Problem G

Matrix Queries

Input File: standard input
Output File: standard output
Time Limit: 1.5 seconds (C/C++)
Memory Limit: 256 megabytes

You are given a matrix of size $2^n \times 2^n$, initially painted in white color. The color of a cell can be either black or white. Let's define the *price* of a matrix as:

1. If a matrix is painted with only one color, the price will be 1 coin;
2. Otherwise, you should split the matrix into 4 size-equal matrices, and the price of a matrix will be the sum of submatrices prices plus 1 coin.

You are given q queries. Each query gives you the number of row/column x, and you have to change the color of all cells in this row/column (i.e., if a cell is white, it will be black; if a cell is black, it will be white) and find the *price* of the new matrix.

Input

The first line contains two integers n and q ($0 \le n \le 20$, $1 \le q \le 10^6$) where n means that the size of the matrix is $2^n \times 2^n$ and q means that there are going to be q queries.

Each of the next q lines contains two integers t and x ($0 \le t \le 1$, $1 \le x \le 2^n$). If $t = 0$, then the x-th row will be changed; otherwise, the x-th column.

Output

For each query, print a matrix price.

Sample input	Sample output
2 7 1 3 0 2 1 1 1 4 0 4 0 3 1 1	13 17 21 17 21 17 13

Note

In the sample, after each query the matrix will be as follows: