# Dynamic Quad Tree

One day, Kevin came up with another more challenging question about quad tree. As previously, quad tree data structure can represent a black-white image. In this question, you will be given a picture containing only black and white pixels. By operating on a single pixel, we can flip a pixel from '0' to '1' or from '1' to '0'. And after each operation, you are required to output the total number of nodes in the corresponding quad tree of the current picture.
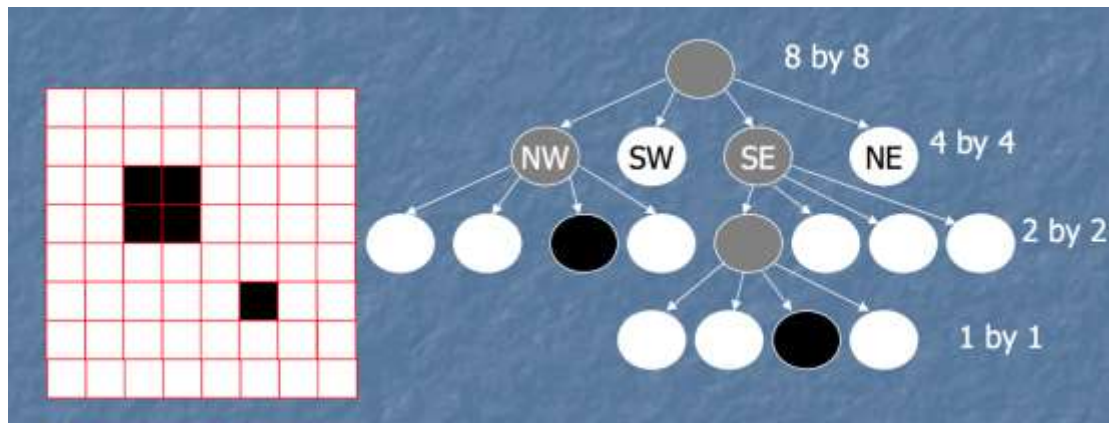
Input:

The input contains multiple cases. The first line contains a single integer T indicating the number of test cases. Each test case begins with one integer k, indicating the size of the image $(n \times n)$, where $n = 2^k$ and $0 \le k \le 10$. The following n lines give the information of the pixels, where the i-th line contains a binary string of n characters, containing '0'(white pixel) and '1'(black pixel), indicating the pixel information in the i-th row of the image. Then there will be an integer m ($1 <= m <= 1000$) indicating the number of operations. In each of the following m lines there will be two integers **r c** ($1 <= r, c <= n$) corresponding to the row and column of the pixel that will be flipped.

Output:

For each operation, print a single line containing one integer indicating the number of nodes in corresponding quad tree.

Hints: the method in previous problem "Simple Quadtree" might not be efficient to solve this problem, it is recommended to use tree data structure.

Sample Input	Sample Output
2	13
2	17
0011	13
0001	9
1111	
0111	
3	
3 1	
3 3	
2 3	
2	
0000	
0000	
0000	
0000	
1	
1 1	