FIFA World Cup Analysis

In [ ]:

```
# Importing the required libraries for data analysis
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import datetime
%matplotlib inline
```

In [ ]:

```
# Importing datasets
worldcups=pd.read_csv('WorldCups.csv')
matches=pd.read_csv('WorldCupMatches.csv')
players=pd.read_csv('WorldCupPlayers.csv')
```

Cleaning 'World Cups' Data

In [ ]:

```
worldcups.head(20)
```

Out[ ]:

	Year	Country	Winner	Runners-Up	Third	Fourth	GoalsScored	QualifiedTeams	MatchesPlayed	Attendance
0	1930	Uruguay	Uruguay	Argentina	USA	Yugoslavia	70	13	18	590.549
1	1934	Italy	Italy	Czechoslovakia	Germany	Austria	70	16	17	363.000
2	1938	France	Italy	Hungary	Brazil	Sweden	84	15	18	375.700
3	1950	Brazil	Uruguay	Brazil	Sweden	Spain	88	13	22	1.045.246
4	1954	Switzerland	Germany FR	Hungary	Austria	Uruguay	140	16	26	768.607
5	1958	Sweden	Brazil	Sweden	France	Germany FR	126	16	35	819.810
6	1962	Chile	Brazil	Czechoslovakia	Chile	Yugoslavia	89	16	32	893.172
7	1966	England	England	Germany FR	Portugal	Soviet Union	89	16	32	1.563.135
8	1970	Mexico	Brazil	Italy	Germany FR	Uruguay	95	16	32	1.603.975
9	1974	Germany	Germany FR	Netherlands	Poland	Brazil	97	16	38	1.865.753
10	1978	Argentina	Argentina	Netherlands	Brazil	Italy	102	16	38	1.545.791
11	1982	Spain	Italy	Germany FR	Poland	France	146	24	52	2.109.723
12	1986	Mexico	Argentina	Germany FR	France	Belgium	132	24	52	2.394.031
13	1990	Italy	Germany FR	Argentina	Italy	England	115	24	52	2.516.215
14	1994	USA	Brazil	Italy	Sweden	Bulgaria	141	24	52	3.587.538
15	1998	France	France	Brazil	Croatia	Netherlands	171	32	64	2.785.100
16	2002	Korea/Japan	Brazil	Germany	Turkey	Korea Republic	161	32	64	2.705.197
17	2006	Germany	Italy	France	Germany	Portugal	147	32	64	3.359.439
18	2010	South Africa	Spain	Netherlands	Germany	Uruguay	145	32	64	3.178.856
19	2014	Brazil	Germany	Argentina	Netherlands	Brazil	171	32	64	3.386.810

In [ ]:

```
worldcups.shape
```

Out[ ]:

```
(20, 10)
```

In [ ]:

```
worldcups.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 20 entries, 0 to 19
Data columns (total 10 columns):
 #   Column          Non-Null Count  Dtype 
---  ------          --------------  ----- 
 0   Year            20 non-null     int64 
 1   Country         20 non-null     object
 2   Winner          20 non-null     object
 3   Runners-Up      20 non-null     object
 4   Third           20 non-null     object
 5   Fourth          20 non-null     object
 6   GoalsScored     20 non-null     int64 
 7   QualifiedTeams  20 non-null     int64 
 8   MatchesPlayed   20 non-null     int64 
 9   Attendance      20 non-null     object
dtypes: int64(4), object(6)
memory usage: 1.7+ KB
```

In [ ]:
```
#Converting 'Attendance' column to int type
worldcups['Attendance']=worldcups['Attendance'].str.replace('.','').astype('int')
worldcups.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 20 entries, 0 to 19
Data columns (total 10 columns):
 #   Column          Non-Null Count  Dtype 
---  ------          --------------  ----- 
 0   Year            20 non-null     int64 
 1   Country         20 non-null     object
 2   Winner          20 non-null     object
 3   Runners-Up      20 non-null     object
 4   Third           20 non-null     object
 5   Fourth          20 non-null     object
 6   GoalsScored     20 non-null     int64 
 7   QualifiedTeams  20 non-null     int64 
 8   MatchesPlayed   20 non-null     int64 
 9   Attendance      20 non-null     int32 
dtypes: int32(1), int64(4), object(5)
memory usage: 1.6+ KB
```

In [ ]:
```
worldcups.describe()
```

Out[ ]:

	Year	GoalsScored	QualifiedTeams	MatchesPlayed	Attendance
count	20.000000	20.000000	20.000000	20.000000	2.000000e+01
mean	1974.800000	118.950000	21.250000	41.800000	1.872882e+06
std	25.582889	32.972836	7.268352	17.218717	1.071842e+06
min	1930.000000	70.000000	13.000000	17.000000	3.630000e+05
25%	1957.000000	89.000000	16.000000	30.500000	8.748315e+05
50%	1976.000000	120.500000	16.000000	38.000000	1.734864e+06
75%	1995.000000	145.250000	26.000000	55.000000	2.725173e+06
max	2014.000000	171.000000	32.000000	64.000000	3.587538e+06

In [ ]:

```
# Correcting wrong/obsolete team names
worldcups['Winner']=worldcups['Winner'].str.replace('Germany FR','Germany')
worldcups['Runners-Up']=worldcups['Runners-Up'].str.replace('Germany FR','Germany')
worldcups['Third']=worldcups['Third'].str.replace('Germany FR','Germany')
worldcups['Fourth']=worldcups['Fourth'].str.replace('Germany FR','Germany')
```

In [ ]:

```
worldcups.head()
```

Out[ ]:

	Year	Country	Winner	Runners-Up	Third	Fourth	GoalsScored	QualifiedTeams	MatchesPlayed	Attendance
0	1930	Uruguay	Uruguay	Argentina	USA	Yugoslavia	70	13	18	590549
1	1934	Italy	Italy	Czechoslovakia	Germany	Austria	70	16	17	363000
2	1938	France	Italy	Hungary	Brazil	Sweden	84	15	18	375700
3	1950	Brazil	Uruguay	Brazil	Sweden	Spain	88	13	22	1045246
4	1954	Switzerland	Germany	Hungary	Austria	Uruguay	140	16	26	768607

Cleaning 'World Cup Matches' Data

In [ ]:

```
matches.head()
```

Out[ ]:

	Year	Datetime	Stage	Stadium	City	Home Team Name	Home Team Goals	Away Team Goals	Away Team Name	Win conditions	Attendance	Half-time Home Goals	Half-time Away Goals	Referee	Assistant 1	As
0	1930.0	13 Jul 1930 - 15:00	Group 1	Pocitos	Montevideo	France	4.0	1.0	Mexico		4444.0	3.0	0.0	LOMBARDI Domingo (URU)	CRISTOPHE Henry (BEL)	
1	1930.0	13 Jul 1930 - 15:00	Group 4	Parque Central	Montevideo	USA	3.0	0.0	Belgium		18346.0	2.0	0.0	MACIAS Jose (ARG)	MATEUCCI Francisco (URU)	W
2	1930.0	14 Jul 1930 - 12:45	Group 2	Parque Central	Montevideo	Yugoslavia	2.0	1.0	Brazil		24059.0	2.0	0.0	TEJADA Anibal (URU)	VALLARINO Ricardo (URU)	
3	1930.0	14 Jul 1930 - 14:50	Group 3	Pocitos	Montevideo	Romania	3.0	1.0	Peru		2549.0	1.0	0.0	WARNKEN Alberto (CHI)	LANGENUS Jean (BEL)	M
4	1930.0	15 Jul 1930 - 16:00	Group 1	Parque Central	Montevideo	Argentina	1.0	0.0	France		23409.0	0.0	0.0	REGO Gilberto (BRA)	SAUCEDO Ulises (BOL)	RA C

In [ ]:

```
matches.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 4572 entries, 0 to 4571
Data columns (total 20 columns):
 #   Column                Non-Null Count  Dtype  
---  ------                --------------  -----  
 0   Year                  852 non-null    float64
 1   Datetime              852 non-null    object 
 2   Stage                 852 non-null    object 
 3   Stadium               852 non-null    object 
 4   City                  852 non-null    object 
 5   Home Team Name        852 non-null    object 
 6   Home Team Goals       852 non-null    float64
 7   Away Team Goals       852 non-null    float64
 8   Away Team Name        852 non-null    object 
 9   Win conditions        852 non-null    object 
 10  Attendance            850 non-null    float64
 11  Half-time Home Goals  852 non-null    float64
 12  Half-time Away Goals  852 non-null    float64
 13  Referee               852 non-null    object 
 14  Assistant 1           852 non-null    object 
 15  Assistant 2           852 non-null    object 
 16  RoundID               852 non-null    float64
 17  MatchID               852 non-null    float64
 18  Home Team Initials    852 non-null    object 
 19  Away Team Initials    852 non-null    object 
dtypes: float64(8), object(12)
memory usage: 714.5+ KB
```

In [ ]:

```
# Removing duplicates in matches table
matches.drop_duplicates(inplace=True)
```

In [ ]:

```
# Checking for NaN values in Attendance column, as refected in .info() method
matches[matches['Attendance'].isna()==True]
```

Out[ ]:

	Year	Datetime	Stage	Stadium	City	Home Team Name	Home Team Goals	Away Team Goals	Away Team Name	Win conditions	Attendance	Half-time Home Goals	Half-time Away Goals	Referee	Assistant 1	Assistant 2
823	2014.0	30 Jun 2014 - 17:00	Round of 16	Estadio Beira-Rio	Porto Alegre	Germany	2.0	1.0	Algeria	Germany win after extra time	NaN	0.0	0.0	RICCI Sandro (BRA)	DE CARVALHO Emerson (BRA)	VAN GASSE Marcelo (BRA)
852	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN

In [ ]:

```
#Filling missing value for attendance with the average of attendance from matches where Germany is Home Team in 2014 World Cup
df_2014=matches[matches['Year']==2014]
avg_attendance=round(df_2014[df_2014['Home Team Name']=='Germany']['Attendance'].mean(),0)
matches.loc[823,'Attendance']=avg_attendance
```

In [ ]:

```
# Removing blank rows from matches table
matches.dropna(inplace=True)
matches.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 836 entries, 0 to 835
Data columns (total 20 columns):
 #   Column                Non-Null Count  Dtype  
---  ------                --------------  -----  
 0   Year                  836 non-null    float64
 1   Datetime              836 non-null    object 
 2   Stage                 836 non-null    object 
 3   Stadium               836 non-null    object 
 4   City                  836 non-null    object 
 5   Home Team Name        836 non-null    object 
 6   Home Team Goals       836 non-null    float64
 7   Away Team Goals       836 non-null    float64
 8   Away Team Name        836 non-null    object 
 9   Win conditions        836 non-null    object 
 10  Attendance            836 non-null    float64
 11  Half-time Home Goals  836 non-null    float64
 12  Half-time Away Goals  836 non-null    float64
 13  Referee               836 non-null    object 
 14  Assistant 1           836 non-null    object 
 15  Assistant 2           836 non-null    object 
 16  RoundID               836 non-null    float64
 17  MatchID               836 non-null    float64
 18  Home Team Initials    836 non-null    object 
 19  Away Team Initials    836 non-null    object 
dtypes: float64(8), object(12)
memory usage: 137.2+ KB
```

In [ ]:

```
matches['Home Team Name'].value_counts()
```

Out[ ]:

```
Home Team Name
Brazil                        78
Italy                         57
Argentina                     52
Germany FR                    43
England                       35
                              ..
Wales                          1
Norway                         1
rn">United Arab Emirates       1
Haiti                          1
rn">Bosnia and Herzegovina     1
Name: count, Length: 78, dtype: int64
```

In [ ]:

```
# Correcting Team names
matches[matches['Home Team Name'].str.contains('rn">')]['Home Team Name'].value_counts()
```

Out[ ]:

```
Home Team Name
rn">Republic of Ireland       5
rn">United Arab Emirates      1
rn">Trinidad and Tobago       1
rn">Serbia and Montenegro     1
rn">Bosnia and Herzegovina    1
Name: count, dtype: int64
```

In [ ]:

```
# Correcting Team names
matches[matches['Away Team Name'].str.contains('rn">')]['Away Team Name'].value_counts()
```

Out[ ]:

```
Away Team Name
rn">Republic of Ireland       8
rn">United Arab Emirates      2
rn">Trinidad and Tobago       2
rn">Serbia and Montenegro     2
rn">Bosnia and Herzegovina    2
Name: count, dtype: int64
```

In [ ]:

```
# Correcting Team names
matches[matches['Home Team Name'].str.contains('Germany')]['Home Team Initials']
```

Out[ ]:

```
22     GER
27     GER
33     GER
79     FRG
91     FRG
      ...
769    GER
783    GER
799    GER
823    GER
828    GER
Name: Home Team Initials, Length: 75, dtype: object
```

In [ ]:

```
# Correcting Team names
matches['Home Team Name']=matches['Home Team Name'].str.replace('rn">','')
matches['Away Team Name']=matches['Away Team Name'].str.replace('rn">','')
matches['Home Team Name']=matches['Home Team Name'].str.replace('Germany FR','Germany')
matches['Away Team Name']=matches['Away Team Name'].str.replace('Germany FR','Germany')
matches['Win conditions']=matches['Win conditions'].str.replace('Germany FR','Germany')
```

```
matches['Home Team Initials']=matches['Home Team Initials'].str.replace('FRG','GER')
matches['Away Team Initials']=matches['Away Team Initials'].str.replace('FRG','GER')
```

In [ ]:

```
# Table is now clean
matches.head()
```

Out[ ]:

	Year	Datetime	Stage	Stadium	City	Home Team Name	Home Team Goals	Away Team Goals	Away Team Name	Win conditions	Attendance	Half-time Home Goals	Half-time Away Goals	Referee	Assistant 1	As
0	1930.0	13 Jul 1930 - 15:00	Group 1	Pocitos	Montevideo	France	4.0	1.0	Mexico		4444.0	3.0	0.0	LOMBARDI Domingo (URU)	CRISTOPHE Henry (BEL)	
1	1930.0	13 Jul 1930 - 15:00	Group 4	Parque Central	Montevideo	USA	3.0	0.0	Belgium		18346.0	2.0	0.0	MACIAS Jose (ARG)	MATEUCCI Francisco (URU)	W
2	1930.0	14 Jul 1930 - 12:45	Group 2	Parque Central	Montevideo	Yugoslavia	2.0	1.0	Brazil		24059.0	2.0	0.0	TEJADA Anibal (URU)	VALLARINO Ricardo (URU)	
3	1930.0	14 Jul 1930 - 14:50	Group 3	Pocitos	Montevideo	Romania	3.0	1.0	Peru		2549.0	1.0	0.0	WARNKEN Alberto (CHI)	LANGENUS Jean (BEL)	M
4	1930.0	15 Jul 1930 - 16:00	Group 1	Parque Central	Montevideo	Argentina	1.0	0.0	France		23409.0	0.0	0.0	REGO Gilberto (BRA)	SAUCEDO Ulises (BOL)	RAI C

Cleaning 'World Cup Players' Data

In [ ]:

```
players.head()
```

Out[ ]:

	RoundID	MatchID	Team Initials	Coach Name	Line-up	Shirt Number	Player Name	Position	Event
0	201	1096	FRA	CAUDRON Raoul (FRA)	S	0	Alex THEPOT	GK	NaN
1	201	1096	MEX	LUQUE Juan (MEX)	S	0	Oscar BONFIGLIO	GK	NaN
2	201	1096	FRA	CAUDRON Raoul (FRA)	S	0	Marcel LANGILLER	NaN	G40'
3	201	1096	MEX	LUQUE Juan (MEX)	S	0	Juan CARRENO	NaN	G70'
4	201	1096	FRA	CAUDRON Raoul (FRA)	S	0	Ernest LIBERATI	NaN	NaN

In [ ]:

```
players.shape
```

Out[ ]:

```
(37784, 9)
```

In [ ]:

```
players.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 37784 entries, 0 to 37783
Data columns (total 9 columns):
 #   Column         Non-Null Count  Dtype 
---  ------         --------------  ----- 
 0   RoundID        37784 non-null  int64 
 1   MatchID        37784 non-null  int64 
 2   Team Initials  37784 non-null  object
 3   Coach Name     37784 non-null  object
 4   Line-up        37784 non-null  object
 5   Shirt Number   37784 non-null  int64 
 6   Player Name    37784 non-null  object
 7   Position       4143 non-null   object
 8   Event          9069 non-null   object
dtypes: int64(3), object(6)
memory usage: 2.6+ MB
```

In [ ]:

```
players['Position'].value_counts()
```

Out[ ]:

```
Position
GK     2441
C      1510
GKC     192
Name: count, dtype: int64
```

In [ ]:

```
players['Event'].value_counts()
```

Out[ ]:

```
Event
OH46'                 247
IH46'                 206
Y1'                    87
I77'                   78
I78'                   78
                     ...
Y58' G59' G81'          1
P4'                     1
Y1' Y49' RSY49'         1
G18' G84'               1
G60' O83'               1
Name: count, Length: 1893, dtype: int64
```

In [ ]:

```
# Filling blank values with 0
players.fillna(0, inplace=True)
```

In [ ]:

```
# Correcting Team names
players['Team Initials']=players['Team Initials'].str.replace('FRG','GER')
```

In [ ]:

```
players.head()
```

Out[ ]:

	RoundID	MatchID	Team Initials	Coach Name	Line-up	Shirt Number	Player Name	Position	Event
0	201	1096	FRA	CAUDRON Raoul (FRA)	S	0	Alex THEPOT	GK	0
1	201	1096	MEX	LUQUE Juan (MEX)	S	0	Oscar BONFIGLIO	GK	0
2	201	1096	FRA	CAUDRON Raoul (FRA)	S	0	Marcel LANGILLER	0	G40'
3	201	1096	MEX	LUQUE Juan (MEX)	S	0	Juan CARRENO	0	G70'
4	201	1096	FRA	CAUDRON Raoul (FRA)	S	0	Ernest LIBERATI	0	0

Feature Engineering

In [ ]:

```
# Removing whitespaces from the column
matches['Win conditions']=matches['Win conditions'].str.strip()
```

