Planar Exact Cover

Input file:	`standard input`
Output file:	`standard output`
Time limit:	3 seconds
Memory limit:	1024 megabytes

The farmers' market has N stalls and M storage barns on a two-dimensional plane. There are $6M$ roads, each connecting a stall to a storage barn, such that no two roads intersect except at endpoints. In other words, the stalls and barns form a planar bipartite graph. Furthermore, every storage barn is connected to exactly 6 distinct stalls.

Busy Beaver wants to select a subset of storage barns such that every stall is connected to exactly one selected barn by a road. How many ways are there to choose such a subset? As the answer may be large, output it modulo $10^9 + 7$.

Input

The first line contains a single integer T $(1 \le T \le 10^4)$ — the number of test cases.

The first line of each test case contains two integers N and M $(6 \le N \le 3 \cdot 10^5$, $N/6 \le M \le 10^5$, $N \equiv 0 \pmod 6)$, the number of stalls and the number of barns, respectively.

The i-th of the next M lines starts with the integer 6, followed by 6 **distinct** integers $a_{i1}, \ldots, a_{i6}$ $(1 \le a_{ij} \le N$ for all $1 \le j \le 6)$, describing the stalls connected to the i-th barn in clockwise order.

The i-th of the next N lines starts with an integer d_i $(1 \le d_i \le M)$, followed by d_i **distinct** integers $b_{i1}, \ldots, b_{id_i}$ $(1 \le b_{ij} \le M$ for all $1 \le j \le d_i)$, describing the barns connected to the i-th stall in clockwise order.

It is guaranteed that the input describes a valid planar combinatorial embedding.

The sum of N across all test cases does not exceed $3 \cdot 10^5$.

The sum of M across all test cases does not exceed 10^5.

Output

Output a single integer for each test case: the number of ways, modulo $10^9 + 7$.

Scoring

There are two subtasks for this problem.

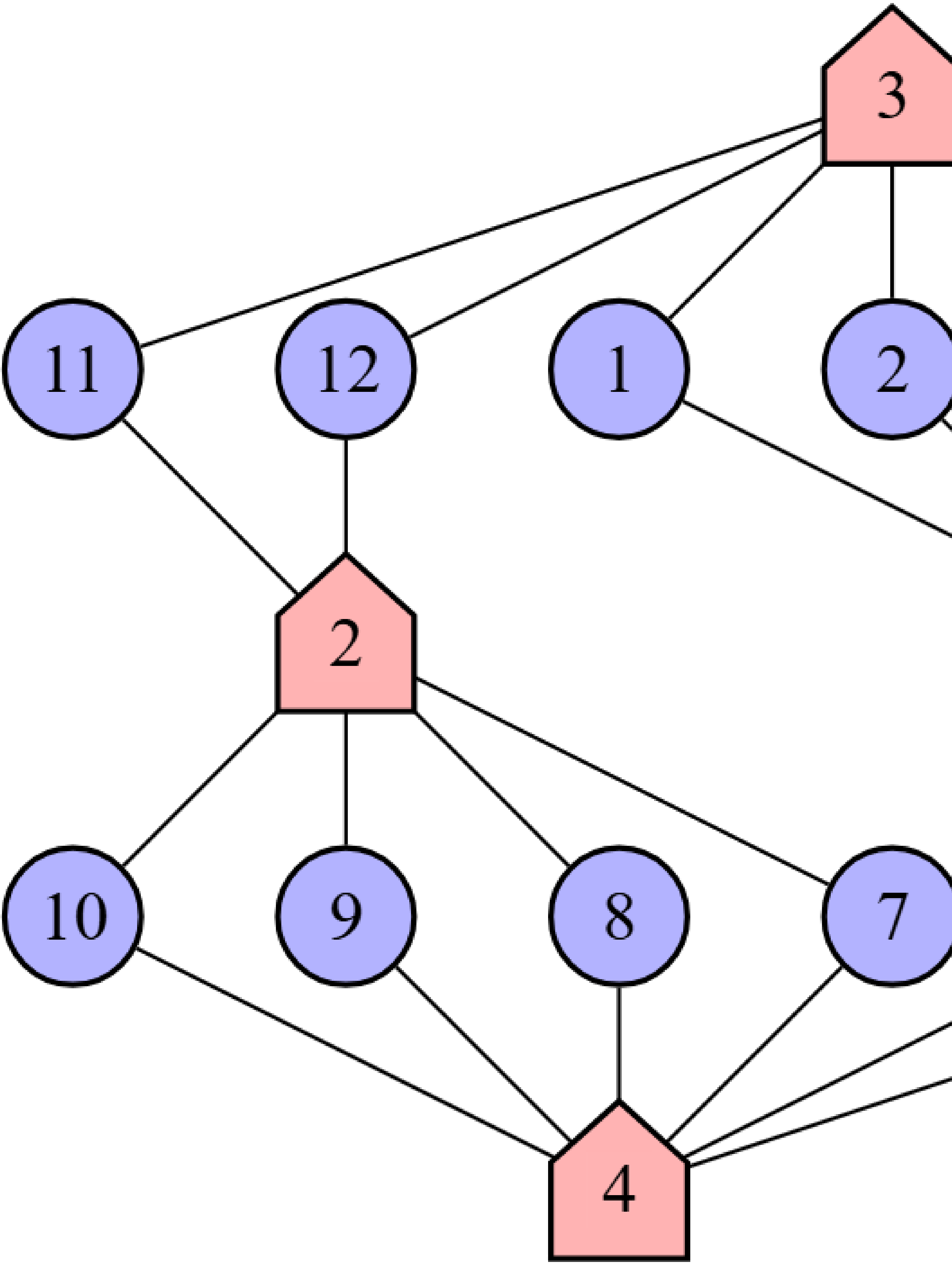
- (50 points): The sum of N across all test cases does not exceed $3 \cdot 10^3$, and the sum of M across all test cases does not exceed 10^3.
- (50 points): No additional constraints.

