Subgrid Connected Components

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2.5 seconds
Memory limit:	384 megabytes

Please note that the memory limit for this problem is 384 MiB.

You are given a grid with $2N+1$ rows and $2N+1$ columns, where N is a positive integer. Let the cell in the i-th row from the top and the j-th column from the left ($1 \leq i, j \leq 2N+1$) be denoted by (i, j). Each cell (i, j) contains a character $S_{i,j}$, which satisfies the following properties:

- If i is odd and j is odd, then $S_{i,j} =$ `o`
- If i is odd and j is even, then $S_{i,j} =$ `-` or `.`
- If i is even and j is odd, then $S_{i,j} =$ `|` or `.`
- If i is even and j is even, then $S_{i,j} =$ `.`

You are given Q independent queries. In the i-th query ($1 \leq i \leq Q$), odd integers U_i, D_i, L_i, R_i ($1 \leq U_i \leq D_i \leq 2N+1,\ 1 \leq L_i \leq R_i \leq 2N+1$) are given. For each query, answer the following question.

> In the subgrid $[U_i, D_i] \times [L_i, R_i]$, treat the character `o` as vertices and the characters `-` and `|` as edges. How many connected components does the resulting undirected graph have?

More precisely, answer the following.

> Consider an undirected graph G with $((D_i - U_i + 2)/2) \times ((R_i - L_i + 2)/2)$ vertices. Each vertex corresponds to a pair (x, y), where x is an odd integer with $U_i \leq x \leq D_i$ and y is an odd integer with $L_i \leq y \leq R_i$.
> The undirected graph G has the following edges, and no other edges:
>
> - If odd integers x, y satisfy $U_i \leq x \leq D_i$, $L_i \leq y \leq R_i - 2$, and $S_{x,y+1} =$ `-`, then there is an undirected edge between vertices (x, y) and $(x, y+2)$.
> - If odd integers x, y satisfy $U_i \leq x \leq D_i - 2$, $L_i \leq y \leq R_i$, and $S_{x+1,y} =$ `|`, then there is an undirected edge between vertices (x, y) and $(x+2, y)$.
>
> Find the number of connected components of the undirected graph G.

Input

The input is given in the following format:

N
$S_{1,1}S_{1,2}\ldots S_{1,2N+1}$
$S_{2,1}S_{2,2}\ldots S_{2,2N+1}$
$\vdots$
$S_{2N+1,1}S_{2N+1,2}\ldots S_{2N+1,2N+1}$
Q
$U_1\ D_1\ L_1\ R_1$
$U_2\ D_2\ L_2\ R_2$
$\vdots$
$U_Q\ D_Q\ L_Q\ R_Q$

- N is an integer satisfying $1 \leq N \leq 2000$.
- If i is odd and j is odd, then $S_{i,j} =$ `o`
- If i is odd and j is even, then $S_{i,j} =$ `-` or `.`
- If i is even and j is odd, then $S_{i,j} =$ `|` or `.`
- If i is even and j is even, then $S_{i,j} =$ `.`
- Q is an integer satisfying $1 \leq Q \leq 7000$.
- $1 \leq U_i \leq D_i \leq 2N + 1$
- $1 \leq L_i \leq R_i \leq 2N + 1$
- U_i, D_i, L_i, R_i are odd integers.

Output

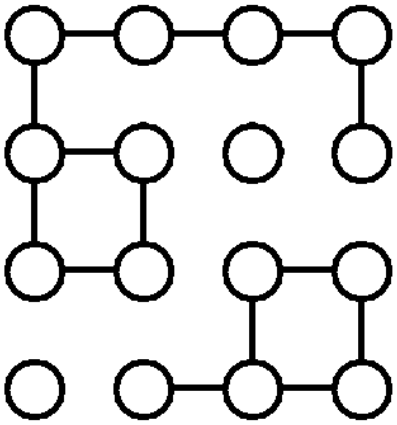
Output Q lines. For $i = 1, 2, \ldots, Q$, output the answer to the i-th query on the i-th line.

Example

standard input	standard output
3 o-o-o-o |.....| o-o.o.o |.|.... o-o.o-o ....|.| o.o-o-o 12 3 5 1 7 1 1 1 1 1 3 1 3 1 3 1 7 1 1 1 1 1 1 1 7 1 7 1 1 1 7 1 7 3 5 3 5 3 5 3 7 3 7 3 7 5 7 3 5	4 1 1 2 1 1 2 4 3 4 4 2

Note

The given grid looks as follows:



The answer to the first query is 4, as shown in the following figure.