

## 5040 Grid Coloring

You have to color an  $N \times M$  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 those 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  $(x + 1, y)$  cannot 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  $T$ , the number of test cases.  $T$  is around 600. Each test case starts with a line containing four integers  $N$  ( $1 \leq N \leq 1,000,000$ ),  $M$  ( $1 \leq M \leq 1,000,000$ ),  $K$  ( $0 \leq K \leq 1,000,000$ ) and  $B$  ( $0 \leq B \leq 500$ ). Each of the next  $B$  lines will contain two integers  $x$  and  $y$  ( $1 \leq x \leq N$ ,  $1 \leq y \leq M$ ), the row and column number of a blocked cell. Each of these  $B$  lines is distinct.

### Output

For each test case, print a single line in output in the format 'Case  $I$ :  $C$ ' (quote for clarity). Here  $I$  is the case number and  $C$  is an integer, the number of ways for coloring the grid *modulo* 1, 000, 000, 000.

See the sample input/output for exact formatting.

### Sample Input

```

3
3 3 3 0
3 4 4 2
3 1
3 3
2 2 5 2
1 2
2 2
  
```

**Sample Output**

Case 1: 1728

Case 2: 186624

Case 3: 20