Example

standard input	standard output
2	2
12 4	0
6 1 2 3 4 5 6	
6 7 8 9 10 11 12	
6 4 3 2 1 12 11	
6 10 9 8 7 6 5	
2 1 3	
2 1 3	
2 1 3	
2 1 3	
2 1 4	
2 1 4	
2 2 4	
2 2 4	
2 2 4	
2 2 4	
2 2 3	
2 2 3	
12 4	
6 1 2 3 4 5 6	
6 6 7 8 9 10 11	
6 1 12 6 11 10 9	
6 8 7 6 5 4 3	
2 1 3	
1 1	
2 1 4	
2 1 4	
2 1 4	
4 1 4 2 3	
2 2 4	
2 2 4	
2 2 3	
2 2 3	
2 2 3	
1 3	

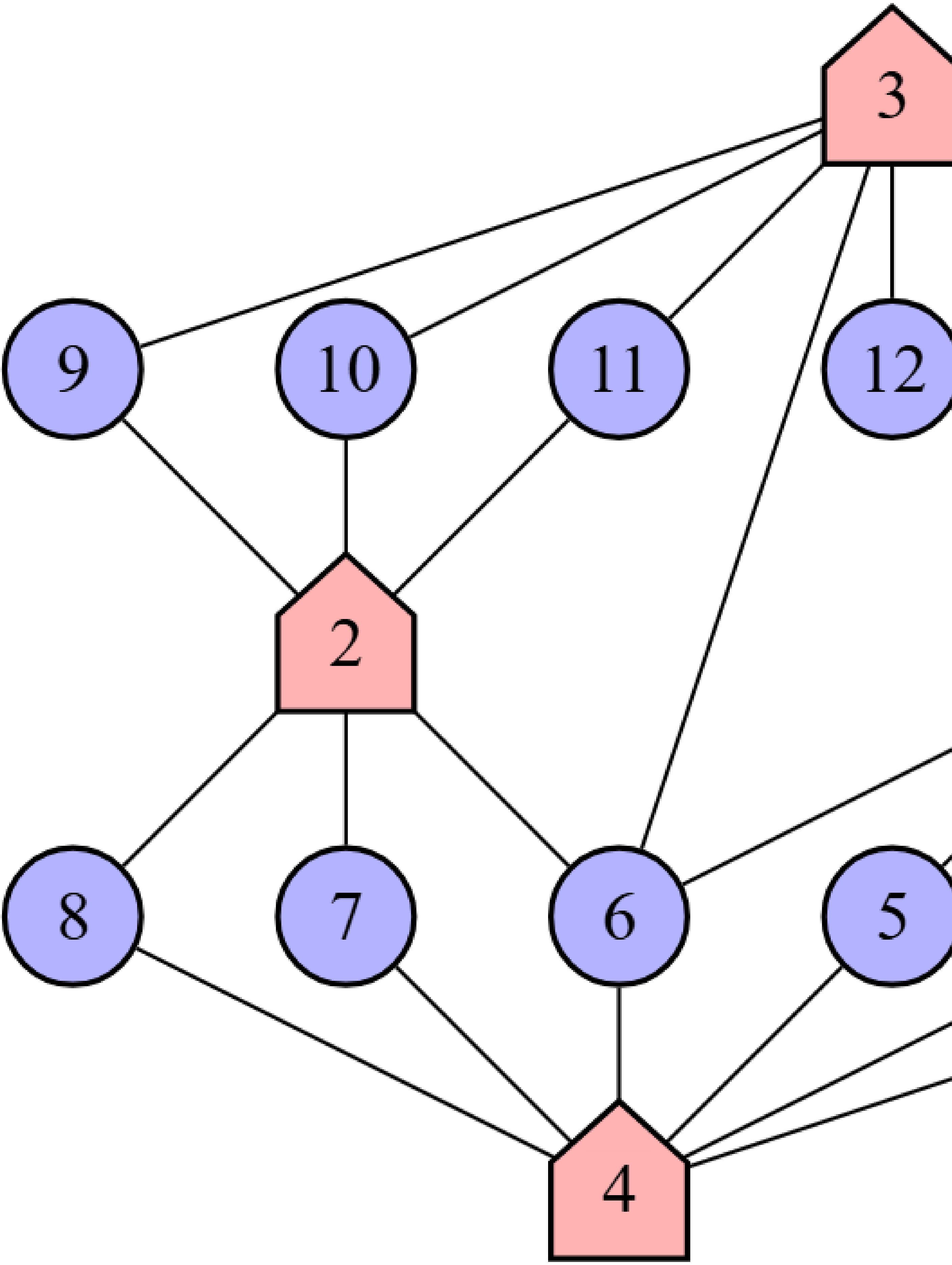
Note

In the first test case, the barns and stalls are as follows:


3
11
12
1
2
2
10
9
8
7
4

There are 2 ways to select the subset: either choosing barns 1 and 2, or choosing barns 3 and 4.

In the second test case, the barns and stalls are as follows:


3
9
10
11
12
2
8
7
6
5
4

Note that the barns connected to stall 6 are listed in clockwise order: $1, 4, 2, 3$. There are no ways to select a subset of barns such that every stall is connected to exactly one selected barn.