Instructions:

Implement the program described on the next page in a single Python file named 'chess.py' (otherwise the automatic tests will not accept your program). You can assume that the input always adheres to the assignment description.

Exercise:

The Swiss system is a ranking system often used in chess tournaments that have more players than rounds to be played. In this system a ranking list is made after each round of playing. On this ranking list, each contestant has a certain amount of points. Pairings for the next round are created in such a way that players have to play against a player who has the same amount of points if possible. This way, the good players have to play against other good players, and bad players have to play against other bad players. Winning a round grants a player 1 point, tying a round grants a player half a point, and losing a round grants a player 0 points.

To demonstrate how this system works, consider the following example. In this example, six players (Anna, Bob, Charlotte, Daniel, Erik, and Femke) play against each other in three rounds. The results of the first round are as follows:

```
Anna            vs.      Femke        Anna wins
Bob             vs.      Erik         Erik wins
Charlotte       vs.      Daniel       Tie
```

The player on the left hand-side played as white, the player on the right-hand side played as black.

The results of the second round are as follows:

```
Erik            vs.      Anna         Erik wins
Femke           vs.      Charlotte    Tie
Daniel          vs.      Bob          Daniel wins
```

The ranking table now looks as follows:

```
1. Erik                  (2 points)
2. Daniel                (1.5 points)
3. Anna and Charlotte    (1 point)
5. Femke                 (0.5 points)
6. Bob                   (0 points)
```

The results of the last round are as follows:

```
Daniel          vs.      Erik         Tie
Charlotte       vs.      Anna         Charlotte wins
Bob             vs.      Femke        Bob wins
```

And the ranking table is updated to:

```
1. Erik                  (2.5 points)
2. Charlotte and Daniel  (2 points)
4. Anna and Bob          (1 point)
6. Femke                 (0.5 points)
```

Now some players are tied in their placing, and those ties should be resolved. In the Swiss ranking system, in case two players have an equal amount of points, the rankings are decided by the players' *resistance points*. The number of resistance points for a player P are calculated by taking the sum of the points of all players that P has played against.

In case two players have an equal amount of points, and an equal amount of resistance points, the "Sonneborn-Berger system" is used. The number of *Sonnenborn-Berger* points for a player P are by taking the sum of:

- 1 times the number of points of the players that have been defeated by P
- 0.5 times the number of points of the players that have tied with P
- 0 times the number of points of the player that have defeated P

In case two players have an equal amount of points, an equal amount of resistance points, and an equal amount of Sonnenborn-Berger points, the player who played black the most number of times wins.

After all these rules have been applied, we can deduce that Daniël gets the second place over Charlotte (who now gets the third place), and that Anna gets the fourth place over Bob (who now gets the fifth place).

All these points are shown in the following table:

```
              | pt  | rp  |  SB  | b |
        -----------------------------------
1 Erik        | 2.5 | 4.0 | 3.00 | 2 |
2 Daniel      | 2.0 | 5.5 | 3.25 | 1 |
3 Charlotte   | 2.0 | 3.5 | 2.25 | 1 |
4 Anna        | 1.0 | 5.0 | 0.50 | 2 |
5 Bob         | 1.0 | 5.0 | 0.50 | 1 |
6 Femke       | 0.5 | 4.0 | 1.00 | 2 |
```

This table shows that Erik ranked first place place. He earned a total of 2.5 points (pt), 4.0 resistance points (rp), 3.0 Sonnenborn-Berger points (SB), and he played as black 2 times (b).

For this assignment, you have to write an assignment that can determine the ranking for a chess tournament. To do so, you have to implement a function `def determine_output(input)`. The parameter `input` is a string. The string first contains the names of all players, each one on a separate line. Then there is an empty line followed by the results of the first round, then an empty line followed by the results of the second round, etc. The results of a round are written in the following way:

```
<white player name> <black player name> <points earned by white player> <points earned by black player>
<white player name> <black player name> <points earned by white player> <points earned by black player>
<white player name> <black player name> <points earned by white player> <points earned by black player>
...
```

As an example, this is what input would look like in case of the tournament described on the previous page:

```
Anna
Bob
Charlotte
Daniel
Erik
Femke

Anna Femke 1 0
Bob Erik 0 1
Charlotte Daniel 0.5 0.5

Erik Anna 1 0
Femke Charlotte 0.5 0.5
Daniel Bob 1 0

Daniel Erik 0.5 0.5
Charlotte Anna 1 0
Bob Femke 1 0
```

The function `determine_output()` should return a list containing instances of the `player_result` class. The first element of the list should be the player in the first place, the second element of the list should be the player in the second place, etc. For example, the output of determine_output() in case of the tournament described on the previous page should be the following:

```
[player_result(name='Erik',     points=2.5, resistance_points=4.0, sonnenborn_berger=3.00, black=2),
 player_result(name='Daniel',   points=2.0, resistance_points=5.5, sonnenborn_berger=3.25, black=1),
 player_result(name='Charlotte', points=2.0, resistance_points=3.5, sonnenborn_berger=2.25, black=1),
 player_result(name='Anna',     points=1.0, resistance_points=5.0, sonnenborn_berger=0.50, black=2),
 player_result(name='Bob',      points=1.0, resistance_points=5.0, sonnenborn_berger=0.50, black=1),
 player_result(name='Femke',    points=0.5, resistance_points=4.0, sonnenborn_berger=1.00, black=2)]
```

Note that you are not allowed to modify the `player_result` class.

You can test your code by running `chess_test.py`. Inside that file, you can also find the input and output of another chess tournament.