



LEVEL 4



**Corpo:**

Well, well, would you look at that. Boss told me you had some potential but I never expected you to be so ... quick.

Well what do you expect, a raise?  
Get on with it!

**Task for Level 4:**

Calculate the ELO rating of each player!

- › The goal for this level will be to implement an **ELO ranking system**.
- › In this ranking system, all players start from a base rating value.
- › For each game, each player has an expected chance of winning based on its own rating and the opponent's.
- › **The winner gains rating points based on its expected chance of winning.**
- › In case there are players with the **same amount of points**, the one with the **lowest player id** comes before the others.

- › In order to calculate the **chance of winning** for one player the ELO system uses a logistic curve distribution
- › 
$$E_A = \frac{1}{1 + 10^{(R_B - R_A)/400}}$$
- ›  $E_A$  - Expected chance of A winning
- ›  $R_B$  - Current rating of opponent B
- ›  $R_A$  - Current rating of player A
- › This means that if  $R_A$  and  $R_B$  are equal, the expected **chance of winning is 50%**.
- › If A has 400 more rating points than B, the expected chance of winning is 90.(90)%

- › The formula for updating the ratings after a game is:

$$R'_A = R_A + K(S_A - E_A)$$

- ›  $R'_A$  - The new rating for player A
- ›  $R_A$  - The old rating for player A
- ›  $K$  - The K factor the of the ELO system. This could vary among rating brackets to get a better rating distribution of players, but for the purposes of our system we'll keep it at **32**.
- ›  $S_A$  - The “score” output of A. It will be **1** in case A **wins** and **0** if it **loses**.
- › All players start from a rating of **1000**.
- › After calculating the new rating, the result is **rounded down (floored)**

	Input	Output
Format	<pre>gameCount playerCount player1Id scorePlayer1 player2Id scorePlayer2 ... repeated for each game... player1Id scorePlayer1 player2Id scorePlayer2</pre>	<pre>playerId rating playerId rating ... repeated for all players sorted in descending order by pointCount ... playerId rating</pre>
Types	<pre>gameCount - Integer. Represents the number of games played for this test case playerCount - Integer. Represents the number of players involved in this test case. player1Id - Integer. Id of the first player involved in the game. player1Id &lt; playerCount. player1Score - Integer. Number of points obtained by the first player. player2Id - Integer. Id of the second player involved in the game. player2Id &lt; playerCount. player2Score - Integer. Number of points obtained by the second player.</pre>	<pre>playerId - Integer. rating - Integer. The rating of the player.</pre>
Example	<pre>10 4 0 159 1 68 2 96 3 95 1 83 2 237 0 50 2 28 0 310 2 168 0 39 2 306 1 858 2 429 0 401 1 212 2 833 3 294 0 240 3 57</pre>	<pre>0 1054 2 1011 1 972 3 955</pre>



PLAY  
TO  
WIN

# MOBA MATCHMAKING

GOOD LUCK