

6305 Ranking Number

There is an International Communication and Pastime Company (ICPC) with k departments. Some important managers of this company plan to propose a cross-department project. They first organize a project committee to handle this project. The project committee members are invited from k departments such that each department has at least one member invited to join the project committee. Note that any two departments can share members if they are in the project committee. Two members X and Y can *directly* discuss the project, denoted by $X \leftrightarrow Y$, if and only if they are in the same department or they are both in the project committee. In addition, two members X and Y can *indirectly* discuss the project if and only if they can discuss the project via another $t - 2$ members $M_1 (= X), M_2, \dots, M_{t-1}, M_t (= Y)$ such that $M_1 \leftrightarrow M_2 \leftrightarrow M_3 \leftrightarrow \dots \leftrightarrow M_{t-1} \leftrightarrow M_t$, where $t \leq 3$. We call M_i for $2 \leq i \leq t - 1$ *key persons* for X and Y .

For some security reason, the chief executive officer of this company asks the Human Resources to assign a “*ranking number*” to each member X using $r(X) \in RN = \{1, 2, \dots, \alpha\}$ for some $1 \leq \alpha \leq 10001$ such that the following *ranking conditions* hold:

1. Two persons from the same department or from the project committee must receive different ranking numbers.
2. If there exist two persons, X and Y , with the same ranking number q , then they can indirectly discuss the project and there exists a key person Z for X and Y such that the ranking number of Z is higher than q (i.e., $r(Z) > r(X) = r(Y) = q$).

Given a company with k departments D_1, D_2, \dots, D_k , where $1 \leq k \leq 1000$, and the project committee D_0 , let $|D_j|$ for $0 \leq j \leq k$ denote the number of members in D_j , where $1 \leq |D_0| \leq 10000$ and $2 \leq |D_i| \leq 10001$ for $1 \leq i \leq k$. Your task is to provide a computer program to compute the minimum α in RN such that the ranking conditions hold. We call such an α optimal ranking number.

For example, assume that there are three departments D_1, D_2 , and D_3 in the company. D_1 has three members: A, B , and C ; D_2 has two members: D and E ; and D_3 has four members: F, G, H , and I . The members of project committee D_0 are A, D , and F . Then, we can assign the ranking numbers to the members with $r(A) = 3, r(B) = 1, r(C) = 2, r(D) = 4, r(E) = 1, r(F) = 5, r(G) = 3, r(H) = 1$, and $r(I) = 2$. In this assignment, although A and G have been assigned the same ranking number 3, they can indirectly discuss the project via F with $A \leftrightarrow F \leftrightarrow G$, where $r(F) = 5 > r(A) = r(G) = 3$. The similar reasons can apply to members C and I , and any two members in $\{B, E, H\}$. Hence, the ranking conditions hold. In this case, $\alpha = 5$. However, there exists another ranking with $r(A) = 3, r(B) = 1, r(C) = 2, r(D) = 2, r(E) = 1, r(F) = 4, r(G) = 3, r(H) = 2$, and $r(I) = 1$. In this assignment, $\alpha = 4$. In fact, the optimal ranking number equals 4.

Input

For convenience, we use $\{1, 2, \dots, i\}$ to denote i project committee members.

The first line of the input file contains an integer, denoting the number of test cases to follow. For each case, the k departments and $|D_0|$ project committee members are given the following format: The first line contains two positive integers, k and $|D_0|$, separated by a space. In the following k lines, each line contains $m + 2$ positive integers and any two consecutive integers are separated by a space. The first positive integer m indicates the number of members invited from the corresponding department to join the project committee; the second positive integer indicates the number of members in the department; and the following m positive integers represent the project committee members.

Output

For each case, output the optimal ranking number.

Sample Input

```
3
3 3
1 3 2
1 2 1
1 4 3
4 3
1 4 3
1 2 1
1 3 1
1 3 2
2 4
2 9 1 3
2 12 2 4
```

Sample Output

```
4
5
12
```