African Institute for Mathematical Sciences – AIMS-SN

InPy-04 – Functions, Strings, Lists & Tuples.

September 11, 2019

1 Example

In a football World Cup competition, teams are arranged in groups of 4, and each team plays every other team in its group. The aim of this question is to develop a python program to print a group table, as below, showing the relative standings of the teams after some, but not necessarily all, of the matches have been played.

Team	P	W	D	L	F	A	GD	Pts
England	2	1	1	0	3	2	1	4
Argentina	2	1	0	1	3	2	1	3
Nigeria	2	1	0	1	1	2	-1	3
Sweden	2	0	1	1	1	2	-1	1

The columns in the table have the following meanings:

- `P` The number of matches *played* by this team;
- `W` The number of matches *won* by this team;
- `D` The number of matches *drawn* by this team;
- `L` The number of matches *lost* by this team;
- `F` The number of goals scored *for* this team;
- `A` The number of goals scored *against* this team;
- `GA` The *goal difference* for this team: the difference between goals for and goals against;

`Pts` The number of *points* earned by this team: three points earned for a win, and one point for a draw.

The table is arranged is *decreasing* order of points scored; when two teams have the same number of points (for example, Argentina and Nigeria, above), the team with the higher goal difference is placed higher. We will use the following variables `team, score, result` belonging to the following classes `str, int, tuple` as inputs for our python programs.

(i) `team` $\rightarrow$ `str`

(ii) `score` $\rightarrow$ `int`

(iii) `result` $\rightarrow$ `tuple` of the form `(team, score, team, score)`

(a) Write python functions `has_won, has_lost, has_drawn` each of which takes inputs `team, result` and returns `Bool` that test whether a given tean has won, lost or drawn a match with the given result; the given team might not have actually played in the match.

Also write python functions `goals_for, goals_agianst` each of which takes inputs `team, results` and returns an integer which is the number of goals scored for or against a team in a match with the given result; again, the given team might not have actually played the match.

(b) Next we will calculate the statistics to be entered in the table for a single team which is a `tuple` of the form

`statistics` $\rightarrow$ `(team, int, int, int, int, int, int, int, int)`

where the nine fields correspond to the nine columns of the table, in order. Write a python program `get_stats` that takes a list of tuples each of the same form as `result` and `team` as inputs and returns a tuple of the same form as `statistics`.

(c) Now write a python program `get_all_stats` with two inputs – a list of tuples each of the same form as `result` and a list of strings where each string is the team name – and returns a list of tuples each of the same form as `statistics` which is the statistics of all the teams. The statistics should be listed in the order they will appear in the group table, as described above.

(d) Write a python program `show_table` that creates the group table from the statistics. This function takes a list of tuples of the same form as `statistics` and returns a `string`. Format the team name in a column 10 characters wide, the goal difference in a column 4 wide, and all other data in columns 3 characters wide.

Hence write a python program `make_table` that calculates the statistics and prints the table. This function takes as inputs, a list of tuples with each tuple of the same form as `result` and a list of strings, each string being each team represented in the world cup.