$).
- C_i is either 1 or 2 ($1 \leq i \leq H$).
- $2 \leq T_k$ ($1 \leq k \leq Q$).
- $T_1 + T_2 + \cdots + T_Q \leq 200\,000$.
- $1 \leq X_{k,l} \leq H$ ($1 \leq k \leq Q, 1 \leq l \leq T_k$).
- $1 \leq Y_{k,l} \leq W$ ($1 \leq k \leq Q, 1 \leq l \leq T_k$).
- $(X_{k,1}, Y_{k,1}), (X_{k,2}, Y_{k,2}), \ldots, (X_{k,T_k}, Y_{k,T_k})$ are distinct ($1 \leq k \leq Q$).
- Given values are all integers.

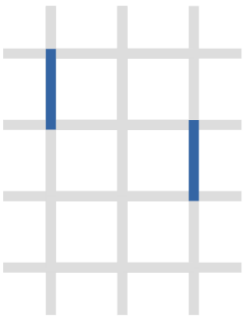
Subtasks

1. (10 points) $C_i = 1$ ($1 \leq i \leq H$), $Q \leq 5$, $T_k = 2$ ($1 \leq k \leq Q$), $A_{i,j} = 0$ ($1 \leq i \leq H, 1 \leq j \leq W-1$).
2. (6 points) $C_i = 1$ ($1 \leq i \leq H$), $Q \leq 5$, $T_k = 2$ ($1 \leq k \leq Q$).
3. (15 points) $C_i = 1$ ($1 \leq i \leq H$), $Q \leq 5$.
4. (11 points) $C_i = 1$ ($1 \leq i \leq H$), $T_k = 2$ ($1 \leq k \leq Q$).
5. (6 points) $C_i = 1$ ($1 \leq i \leq H$).
6. (12 points) $Q \leq 5$.
7. (26 points) $T_k = 2$ ($1 \leq k \leq Q$).
8. (14 points) No additional constraints.

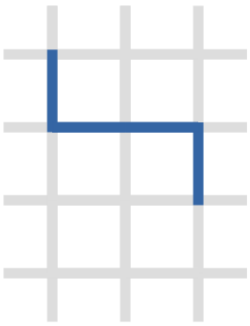
Sample Input and Output

Sample Input 1	Sample Output 1
4 3 4 00 00 00 00 100 001 000 1 1 1 1 2 1 1 3 3 2 3 1 1 2 2 2 3 3 3 2 4 2 3 2	1 3 0 -1

The figure below shows the current status of the road network. The gray part is closed, and the blue part is passable.



- In the first question, a repair with $i = 2$ will make the status of the road network as follows, and intersections $(1, 1)$ and $(3, 3)$ will be mutually connected.



The period of a repair plan consisting of this single repair is 1 day, and there is no repair plan with a shorter period that makes intersections $(1, 1)$ and $(3, 3)$ mutually reachable, so your program should output 1 in the first line.

- In the second question, three repairs with $i = 1, 2, 3$ respectively will make the intersecion $(3, 1)$ and $(1, 2)$ mutually reachable. The period of a repair plan consisting of these three repairs is 3 days, and there is no repair plan with a shorter period that makes intersecions $(3, 1)$ and $(1, 2)$ mutually reachable, so your program should output 3 in the second line.
- In the third question, the intersections $(2, 3)$ and $(3, 3)$ are already mutually reachable, so your program should output 0 in the third line.
- In the fourth question, there is no repair plan that makes intersections $(4, 2)$ and $(3, 2)$ mutually reachable, so your program should output -1 in the fourth line.

This sample input satisfies the constraints of Subtasks $1, 2, 3, 4, 5, 6, 7, 8$.

Sample Input 2	Sample Output 2
4 4 4 100 110 011 010 0010 1001 0101 1 1 1 1 2 1 2 3 1 2 1 4 4 1 2 3 2 1 2 2 4 3 1 1	1 3 2 2

This sample input satisfies the constraints of Subtasks 2, 3, 4, 5, 6, 7, 8.

Sample Input 3	Sample Output 3
7 3 3 10 00 00 10 00 01 00 110 101 011 001 110 100 1 1 1 1 1 1 1 3 7 2 3 1 3 2 3 3 1 6 3 2 3 7 2 2 1 3 7 3 5 2 1 2 7 2 3 1	3 2 4

This sample input satisfies the constraints of Subtasks 3, 5, 6, 8.

Sample Input 4	Sample Output 4
4 3 3 00 00 10 00 110 011 001 1 2 2 2 2 1 1 3 1 2 4 3 2 1 2 4 1 1 3	1 2 5

This sample input satisfies the constraints of Subtasks 6, 7, 8.

Sample Input 5	Sample Output 5
7 3 2 01 00 00 00 00 10 01 100 110 011 001 101 001 1 1 2 1 1 2 2 3 7 2 1 3 5 1 5 1 1 2 2 3 1 2 3 4 2	4 1

This sample input satisfies the constraints of Subtasks 6, 8.