In [ ]:

```
# Creating Winner column
for i in list(matches.index):
    if matches.loc[i,'Home Team Goals'] > matches.loc[i,'Away Team Goals']: matches.loc[i,'Winner']=matches.loc[i,'Home Team Name
    elif matches.loc[i,'Home Team Goals'] < matches.loc[i,'Away Team Goals']: matches.loc[i,'Winner']=matches.loc[i,'Away Team Na
    elif matches.loc[i,'Home Team Name'] in matches.loc[i,'Win conditions']: matches.loc[i,'Winner']=matches.loc[i,'Home Team Nam
    elif matches.loc[i,'Away Team Name'] in matches.loc[i,'Win conditions']: matches.loc[i,'Winner']=matches.loc[i,'Away Team Nam
    elif matches.loc[i,'Win conditions']=='': matches.loc[i,'Winner']='Draw'
    elif int(matches.loc[i,'Win conditions'][-2])<int(matches.loc[i,'Win conditions'][-6]): matches.loc[i,'Winner']=matches.loc[i
    elif int(matches.loc[i,'Win conditions'][-2])>int(matches.loc[i,'Win conditions'][-6]): matches.loc[i,'Winner']=matches.loc[i
```

In [ ]:

```
matches.head(10)
```

Out[ ]:

	Year	Datetime	Stage	Stadium	City	Home Team Name	Home Team Goals	Away Team Goals	Away Team Name	Win conditions	...	Half-time Home Goals	Half-time Away Goals	Referee	Assistant 1	Assista
0	1930.0	13 Jul 1930 - 15:00	Group 1	Pocitos	Montevideo	France	4.0	1.0	Mexico		...	3.0	0.0	LOMBARDI Domingo (URU)	CRISTOPHE Henry (BEL)	RI Gilb (E
1	1930.0	13 Jul 1930 - 15:00	Group 4	Parque Central	Montevideo	USA	3.0	0.0	Belgium		...	2.0	0.0	MACIAS Jose (ARG)	MATEUCCI Francisco (URU)	WARN Alb (
2	1930.0	14 Jul 1930 - 12:45	Group 2	Parque Central	Montevideo	Yugoslavia	2.0	1.0	Brazil		...	2.0	0.0	TEJADA Anibal (URU)	VALLARINO Ricardo (URU)	BALV Tho (F
3	1930.0	14 Jul 1930 - 14:50	Group 3	Pocitos	Montevideo	Romania	3.0	1.0	Peru		...	1.0	0.0	WARNKEN Alberto (CHI)	LANGENUS Jean (BEL)	MATEU Franc (U
4	1930.0	15 Jul 1930 - 16:00	Group 1	Parque Central	Montevideo	Argentina	1.0	0.0	France		...	0.0	0.0	REGO Gilberto (BRA)	SAUCEDO Ulises (BOL)	RADULE Consta (R
5	1930.0	16 Jul 1930 - 14:45	Group 1	Parque Central	Montevideo	Chile	3.0	0.0	Mexico		...	1.0	0.0	CRISTOPHE Henry (BEL)	APHESTEGUY Martin (URU)	LANGEI Jean (
6	1930.0	17 Jul 1930 - 12:45	Group 2	Parque Central	Montevideo	Yugoslavia	4.0	0.0	Bolivia		...	0.0	0.0	MATEUCCI Francisco (URU)	LOMBARDI Domingo (URU)	WARN Alb (
7	1930.0	17 Jul 1930 - 14:45	Group 4	Parque Central	Montevideo	USA	3.0	0.0	Paraguay		...	2.0	0.0	MACIAS Jose (ARG)	APHESTEGUY Martin (URU)	TEJA Ar (U
8	1930.0	18 Jul 1930 - 14:30	Group 3	Estadio Centenario	Montevideo	Uruguay	1.0	0.0	Peru		...	0.0	0.0	LANGENUS Jean (BEL)	BALWAY Thomas (FRA)	CRISTO Henry (
9	1930.0	19 Jul 1930 - 12:50	Group 1	Estadio Centenario	Montevideo	Chile	1.0	0.0	France		...	0.0	0.0	TEJADA Anibal (URU)	LOMBARDI Domingo (URU)	RI Gilb (E

10 rows × 21 columns

In [ ]:

```
players['Event'].value_counts()
```

Out[ ]:

```
Event
0                  28715
OH46'                247
IH46'                206
Y1'                   87
I77'                  78
                   ...  
Y58' G59' G81'         1
P4'                    1
Y1' Y49' RSY49'        1
G18' G84'              1
G60' O83'              1
Name: count, Length: 1894, dtype: int64
```

In [ ]:

```
# Removing Event time from column
players['Event']=players['Event'].str.replace('\d+', '',regex=True)
players['Event'].value_counts()
```

Out[ ]:

```
Event
I'             2342
O'             2034
Y'             1468
G'             1112
Y' O'           288
               ... 
G' G' G' P'       1
G' Y' P' O'       1
IH' G' Y'         1
IH' R'            1
P' OH'            1
Name: count, Length: 100, dtype: int64
```

In [ ]:

```
# Populating Events as individual columns and dropping Event column
players['Goal']=players['Event'].str.count("G'")
players['Penalty Goal']=players['Event'].str.count("P'")-players['Event'].str.count("MP'")
players['Yellow Card']=players['Event'].str.count("Y'")
players['Red Card']=players['Event'].str.count("R'")
players['Offside']=players['Event'].str.count("O'")
players['Injured']=players['Event'].str.count("I'")
players['Own Goal']=players['Event'].str.count("W'")
players['HalfTime IN']=players['Event'].str.count("IH'")
```

```
players['HalfTime OUT']=players['Event'].str.count("OH'")
players['Missed Penalty']=players['Event'].str.count("MP'")
players.fillna(0, inplace=True)
players.drop(columns='Event',inplace=True)
```

Data Analysis

In [ ]:

```
# Function for Bar Plots
def barplot(data,x,y,title,pal):
    plt.figure(figsize=(10,5))
    sns.barplot(data=data, x=x, y=y, palette=pal)
    plt.title(title)
    plt.ylabel(y)
    plt.show()
```

In [ ]:

```
# Function for Line Plots
def lineplot(data,x,y,title):
    plt.figure(figsize=(15,3))
    sns.lineplot(data=data, x=x, y=y, color='purple', marker='*', markersize=12)
    plt.title(title)
    plt.xlabel(x)
    plt.ylabel(y)
    plt.xticks(data[x])
    plt.show()
```

In [ ]:

```
worldcups.describe()
```

Out[ ]:

	Year	GoalsScored	QualifiedTeams	MatchesPlayed	Attendance
count	20.000000	20.000000	20.000000	20.000000	2.000000e+01
mean	1974.800000	118.950000	21.250000	41.800000	1.872882e+06
std	25.582889	32.972836	7.268352	17.218717	1.071842e+06
min	1930.000000	70.000000	13.000000	17.000000	3.630000e+05
25%	1957.000000	89.000000	16.000000	30.500000	8.748315e+05
50%	1976.000000	120.500000	16.000000	38.000000	1.734864e+06
75%	1995.000000	145.250000	26.000000	55.000000	2.725173e+06
max	2014.000000	171.000000	32.000000	64.000000	3.587538e+06

In [ ]:

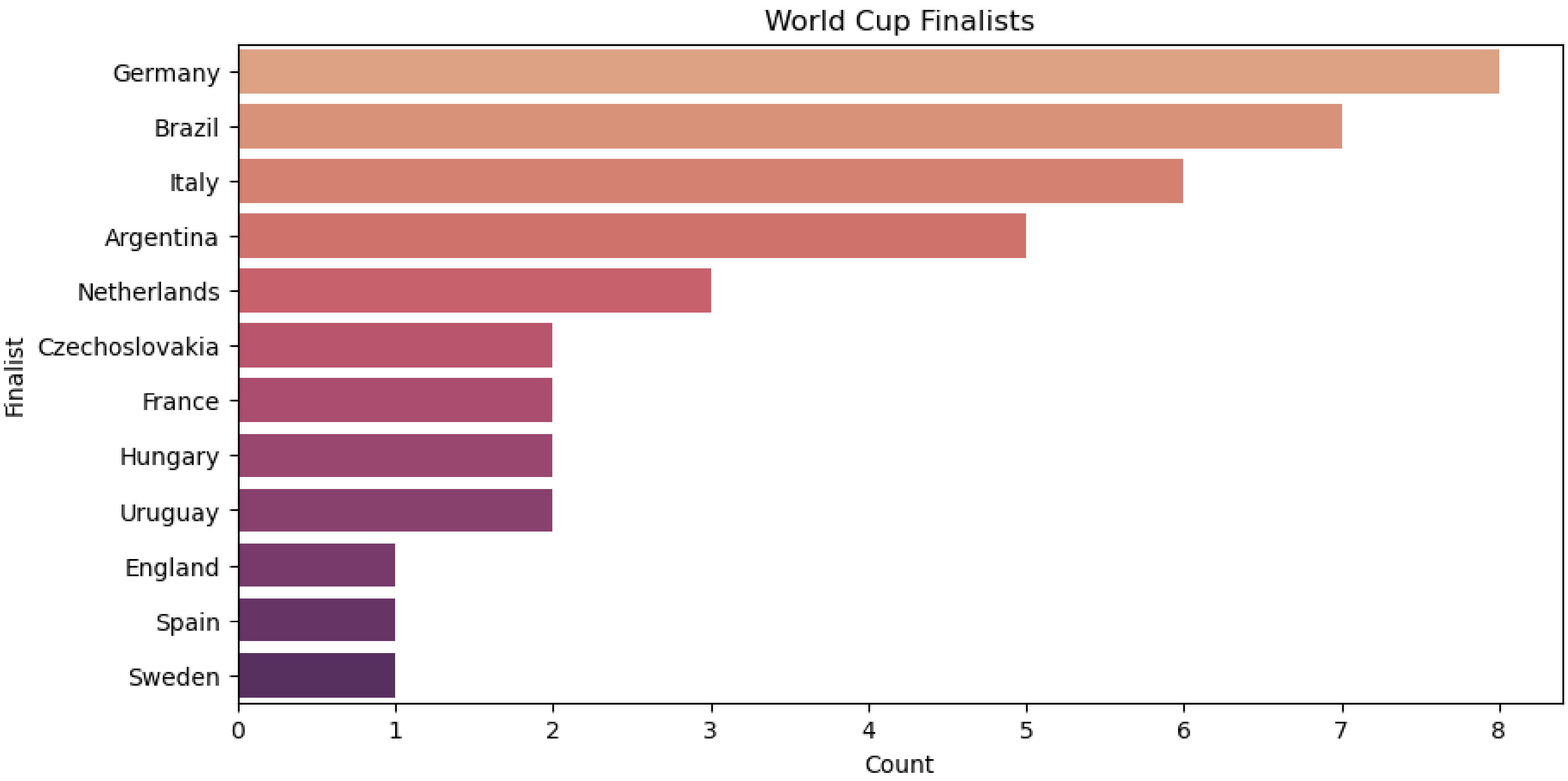
```
worldcups.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 20 entries, 0 to 19
Data columns (total 10 columns):
 #   Column          Non-Null Count  Dtype 
---  ------          --------------  ----- 
 0   Year            20 non-null     int64 
 1   Country         20 non-null     object
 2   Winner          20 non-null     object
 3   Runners-Up      20 non-null     object
 4   Third           20 non-null     object
 5   Fourth          20 non-null     object
 6   GoalsScored     20 non-null     int64 
 7   QualifiedTeams  20 non-null     int64 
 8   MatchesPlayed   20 non-null     int64 
 9   Attendance      20 non-null     int32 
dtypes: int32(1), int64(4), object(5)
memory usage: 1.6+ KB
```

