Data Structures & Algorithms LAB – Fall 2015

(BS-SE-F14 Morning & Afternoon)

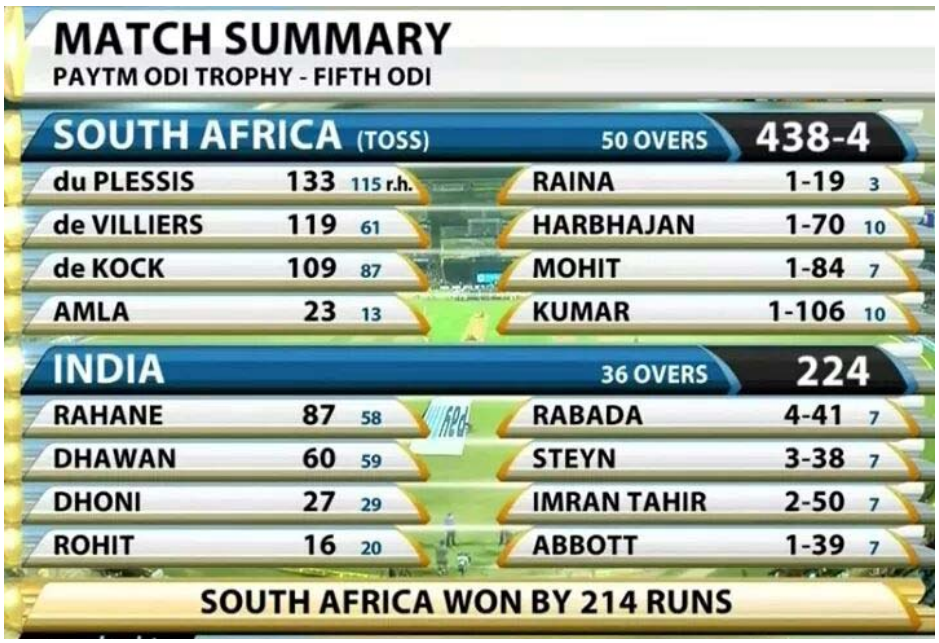
Lab # 3

Instructions:

- Make sure that there are no ***dangling pointers*** or ***memory leaks*** in your programs.
- Indent your code properly.
- Use meaningful variable and function names. Follow the naming conventions.
- Use meaningful prompt lines/labels for all input/output that is done by your programs.
- Implement all the functions **in the given order**.

Prelude

In the match summary, which is displayed at the end of a cricket match, bowling figures of bowlers are displayed in **decreasing order of Wickets** that they have taken. Furthermore, if two (or more) bowlers have the same number of wickets, then the bowler conceding **lesser runs** is displayed first. As an example, see the following screen shot of the match summary of the recently held 5th ODI (dated 25th October 2015) between South Africa and India ☺



You can see that the four Indian bowlers took 1 wicket each, so there records are displayed in increasing order of runs that they conceded.

Task # 1

In this task, you are required to sort a list of bowling figures. You are required to use the following struct **`BowlingFigures`** in your implementation:

```
const int NAME_LENGTH = 25;
struct BowlingFigures
{
      char name[NAME_LENGTH+1];   // Name of the bowler
      int wickets;                // Wickets taken by the bowler
      int runs;                   // Runs conceded by the bowler
};
```

Your program should take its input from a text file. A sample input file[*] is shown below:

```
5
Imran Khan
2 33
Wahab Riaz
4 66
Zulfiqar Babar
0 35
Yasir Shah
4 93
Shoaib Malik
0 10
```

The first line in the input file contains a positive integer indicating the number of bowling figures present in the file. Each bowler's bowling figure is on two lines in the input file. The first line contains the name of the bowler, while there are two integers on the second line which indicate the number of wickets taken and the runs conceded by the bowler, respectively. You can assume that the name of a player will contain 25 characters at max.

You are required to implement the following 3 functions:

- **`BowlingFigures* readFromFile (char* fileName, int& count);`**

  This function will take the name of an input file and an un-initialized integer variable as parameters. If the input file is not found, this function should return 0. If the file is opened successfully, this function will dynamically allocate an array of **`BowlingFigures`** and read all the bowling figures into this array. This function should store the count of the No. of bowling figures into the reference parameter (**`count`**).

[*] If you are wondering, these are the bowling figures from the England's 1st innings in the recently concluded 2nd Test Match (22 to 26 October 2015) between Pakistan and England

- **`void displayBowlingFigures (BowlingFigures * bp, int count);`**

  This function will take the array of **`BowlingFigures`** and its size as parameters, and it will display all the bowling figures on screen, in a neat and readable way.

- **`void sortBowlingFigures (BowlingFigures * bp, int count);`**

  This function will take the array of **`BowlingFigures`** and its size as parameters, and it will sort this array into **decreasing order of bowling figures** i.e. the bowling figures must be arranged in decreasing order of wickets taken, and if two (or more) bowlers have taken the same number of wickets, then the bowler(s) conceding lesser number of runs should be displayed first. You MUST use **SELECTION Sort** to sort the array of bowling figures. You can assume that in the input file, no two bowling figures will be exactly identical.

For the input file shown on the previous page, a sample run of your program will produce the following output:

```
Following 5 Bowling figures were read from the input file:

          Imran Khan  2-33
          Wahab Riaz  4-66
      Zulfiqar Babar  0-35
          Yasir Shah  4-93
        Shoaib Malik  0-10


Bowling figures after sorting are:

          Wahab Riaz  4-66
          Yasir Shah  4-93
          Imran Khan  2-33
        Shoaib Malik  0-10
      Zulfiqar Babar  0-35
```

Task # 2

Modify the function **`sortBowlingFigures(…)`** from the previous task, so that it uses **INSERTION Sort** to sort the list of bowling figures.