

## 3813 Rating Points Exchange

Executive of the ACM (Australian Crikey Masters) club has recently decided to switch into a new rating system in their tournaments. The new rating system is based on a combination of match result, the players' rating, the pieces that remain on the board at the end of the game, as well as a handicap for the white player's advantage for playing first (Just in case you are curious about the game of Crikey. It is a two player board game that uses black and white pieces. The list of rules is lengthy and sometimes vague. One day I shall list them.). But it is complex and requires a lot of time to calculate in a tournament with a large number of participants. A task that must be completed between matches as the result of each match changes the players' ratings. The executive wants to speed-up the process of updating the players' ratings between matches through automation and you have been asked to implement this new rating system.

I shall now explain the updating process along with an example of a game between Alice and Bob, whose current club ratings happen to be 76.91 and 76.36 respectively in the following steps:

1. Alice, who is scheduled to play white, will be treated as though she is three (3) points stronger than her current rating. This gives Alice a rating of 79.91 against Bob's rating of 76.36, and thus a rating gap of 3.55 in favor of Alice. The rating gap is defined as the higher-rated player's rating minus the lower-rated player's rating.
2. Calculate core exchange CE as "rating gap / 10" (rounded to 2 decimals), which is 0.355 (rounded to 0.36) in Alice vs Bob game. In case you have forgotten, the digits 5 to 9 are rounded up and the digits 1 to 4 are rounded down.
3. Calculate the rating points exchange (RPE) based on the match result as follows:
  - a. If the player with the higher rating (in this case, Alice) wins, then the RPE is calculated as " $1 - CE$ ". The winner's rating will go up by the RPE (in this case 0.64) and loser's rating down by the RPE.
  - b. If the player with the lower rating (in this case, Bob) wins, then the RPE is calculated as " $1 + CE$ ". The loser's rating will go down by the RPE (in this case 1.36) and the winner's rating will go up by the RPE.
  - c. If the game is drawn, then the RPE is calculated as " $CE$ ". The higher-rated player's rating (in this case Alice's rating) will go down by the RPE (in this case 0.36) and the lower-rated player's rating will go up by the RPE. If both players have the same rating (after applying the handicap rule), then their ratings will not change.
4. However if the winning side is left with crikey pieces of total value less than those of the losing side, then the RPE calculated above is then doubled; that is multiplied by 2. In our example, the RPE will be calculated as 2.72 ( $1.36 * 2$ ) in the case of Bob winning the game with the value of his remaining pieces less than those of Alice. If the game is drawn, then this rule does not apply.

### Input

The first line of the input contains a single integer between 1 and 1000, inclusive, which is the number of tournaments that follow. The description of each tournament consists of  $n + m + 1$  lines:

1. The first line consists of two integers  $n$  and  $m$  that identify the number of players and the number of games. The value of  $n$  is between 2 and 500, inclusive and the value of  $m$  is between 1 and 500, inclusive. The integers are separated by a single space.

2. Each of the following  $n$  lines consists of a string (with no blank spaces) that represents the player's name followed by a floating point number with 2 digits after the decimal point that represents the player's rating. The name of a player is a string of less than or equal to ten (10) lower-case letters.
3. Each of the next  $m$  lines contains a description of a single game in the form of three (3) strings followed by two (2) integers that are separated by single spaces. The first string is the name of the player playing white, the third string is the white player's result (lost, drew, or won), and the first integer is the total value of the white player's pieces at the end of the game. The second string is the name of the player playing black, and the second integer is the total value of the black player's pieces at the end of the game.

## Output

For each tournament the output starts with a line that contains the tournament number (the first being 'Ratings after Tournament 1'), followed by a ':', as shown in the Sample Output below, and then followed by a sequence of players' names and their ratings sorted in decreasing order of their final ratings. Players with the same rating must be sorted in decreasing alphabetic order.

## Sample Input

```
4
2 1
alice 76.91
bob 76.36
alice bob lost 20 15
2 2
alice 55.55
bob 55.55
alice bob drew 10 30
bob alice drew 20 20
2 1
alice 94.26
bob 96.00
alice bob won 10 10
3 2
alice 52.55
bob 55.55
fred 80.00
alice bob drew 10 30
fred fred lost 27 50
```

## Sample Output

```
Ratings after Tournament 1:
bob 79.08
alice 74.19
Ratings after Tournament 2:
alice 55.61
bob 55.49
Ratings after Tournament 3:
bob 95.13
```

alice 95.13

Ratings after Tournament 4:

fred 80.00

bob 55.55

alice 52.55