In [ ]:

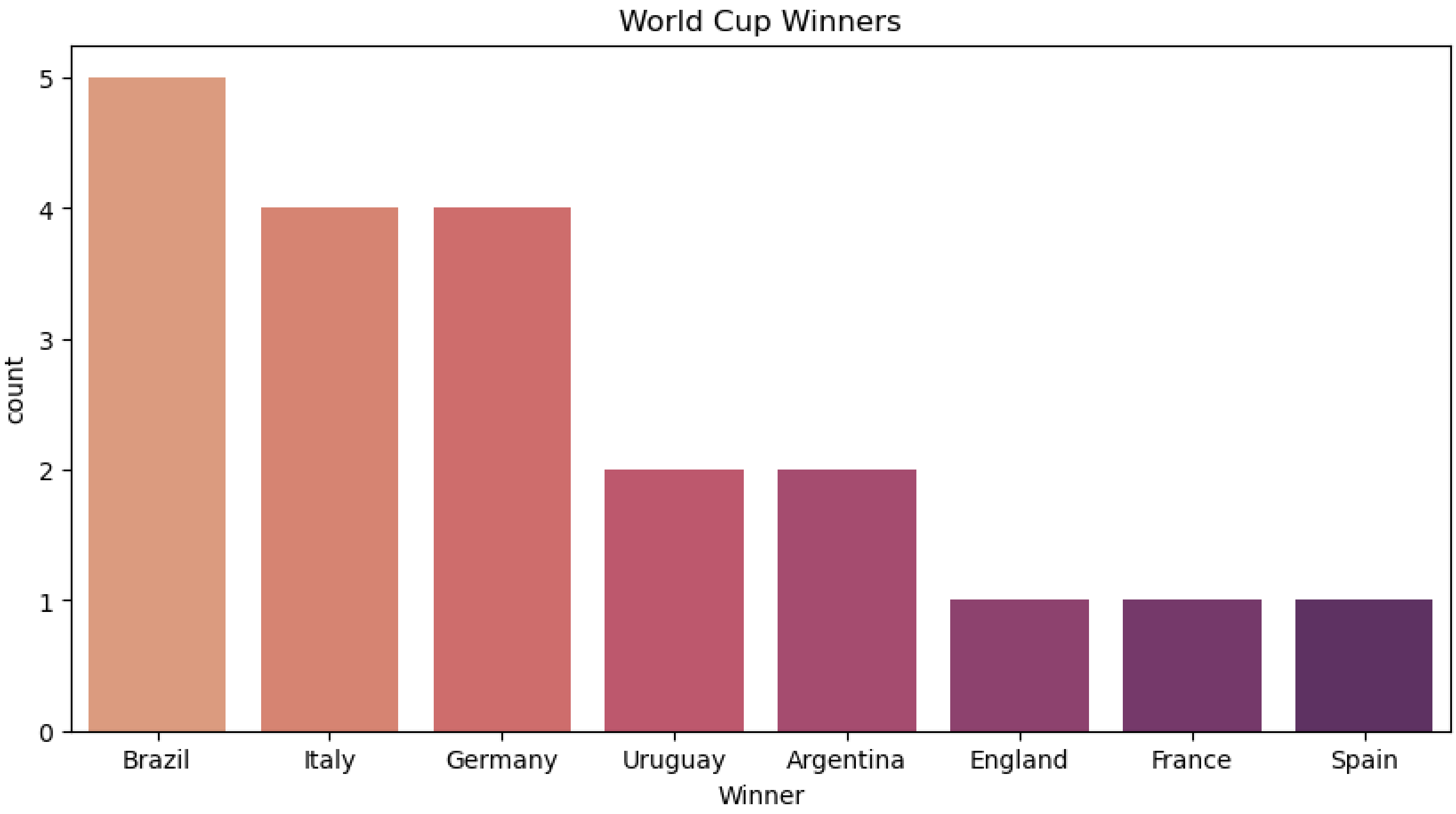
```
winners=worldcups[['Winner']]
runners=worldcups[['Runners-Up']]
winners.columns=['Finalist']
runners.columns=['Finalist']

wc_finalists = pd.concat([winners,runners],axis=0).reset_index(drop=True).groupby(['Finalist'])[['Finalist']].count()
wc_finalists.columns=['Count']
```

```
wc_finalists = wc_finalists.sort_values(by=['Count'],ascending=False).reset_index()

plottitle = 'World Cup Finalists'
barplot(wc_finalists,'Count','Finalist',plottitle,'flare')
```

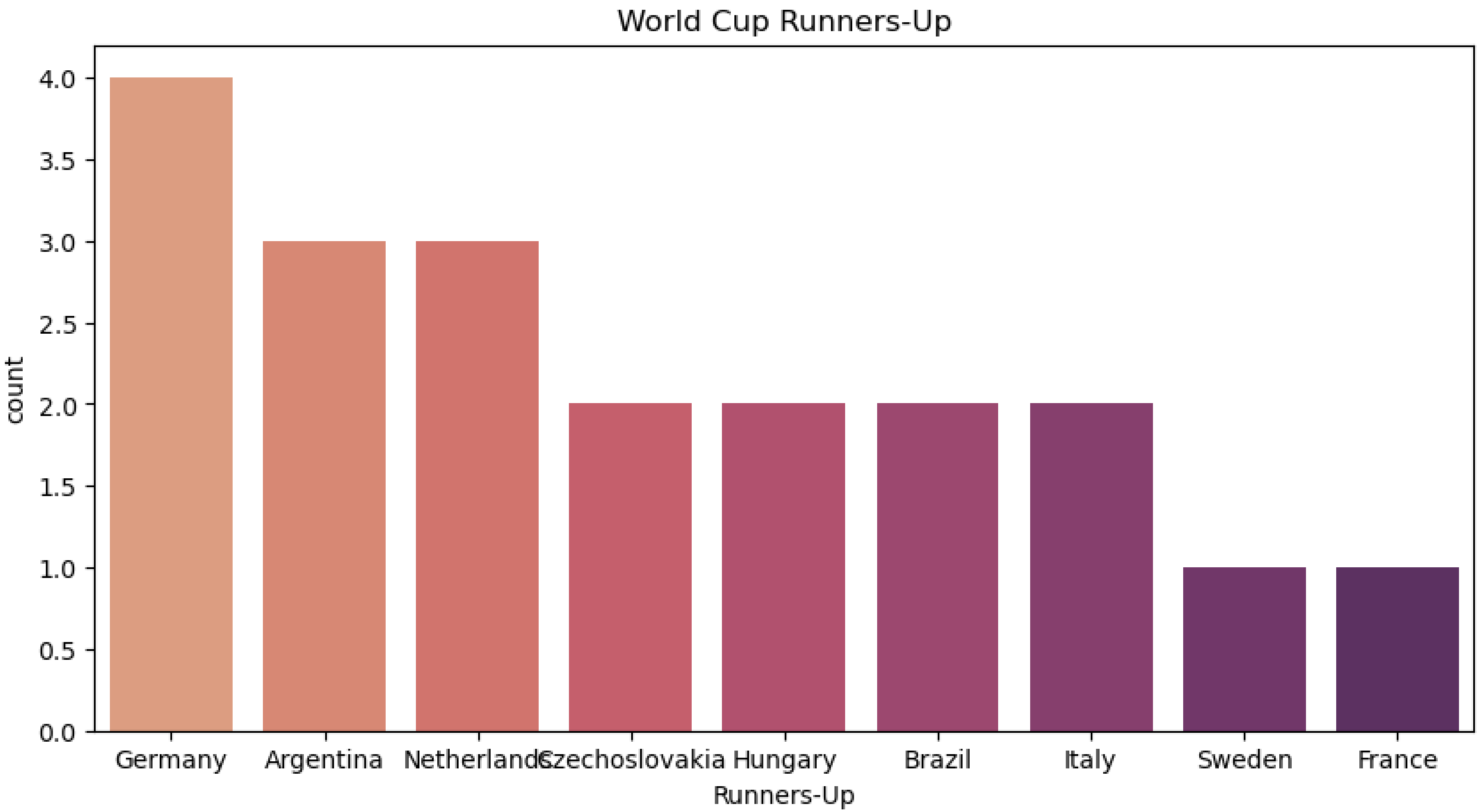


In [ ]:

```
wc_winners=worldcups['Winner'].value_counts().reset_index()

plottitle = 'World Cup Winners'
barplot(wc_winners,'Winner','count',plottitle,'flare')
```

