Permutation Game 4

HackerRank

You are given an initially empty array a. You may perform the following operation any number of times: Choose an integer s ≥ 1 and append a cyclic shift of the array [1, 2, …, s] to the end of a. Formally, select integers s and r such that 1 ≤ r ≤ s, and append the array [r, r+1, …, s, 1, 2, …, r−1] to the end of a. You are also given an integer n and m restrictions of the form $a_i \neq x$. That is, for each of the m restrictions, the value at position i in the final array must not be equal to x. Your task is to count the number of distinct arrays of length exactly n that can be constructed using the allowed operation and satisfy all of the given restrictions. Two arrays are considered different if they differ at any position from 1 to n. Print the answer modulo 998244353.

Input Format

Each test contains multiple test cases. The first line contains the number of test cases t (1 ≤ t ≤ 5000). The description of the test cases follows. The first line of each test case contains two integers n and m (1 ≤ n ≤ 5000, 0 ≤ m ≤ min(5000, n^2)) — the length of the array a and the number of restrictions. The following m lines each contain two integers i and x (1 ≤ i, x ≤ n), indicating that $a_i \neq x$ is a requirement of the final array. It is guaranteed that no limitation is given more than once. It is guaranteed that the sum of n over all test cases does not exceed 5000, and the sum of m over all test cases does not exceed 5000.

Constraints

- 1 ≤ t ≤ 5000
- 1 ≤ n ≤ 5000, 0 ≤ m ≤ min(5000, n^2)
- 1 ≤ i, x ≤ n

Output Format

For each test case, output the number of arrays modulo 998244353.

Sample Input 0

```
7
3 0
3 3
1 1
2 1
3 1
3 2
1 1
2 1
6 2
2 3
4 2
2 3
1 2
2 2
1 1
4 3
2 2
3 2
4 2
```

```
3 2
2 3
3 3
```

Sample Output 0

```
7
0
1
65
0
4
5
```