

# Story Time

On another boring afternoon a few months ago, Lea decided to write a fantasy book which she would call “Game of Kings”, an epic tale about kings and queens, bishops and knights. Oh, and magic.

She has spent many nights imagining what would happen to all the awesome characters she would describe. Now, she just needs to compile the list of events into one book. For every character, she wrote a list of chapters which are centered around him or her. Every chapter is centered around exactly one character, as she felt it would be confusing otherwise. These have to happen in a fixed order.

Also, some chapters have a specific ordering. For example, the scene in which Queen Lena, nicknamed the “Black Queen”, has a nervous breakdown over a letter detailing the abduction of her brother, a famous knight, has to happen after the description of the abduction from her brothers point of view. (The story would go on to detail how her knight would be brainwashed into a fearsome “White Knight” that would be difficult to keep in check.) Lastly, two sequential chapters should not be centered around the same character - that would just be boring.

Can you tell her in how many possible ways she can arrange all the scenes she imagined?

## Input

The first line of the input contains an integer  $t$ .  $t$  test cases follow, each of them separated by a blank line.

Each test case consists of two integers  $n$  and  $m$ , where  $n$  is the number of characters (indexed from 1 to  $n$ ) and  $m$  is the number of dependencies between chapters.  $n$  lines follow. The  $i$ -th line consists of a single integer  $a_i$ , the amount of chapters that are centered around character  $i$ .  $m$  lines follow. The  $j$ -th line consists of four integers  $c_j$ ,  $p_j$ ,  $d_j$ , and  $q_j$  and means that the  $p_j$ -th chapter centered around character  $c_j$  has to happen before the  $q_j$ -th chapter centered around  $d_j$ .

## Output

For each test case, output one line containing “Case # $i$ :  $x$ ” where  $i$  is its number, starting at 1, and  $x$  is the amount of possible orderings of the chapters such that:

- Sequential chapters are about different characters.
- Chapters about a single character are in a fixed order.
- All  $m$  inter-chapter-dependencies are fulfilled.

Each line of the output should end with a line break.

## Constraints

- $1 \leq t \leq 20$
- $1 \leq n \leq 6$
- $0 \leq m \leq 15$
- $1 \leq p_i, q_i \leq a_i \leq 13$
- $c_j \neq d_j$
- $1 \leq c_i, d_i \leq n$
- There are at most 13 chapters.

**Sample Input 1**

```
2
3 0
2
2
2

4 3
3
3
2
3
1 1 2 3
1 3 2 2
3 1 2 1
```

**Sample Output 1**

```
Case #1: 30
Case #2: 570
```

**Sample Input 2**

```
5
2 2
3
3
2 1 1 2
1 3 2 3

3 1
1
2
2
2 1 3 2

3 1
2
1
1
3 1 1 2

2 2
3
2
1 1 2 2
2 2 1 3

3 2
2
2
2
1 2 3 2
1 1 3 1
```

**Sample Output 2**

```
Case #1: 1
Case #2: 12
Case #3: 5
Case #4: 1
Case #5: 11
```