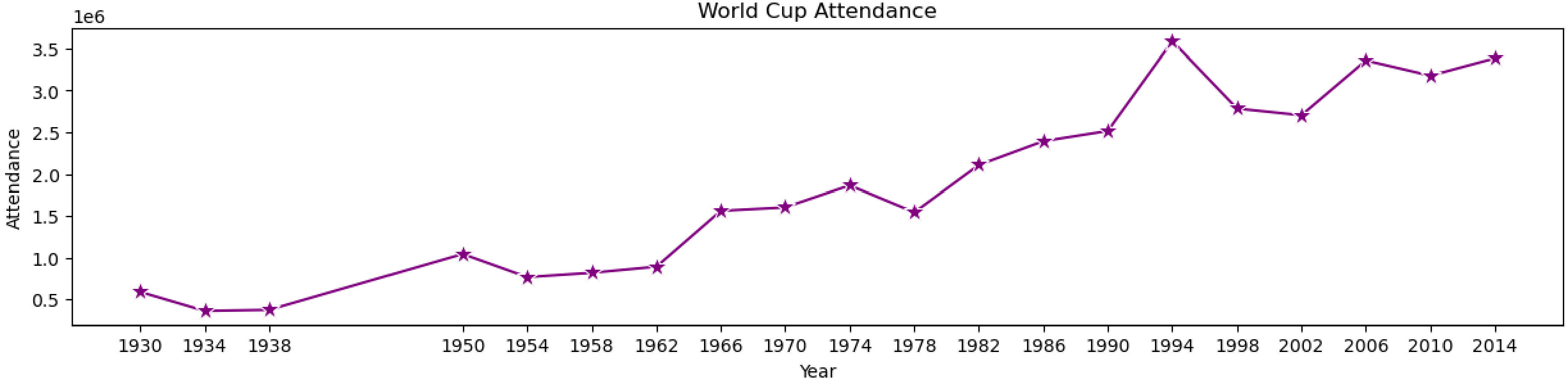


In [ ]:
```
wc_runnerup=worldcups['Runners-Up'].value_counts().reset_index()

plottitle = 'World Cup Runners-Up'
barplot(wc_runnerup,'Runners-Up','count',plottitle,'flare')
```

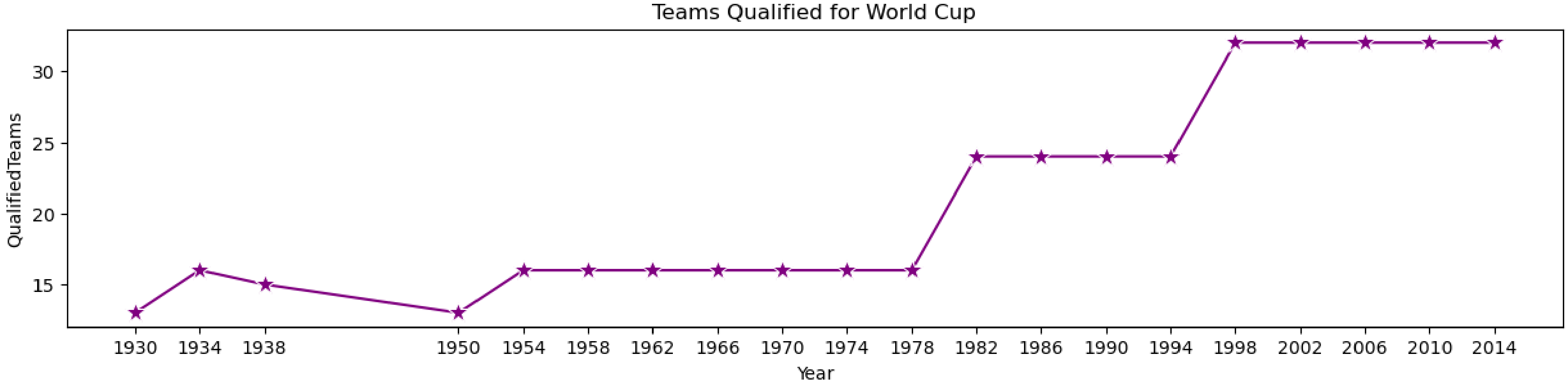


In [ ]:

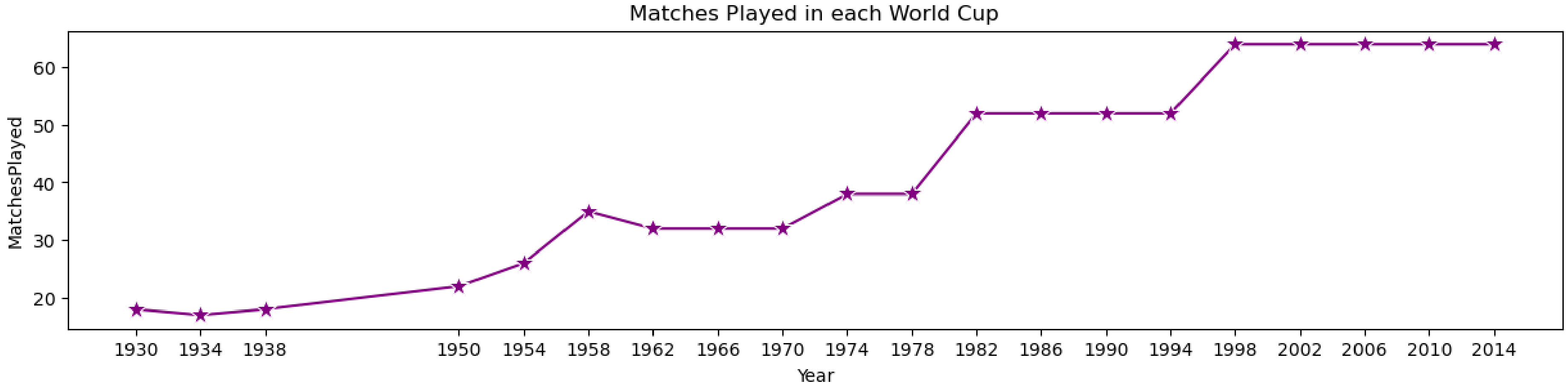
```
plottitle = 'World Cup Attendance'
lineplot(worldcups,'Year','Attendance',plottitle)
```



```
In [ ]: plottitle = 'Teams Qualified for World Cup'
        lineplot(worldcups,'Year','QualifiedTeams',plottitle)
```



```
In [ ]: plottitle = 'Matches Played in each World Cup'
        lineplot(worldcups,'Year','MatchesPlayed',plottitle)
```



In [ ]:
```
matches.describe()
```

Out[ ]:
```
              Year  Home Team Goals  Away Team Goals     Attendance  Half-time Home Goals  Half-time Away Goals       RoundID       MatchID
count   836.000000       836.000000       836.000000     836.000000            836.000000            836.000000  8.360000e+02  8.360000e+02
mean   1984.535885         1.824163         1.021531   44879.736842              0.718900              0.427033  1.086093e+07  5.677577e+07
std      22.299860         1.619178         1.072024   23544.303618              0.941995              0.675091  2.751802e+07  1.070329e+08
min    1930.000000         0.000000         0.000000    2000.000000              0.000000              0.000000  2.010000e+02  2.500000e+01
25%    1970.000000         1.000000         0.000000   29800.000000              0.000000              0.000000  2.620000e+02  1.183500e+03
50%    1990.000000         2.000000         1.000000   41061.500000              0.000000              0.000000  3.370000e+02  2.113500e+03
75%    2002.000000         3.000000         2.000000   61071.500000              1.000000              1.000000  2.497220e+05  4.395005e+07
max    2014.000000        10.000000         7.000000  173850.000000              6.000000              5.000000  9.741060e+07  3.001865e+08
```

In [ ]:
```
matches.head()
```

Out[ ]:

	Year	Datetime	Stage	Stadium	City	Home Team Name	Home Team Goals	Away Team Goals	Away Team Name	Win conditions	...	Half-time Home Goals	Half-time Away Goals	Referee	Assistant 1	Assistant 2
0	1930.0	13 Jul 1930 - 15:00	Group 1	Pocitos	Montevideo	France	4.0	1.0	Mexico		...	3.0	0.0	LOMBARDI Domingo (URU)	CRISTOPHE Henry (BEL)	REGO Gilberto (BRA)
1	1930.0	13 Jul 1930 - 15:00	Group 4	Parque Central	Montevideo	USA	3.0	0.0	Belgium		...	2.0	0.0	MACIAS Jose (ARG)	MATEUCCI Francisco (URU)	WARNKEN Alberto (CHI)
2	1930.0	14 Jul 1930 - 12:45	Group 2	Parque Central	Montevideo	Yugoslavia	2.0	1.0	Brazil		...	2.0	0.0	TEJADA Anibal (URU)	VALLARINO Ricardo (URU)	BALWAY Thomas (FRA)
3	1930.0	14 Jul 1930 - 14:50	Group 3	Pocitos	Montevideo	Romania	3.0	1.0	Peru		...	1.0	0.0	WARNKEN Alberto (CHI)	LANGENUS Jean (BEL)	MATEUCCI Francisco (URU)
4	1930.0	15 Jul 1930 - 16:00	Group 1	Parque Central	Montevideo	Argentina	1.0	0.0	France		...	0.0	0.0	REGO Gilberto (BRA)	SAUCEDO Ulises (BOL)	RADULESCU Constantin (ROU)

