1333 – Grid Coloring

You have to color an **M x N** two dimensional grid. You will be provided **K** different colors for this. You will also be provided a list of **B** blocked cells of this grid. You cannot color these blocked cells.

A cell can be described as **(x, y)**, which points to the **y**[th] cell from the left of the **x**[th] row from the top.

While coloring the grid, you have to follow these rules -

1. You have to color each cell which is not blocked.
2. You cannot color a blocked cell.
3. You can choose exactly one color from **K** given colors to color a cell.
4. No two vertically adjacent cells can have the same color, i.e. cell **(x, y)** and cell **(x + 1, y)** shouldn't contain the same color.

You have to calculate the number of ways you can color this grid obeying all the rules provided.

Input

Input starts with an integer **T (≤ 600)**, denoting the number of test cases.

Each test case starts with a line containing four integers **M N K B (1 ≤ M, N, K ≤ 10^6, 0 ≤ B ≤ 500)**. Each of the next **B** lines will contain two integers **x** and **y** **(1 ≤ x ≤ M, 1 ≤ y ≤ N)**, the row and column number of a blocked cell. Each of these **B** lines will contain distinct cells.

Output

For each case, print the case number and the number of ways to color the grid modulo **10^9**.

Sample Input	Output for Sample Input
3	Case 1: 1728
3 3 3 0	Case 2: 186624
3 4 4 2	Case 3: 20
3 1	
3 3	
2 2 5 2	
1 2	
2 2	