Hasso Plattner Institut
IT Systems Engineering | Universität Potsdam

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Sommersemester 2017

Week 12 – (Adv.) Competitive Programming

Abgabe 10.07.2017 17:00 Uhr, über das Judge-Interface

bachelorprojects: (100 points - 2 seconds timelimit)

Its July again and the current fourth semester students are choosing their bachelorprojects. But this year there are a few things new. The main difference is, that the algorithm is not longer Prof. Döllner himself, no this time there should be a algorithm, which directly finds the best possible solution. Secondly each student has to select his five favourite projects and give them the priorities 1 to 5 (where the project with the priority 1 is the project with the highest priority).

After the deadline for the submissions, Prof. Döllner has the priorities of all students and he wants to compute a assignment, so that the sum over all priorities is as small as possible. Since he knows, that you have some great knowledge about algorithms, please help him finding a good distribution.

Input The input starts with one line, containing the numbers n, p, m and k. n is the number of students, p is the total number of projects, m is the number of priorities, each student gave to Prof. Döllner ($k \leq p$) and k is the amount of people in each project. You can assume, that each project has the same amount of students and that $n = p * k$ is true.

Each of the following n lines contains the priorities of one student. Every line starts with a number i, the id of the student (starting at 0). Afterwards m numbers are following. The first of the m numbers m_0 is the id of the project (which starts with 0) with the priority number 1. m_1 is id of the project with the second highest priority and m_{m-1} is the project with the least priority. ($\forall i < m, \forall j < m : i \neq j \Leftrightarrow m_i \neq m_j$) All other projects have automatically the priority $2m$.
Limitations:

- $1 \leq n \leq 300$
- $1 \leq p \leq 50$
- $1 \leq m \leq 20$
- $1 \leq k \leq 20$

Output Please return an assignment where the sum over all priorities is as small as possible. Note, that it is possible, that a student gets a project, which he hasn't selected in his priority-list. Print the assignment in n lines (sorted by the id of the student). Each line should contain two numbers i and j, where i is the id of the student and j is the id project where he has been assigned to. Every valid assignment where the sum over all priorities is as small as possible, will be accepted by the judge.

Points There are three groups of test cases:

- For the first group worth 30 points you can assume, that $n \leq 100$, $p \leq 5$, $m \leq 4$ and $k \leq 20$.
- For the second group worth 40 points you can assume, that $n \leq 250$, $p \leq 25$, $m \leq 20$ and $k \leq 10$.
- For the second group worth 30 points there are no additional assumptions.

Sample Input

```
6 3 2 2
0 0 1
1 0 1
2 0 1
3 1 0
4 1 0
5 1 2
```

Sample Output

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

The sum over all priorities is 10.