5 rows × 21 columns

In [ ]:

```
matches.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 836 entries, 0 to 835
Data columns (total 21 columns):
 #   Column                Non-Null Count  Dtype  
---  ------                --------------  -----  
 0   Year                  836 non-null    float64
 1   Datetime              836 non-null    object 
 2   Stage                 836 non-null    object 
 3   Stadium               836 non-null    object 
 4   City                  836 non-null    object 
 5   Home Team Name        836 non-null    object 
 6   Home Team Goals       836 non-null    float64
 7   Away Team Goals       836 non-null    float64
 8   Away Team Name        836 non-null    object 
 9   Win conditions        836 non-null    object 
 10  Attendance            836 non-null    float64
 11  Half-time Home Goals  836 non-null    float64
 12  Half-time Away Goals  836 non-null    float64
 13  Referee               836 non-null    object 
 14  Assistant 1           836 non-null    object 
 15  Assistant 2           836 non-null    object 
 16  RoundID               836 non-null    float64
 17  MatchID               836 non-null    float64
 18  Home Team Initials    836 non-null    object 
 19  Away Team Initials    836 non-null    object 
 20  Winner                836 non-null    object 
dtypes: float64(8), object(13)
memory usage: 176.0+ KB
```

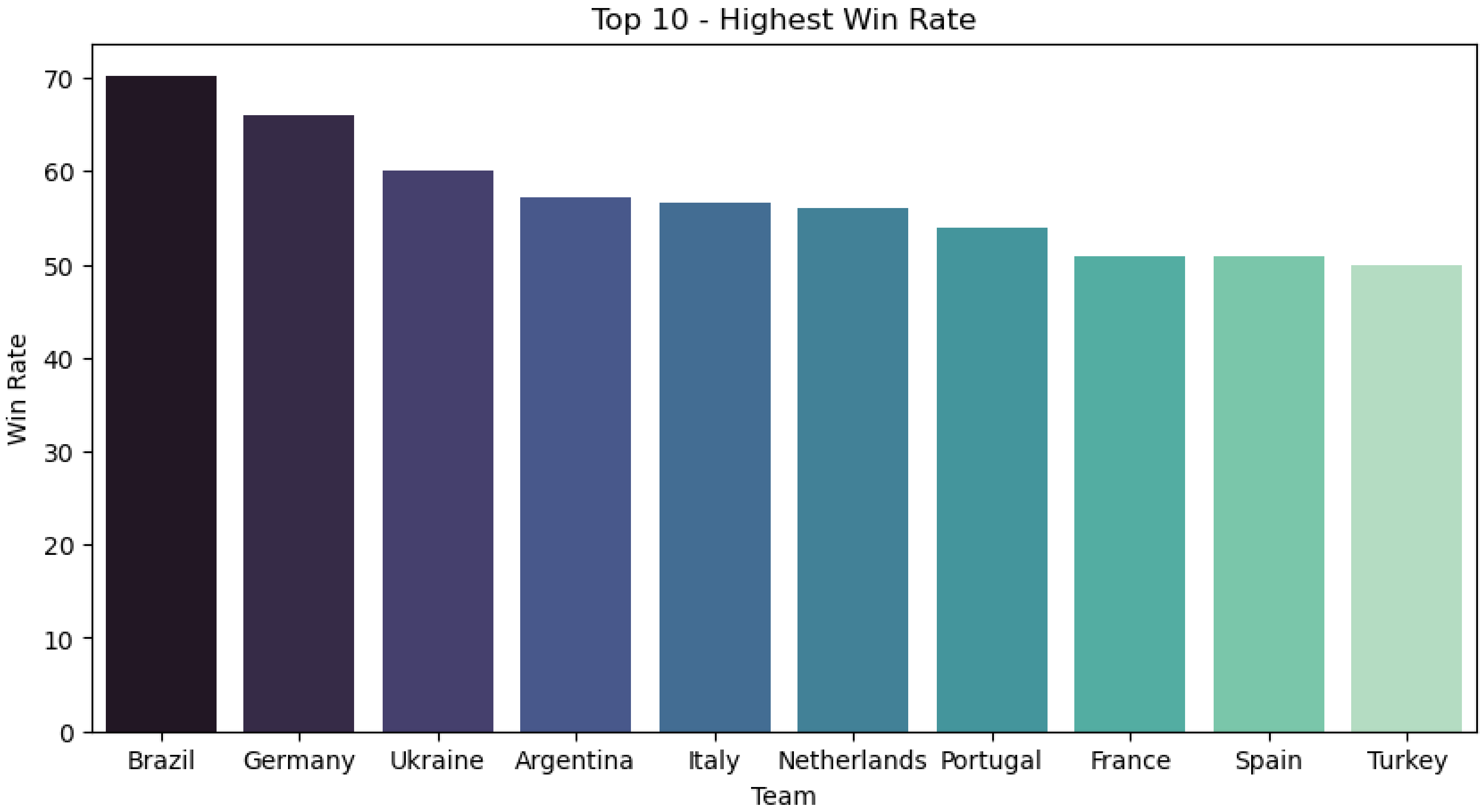
In [ ]:

```
home_matches = pd.DataFrame(matches['Home Team Name'].value_counts()).reset_index()
away_matches = pd.DataFrame(matches['Away Team Name'].value_counts()).reset_index()
home_matches.columns=['Team','Matches']
away_matches.columns=['Team','Matches']

match_count = pd.concat([home_matches,away_matches],axis=0)
match_count = match_count.groupby('Team')[['Matches']].sum().reset_index().sort_values(by='Matches',ascending=False)
```

In [ ]:

```
win_count = pd.DataFrame(matches['Winner'].value_counts()).reset_index()

m_avg_wins = pd.merge(match_count, win_count, left_on='Team', right_on='Winner', how='left').drop('Winner', axis=1).fillna(0)
m_avg_wins.columns=['Team','Matches','Wins']
m_avg_wins['Win Rate'] = round(100 * m_avg_wins['Wins']/m_avg_wins['Matches'],2)
```

```
m_avg_wins = m_avg_wins.sort_values(by='Win Rate', ascending=False).head(10)
m_avg_wins

plottitle = 'Top 10 - Highest Win Rate'
barplot(m_avg_wins,'Team','Win Rate',plottitle,'mako')
```



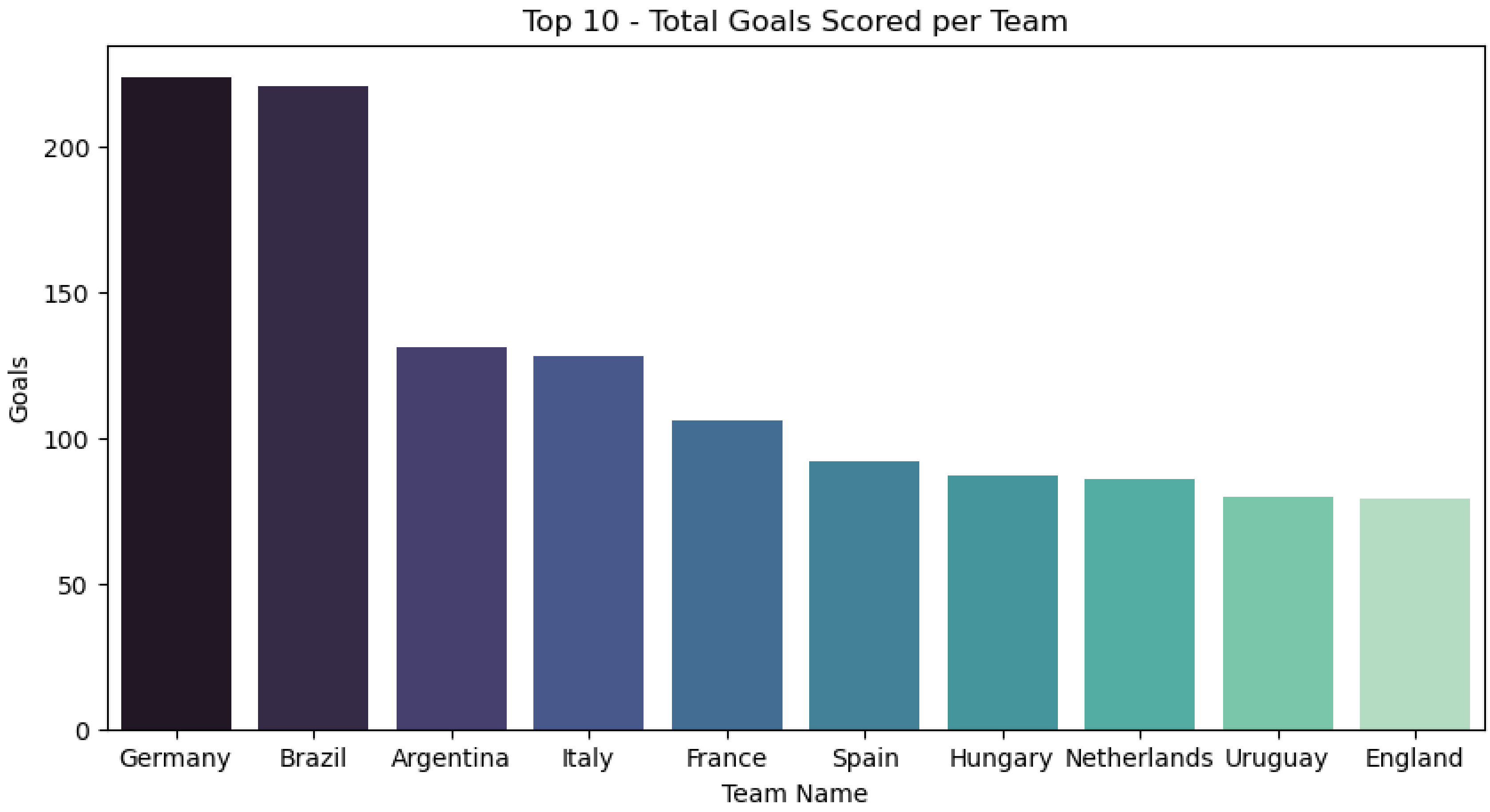
In [ ]:

```
home_team_goals=matches[['Home Team Name','Home Team Goals']]
away_team_goals=matches[['Away Team Name','Away Team Goals']]
home_team_goals.columns=['Team Name', 'Goals']
away_team_goals.columns=['Team Name', 'Goals']
```

