League Standing

B. N	Name
1	إبراهيم علي إبراهيم الدسوقي
3	أحمد جمال سعيد
4	أحمد حمدى محمد فهمي
12	آيه عبدالمنعم جابر
21	ريم محمود صالح

GitHub Link:

https://github.com/algorithm-project-league-standing/league-standing-

Time complexity

Read Data from file (.csv)

O(E log V)

```
83  fstream data;
84  string s, round, date, homeTeam, awayTeam, homeGoals, awayGoals, result;
85  data.open("epl_results.csv", ios::in);
86  getline(data, s, ',');getline(data, s, ',');getline(data, s, ',');getline(data, s, ',');
87  getline(data, s, ',');getline(data, s, ',');getline(data, s, '\n');
88  while(getline(data, round, ',')){
89      getline(data, date, ',');getline(data, homeTeam, ',');getline(data, awayTeam, ',');
90      getline(data, homeGoals, ',');getline(data, awayGoals, ',');getline(data, result, '\n');
91      if(stoint.find(homeTeam) == stoint.end()){
92          nteam++;
93          stoint[homeTeam] = counter++;
94          inttos[counter] = homeTeam;
95      }
96      if(stoint.find(awayTeam) == stoint.end()){
97          nteam++;
98          stoint[awayTeam] = counter++;
99          inttos[counter] = awayTeam;
100     }
101 }
102 data.close();
103
```

O(log V)

```
119 while(true){
120     vector<Team> teams;
121     for(int i = 0; i <= nteam; ++i) vis[i] = 0;
122     for(auto el : inttos){
123         teams.push_back(Team(el.second));
124     }
125     int trio, choice;
126     cout << nl <<  "1 - Search by round " << nl << nl << "2 - search by date " << nl << nl << "3 - End The Program " << nl << nl ;
127     cout << "Enter Your Choice : ";
128     cin >> trio ;
129     if(trio == 1){
130         cout << "Enter the round number : ";
131         cin >> choice;
132         for(int i = 0; i < nteam; ++i){
133             if(!vis[i]){
134                 BFS_round(i, choice, teams);
135             }
136         }
137     }
138     else if(trio == 2){
139         cout << "Enter the date in the form 'dd/mm/year' : " ;
140         string da;
141         cin >> da;
142         choice = dateToInt(da);
143         for(int i = 0; i < nteam; ++i){
144             if(!vis[i]){
145                 BFS_date(i, choice, teams);
146             }
147         }
148     }
149     else {
150         break;
151     }
152
```

O(V)

O(V)

O(V + E) using aggregation analysis

```
174     sort(teams.begin(), teams.end(), srt);
175
176     for(auto el : teams){
177         cout<< left << setw(13) << cnt
178             << left << setw(23) << el.teamName
179             << left << setw(13) << el.matchPlayed
180             << left << setw(13) << el.wins
181             << left << setw(13) << el.drawns
182             << left << setw(13) << el.loses
183             << left << setw(13) << el.goalsFor
184             << left << setw(13) << el.goalsAgainst
185             << left << setw(13) << el.goalsFor - el.goalsAgainst
186             << left << setw(13) << el.points
187             << nl << nl;
188
189         out << cnt << ','<< el.teamName << ',' << el.matchPlayed << ',' << el.wins << ',' <<
190             el.drawns << ',' << el.loses << ',' << el.goalsFor << ',' << el.goalsAgainst << ',' <<
191             el.goalsFor - el.goalsAgainst << ',' << el.points << '\n';
192
193         cnt++;
194     }
195 }
196
```

O(V log V) Sorting of teams based on their statistics

O(V)

Sorting of teams based on their statistics

```
202
203 int stringToInt(string s){
204     int res = 0;
205     for(auto el: s)
206     {
207         res = (res * 10) + (el - '0');
208     }
209     return res;
210 }
211
212 int dateToInt(string s){
213     int year, month, day;
214     std::sscanf(s.c_str(), "%d/%d/%d", &day, &month, &year) ;
215     return 10000 * year + 100 * month + day;
216 }
217
218 bool srt(Team t1, Team t2){
219     if(t1.points != t2.points)return t1.points > t2.points;
220     else if(t1.goalsFor - t1.goalsAgainst != t2.goalsFor - t2.goalsAgainst)
221         return t1.goalsFor - t1.goalsAgainst > t2.goalsFor - t2.goalsAgainst;
222     else return t1.goalsFor > t2.goalsFor;
223 }
224
```

O(1) Function to convert string to int

O(1) Function to convert date to int

O(1) Compartor function

```cpp
void BFS_round(int s, int choice, vector<Team> &teams){
    q.push(s);
    vis[s] = 1;
    while(!q.empty()){
        int u = q.front();
        q.pop();
        for(auto v : adj[u]){
            if(match.round <= choice){
                teams[u].goalsFor += match.homeGoals;
                teams[v.first].goalsAgainst += match.homeGoals;
                teams[u].goalsAgainst += match.awayGoals;
                teams[v.first].goalsFor += match.awayGoals;
                teams[u].matchPlayed++;
                teams[v.first].matchPlayed++;
                if(match.result == "H"){
                    teams[u].wins++;
                    teams[u].points +=3;
                    teams[v.first].loses ++;
                }
                else if(match.result == "A"){
                    teams[v.first].wins++;
                    teams[v.first].points +=3;
                    teams[u].loses ++;
                }
                else{
                    teams[u].drawns++;
                    teams[v.first].drawns++;
                    teams[u].points++;
                    teams[v.first].points++;
                }
            }
            if(!vis[v.first]){
                q.push(v.first);
                vis[v.first] = 1;
            }
        }
```

O(V)

O(E + V)

O(E) using aggregation analysis

Space complexity

```
64   int counter, nteam, cnt;
65   map<string, int> stoint;                          // O(V)
66   map<int, string> inttos;                          // O(V)
67   vector<vector<pair<int, Match>>> adj;             // O(V + E)
68   vector<int> vis;                                  // O(V)
69   queue<int> q;
70
```