



# CyberChallenge.IT 2023 - Programming Test

## Problem 2 - “Who’s the winner?” [60 points]

The local selection of the CyberChallenge.IT program is an individual CTF competition in jeopardy-style.

Each of the  $M$  players is faced with  $N$  tasks, each of them worth a fixed amount of points  $P_1, \dots, P_N$ . Each task has a correct answer, called the *flag*, that must be submitted by players in order to get the task’s points. There are no penalties for wrong submissions and, obviously, a player can solve a task only once (which means that resubmissions of the same flag will not modify the player’s score).

At the end of the competition, the player who scored the most points is the winner. In case of a draw, the “submission time” of a player is taken into account, that is, the timestamp of the last submission that modified the player’s score. In this case, the player with lower submission time is considered the winner. So, the final scoreboard is computed by number of points in descending order, then submission time in ascending order. Finally, if there are still “draw” situations, the players are ordered by their player id, in ascending order (in particular, this is applied to players with score equal to 0, for which the submission time is not set).

Given the number of players  $M$ , tasks  $N$  and total submissions  $S$  during the competition, the list of tasks with their numerical id, amount of points and the correct flag, and the list of submissions with the associated submitted flag, timestamp and player id, can you determine the final scoreboard?

*Note: tasks are numbered from 1 to  $N$ , while players are numbered from 1 to  $M$  for convenience.*

*Note: submissions are given in random order.*

### Problem Details

#### Input

The input consists of  $N + S + 1$  lines:

- Line 1: the numbers  $M$ ,  $N$  and  $S$ , separated by a space.
- Lines 2,  $\dots$ ,  $N + 1$ : the description of the tasks. Each of these lines will have 3 space-separated values, namely the task id (a unique integer between 1 and  $N$ ), the correct flag (a string consisting only in uppercase and lowercase letters of length 10), and the number of points associated to the task (a positive integer up to 1000).
- Lines  $N + 2, \dots, N + S + 1$ : the description of the submissions. Each of these lines will have 4 space-separated values, namely the player id, the task id for which the submission was made, the flag submitted (a string of length 10) and the timestamp of the submission (a positive integer up to  $10^6$ ).

#### Output

The output must contain  $M$  lines, with two space-separated values each. The  $i$ -th line must contain the player id of the player in  $i$ -th position and the associated number of points.

#### Scoring

Your program will be tested on a number of testcases grouped in subtasks. In order to obtain the score associated to a subtask, you need to correctly solve all its testcases.

- **Subtask 1** [30 points]:  $1 \leq M \leq 10, 1 \leq N \leq 10, 1 \leq S \leq 100$ .
- **Subtask 2** [30 points]:  $1 \leq M \leq 300, 1 \leq N \leq 300, 1 \leq S \leq 50000$ .



## Examples

INPUT	OUTPUT
<pre>5 2 6 1 EfnccJSqUy0sYGO 50 2 XWmsVGHynvrEspF 100 2 2 XWmsVGHynvrEspF 7 2 1 EfnccJSqUy0sYGO 4 4 1 EfnccJSqUy0sYGO 10 1 1 EfnccJSqUy0sYGO 5 1 2 bWwinauoIIDfKpz 6 1 1 EfnccJSqUy0sYGO 25</pre>	<pre>2 150 1 50 4 50 3 0 5 0</pre>

## Explanation

From the first line, the competition has 5 players, 2 tasks and 6 total submissions. Task 1 is worth 50 points and its flag is `EfnccJSqUy0sYGO`, while task 2 is worth 100 points and its flag is `XWmsVGHynvrEspF`. Let's go through the submissions:

- Player 2 submitted a correct answer to task 2 at time 7. So their total number of points is now 100 and their submission time is 7.
- Player 2 submitted a correct answer to task 1 at time 4. So their score goes up to 150. Notice that, since the submission for task 1 happened before the one for task 2, the submission time is unchanged.
- Player 4 submitted a correct answer to task 1 at time 10. So their total number of points is now 50 and their submission time is 10.
- Player 1 submitted a correct answer to task 1 at time 5. So their total number of points is now 50 and their submission time is 5.
- Player 1 submitted a **wrong** answer to task 2 at time 6. So both their score and penalty time remain unchanged.
- Player 1 submitted a correct answer to task 1 at time 25. However, they already solved that task before, so both their score and penalty time remain unchanged.

At the end, player 2 is the only one with both tasks solved, being so in first position. Players 1 and 4 both solved only one task, so they are both at 50 points, but player 1 is in second place because of submission time (5 for player 1 and 10 for player 4). Both players 3 and 5 did not manage to get any points, so they are ordered by their id, with player 3 finishing in position 4 and player 5 in position 5.