In [ ]:

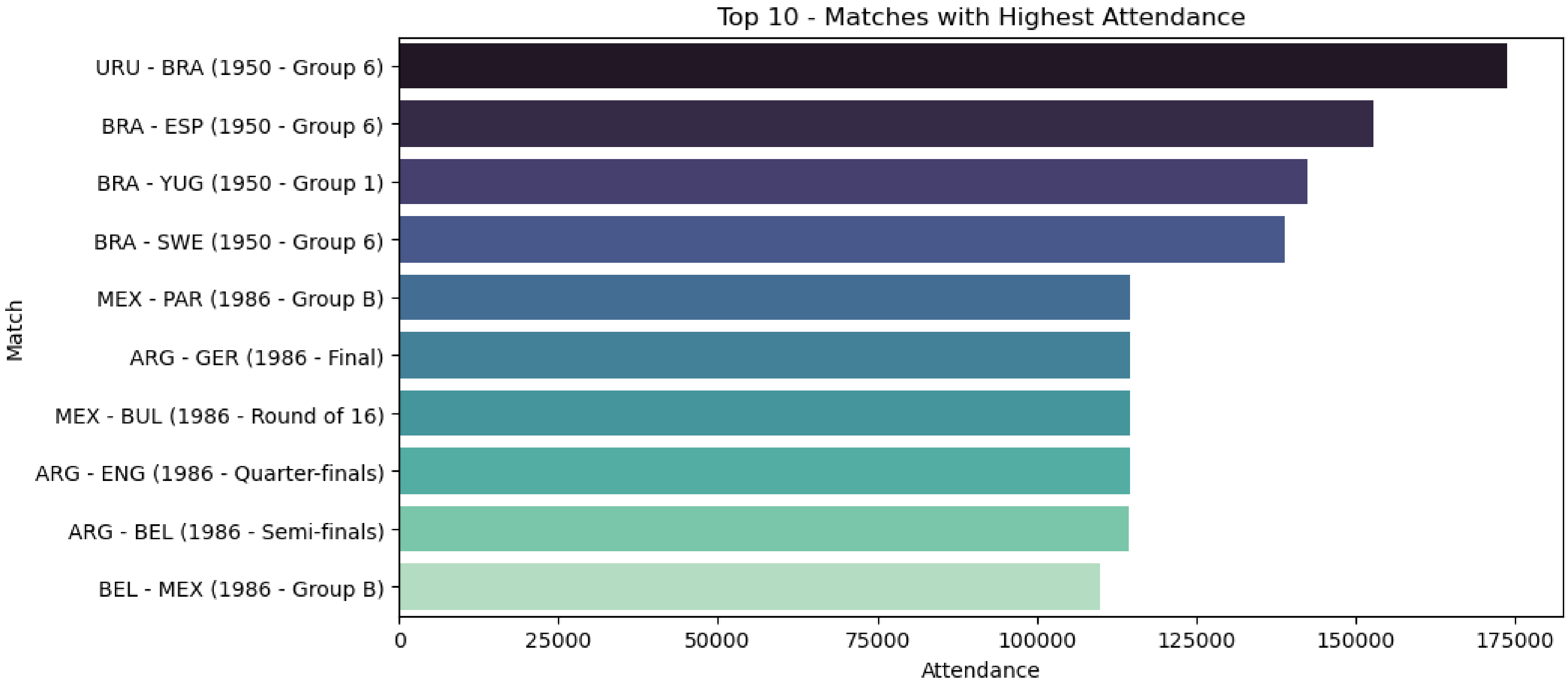
```
m_team_goals=pd.concat([home_team_goals,away_team_goals],axis=0).reset_index(drop=True)
m_team_goals=m_team_goals.groupby('Team Name')['Goals'].sum().sort_values(ascending=False).reset_index().head(10)
```

```
plottitle = 'Top 10 - Total Goals Scored per Team'
barplot(m_team_goals,'Team Name','Goals',plottitle,'mako')
```



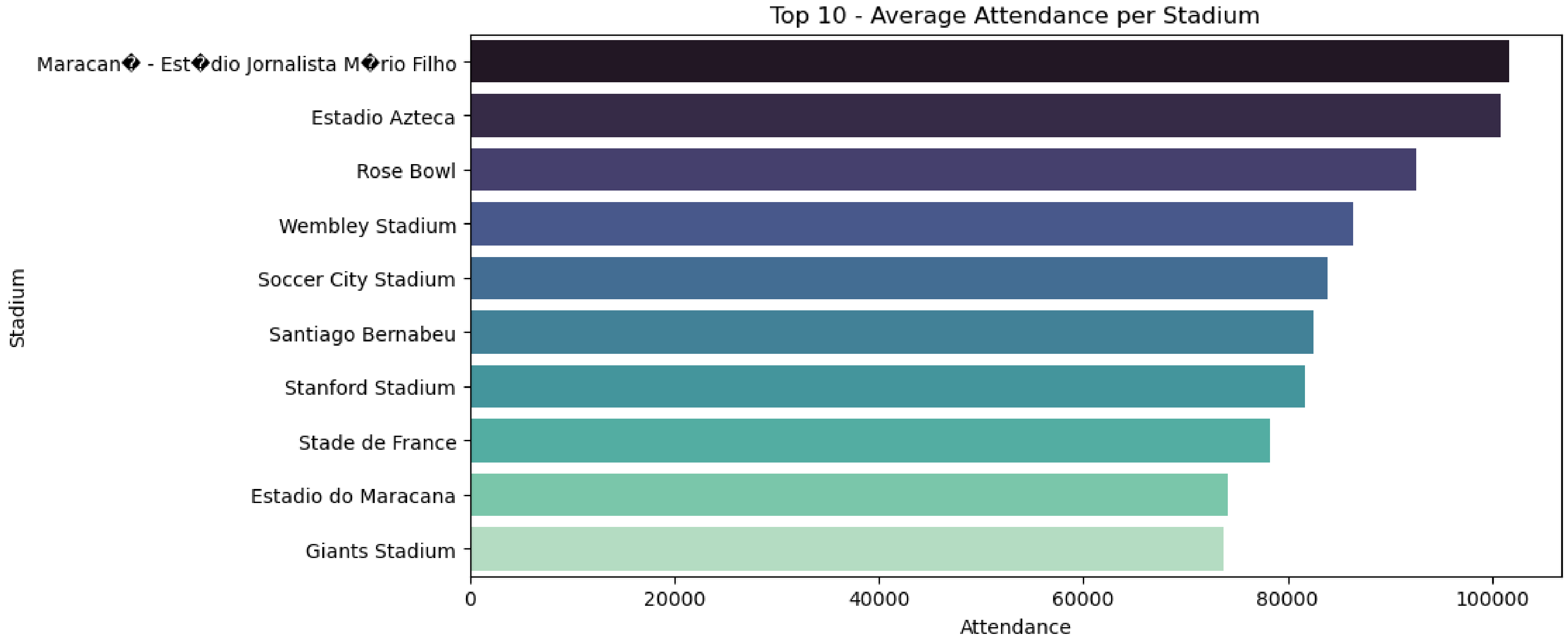
In [ ]:

```
m_attendance = matches[['Year','Stage','Home Team Initials','Away Team Initials','Winner','Attendance']].sort_values(by='Attendan
m_attendance['Match'] = m_attendance['Home Team Initials']+' - '+m_attendance['Away Team Initials']+' ('+m_attendance['Year'].ast

plottitle = 'Top 10 - Matches with Highest Attendance'
barplot(m_attendance,'Attendance','Match',plottitle,'mako')
```



In [ ]:

```
m_stadium_att=matches.groupby('Stadium')['Attendance'].mean().sort_values(ascending=False).reset_index().head(10)

plottitle = 'Top 10 - Average Attendance per Stadium'
barplot(m_stadium_att,'Attendance','Stadium',plottitle,'mako')
```



```
In [ ]: players.describe()
```

Out[ ]:

	RoundID	MatchID	Shirt Number	Goal	Penalty Goal	Yellow Card	Red Card	Offside	Injured	Own Goal	H
count	3.778400e+04	3.778400e+04	37784.000000	37784.000000	37784.000000	37784.000000	37784.000000	37784.000000	37784.000000	37784.000000	37
mean	1.105647e+07	6.362233e+07	10.726022	0.058067	0.004711	0.060819	0.003097	0.069421	0.070003	0.001112	
std	2.770144e+07	1.123916e+08	6.960138	0.272256	0.071130	0.255694	0.055561	0.254172	0.255156	0.033322	
min	2.010000e+02	2.500000e+01	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	
25%	2.630000e+02	1.199000e+03	5.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	
50%	3.370000e+02	2.216000e+03	11.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	
75%	2.559310e+05	9.741000e+07	17.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	
max	9.741060e+07	3.001865e+08	23.000000	4.000000	2.000000	3.000000	1.000000	1.000000	1.000000	1.000000	

In [ ]:

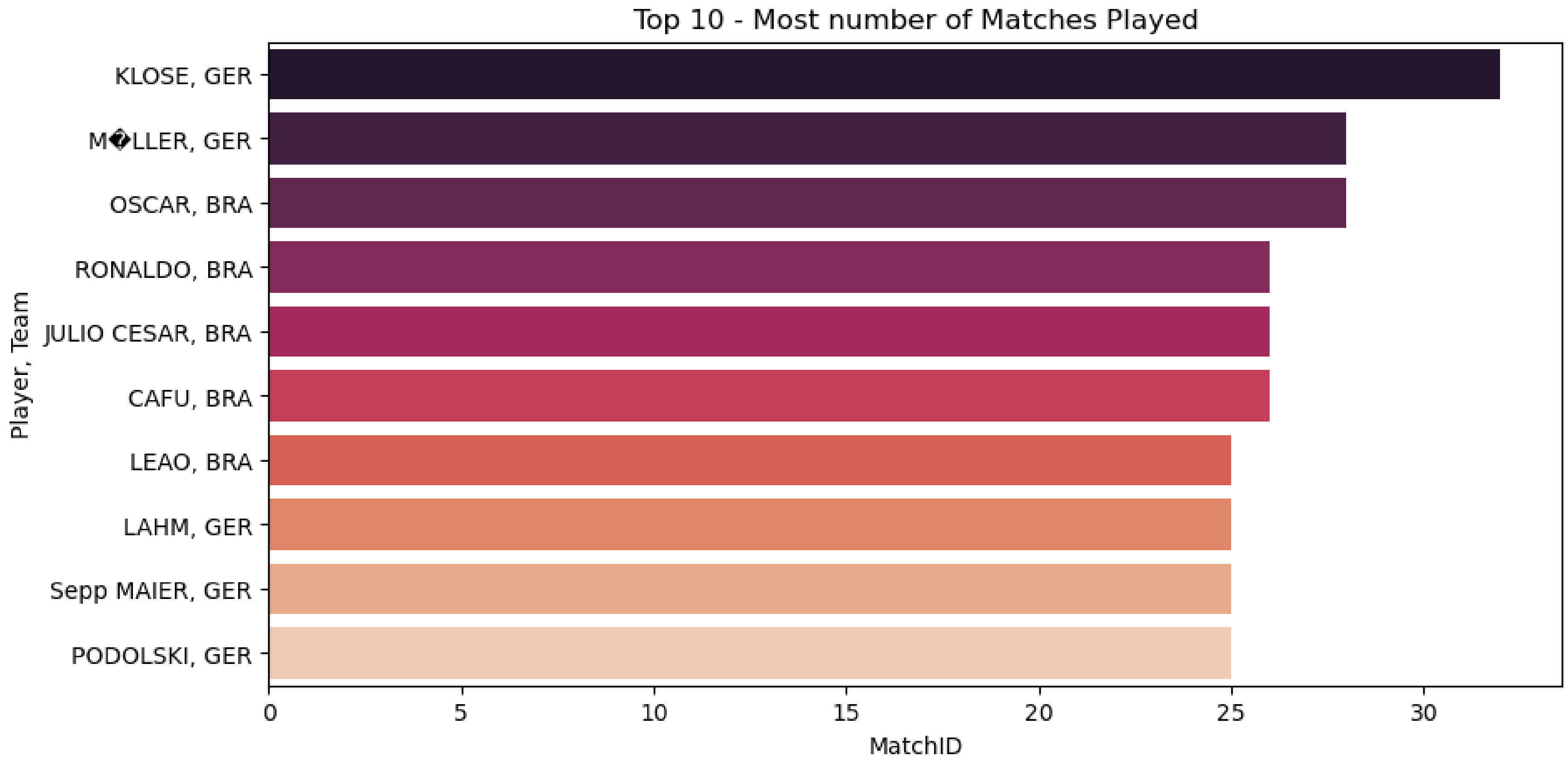
```
#Players who have scored most Goals in a single World Cup match
players[players['Goal']==4]
```

Out[ ]:

	RoundID	MatchID	Team Initials	Coach Name	Line-up	Shirt Number	Player Name	Position	Goal	Penalty Goal	Yellow Card	Red Card	Offside	Injured	Own Goal	HalfTime IN	Ha
1610	206	1150	POL	KALUZA Jozef (POL)	S	0	Ernest WILIMOWSKI	0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
2881	209	1189	BRA	COSTA Flavio (BRA)	S	0	ADEMIR	0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
3609	211	1277	HUN	SEBES Gusztav (HUN)	S	8	Sandor KOCSIS	0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
5675	3483	1382	FRA	BATTEAUX Albert (FRA)	S	17	Just FONTAINE	0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
21540	337	3079	RUS	SADYRIN Pavel (RUS)	S	9	Oleg SALENKO	0	4.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	

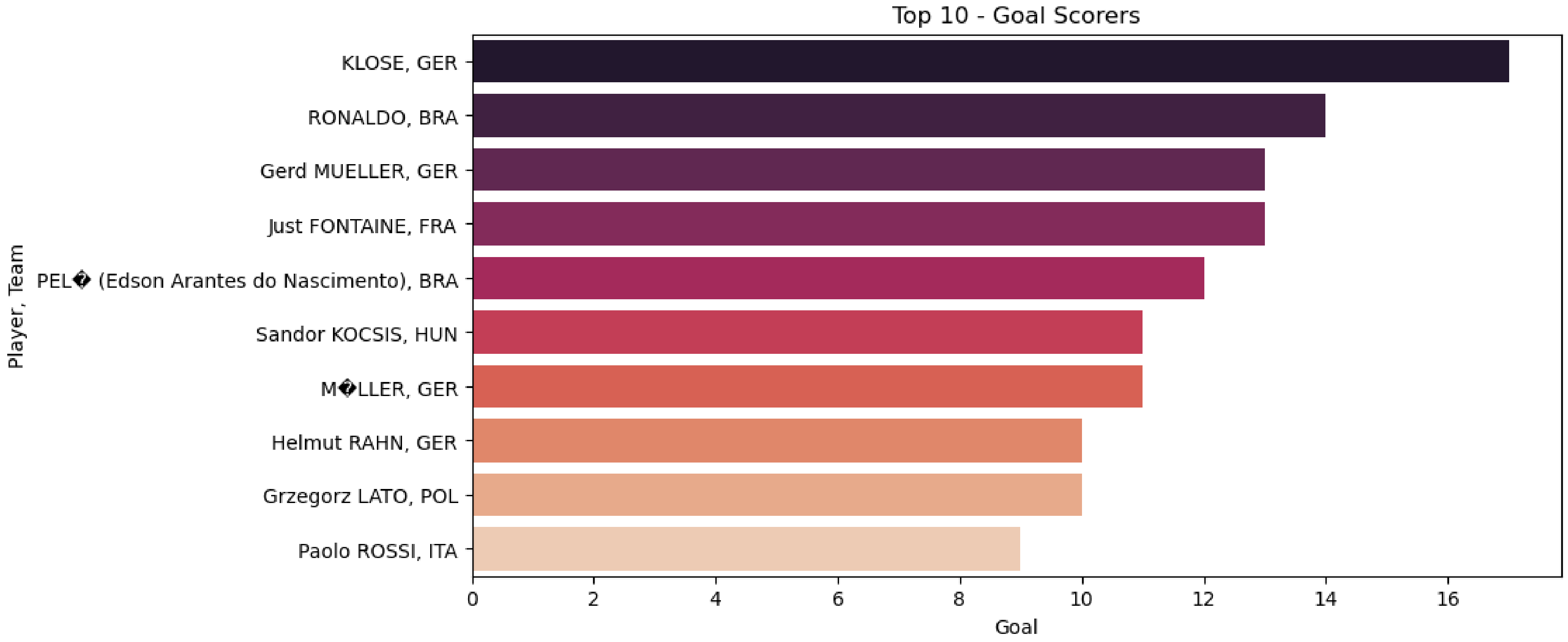
In [ ]:

```python
# Top 10 - Most Matches
p_matches = players.groupby(['Player Name','Team Initials'])[['MatchID']].count().reset_index()
p_matches['Player, Team'] = p_matches['Player Name']+', '+p_matches['Team Initials']
p_matches = p_matches.sort_values(by='MatchID', ascending=False).head(10)

plottitle = 'Top 10 - Most number of Matches Played'
barplot(p_matches,'MatchID','Player, Team',plottitle,'rocket')
```



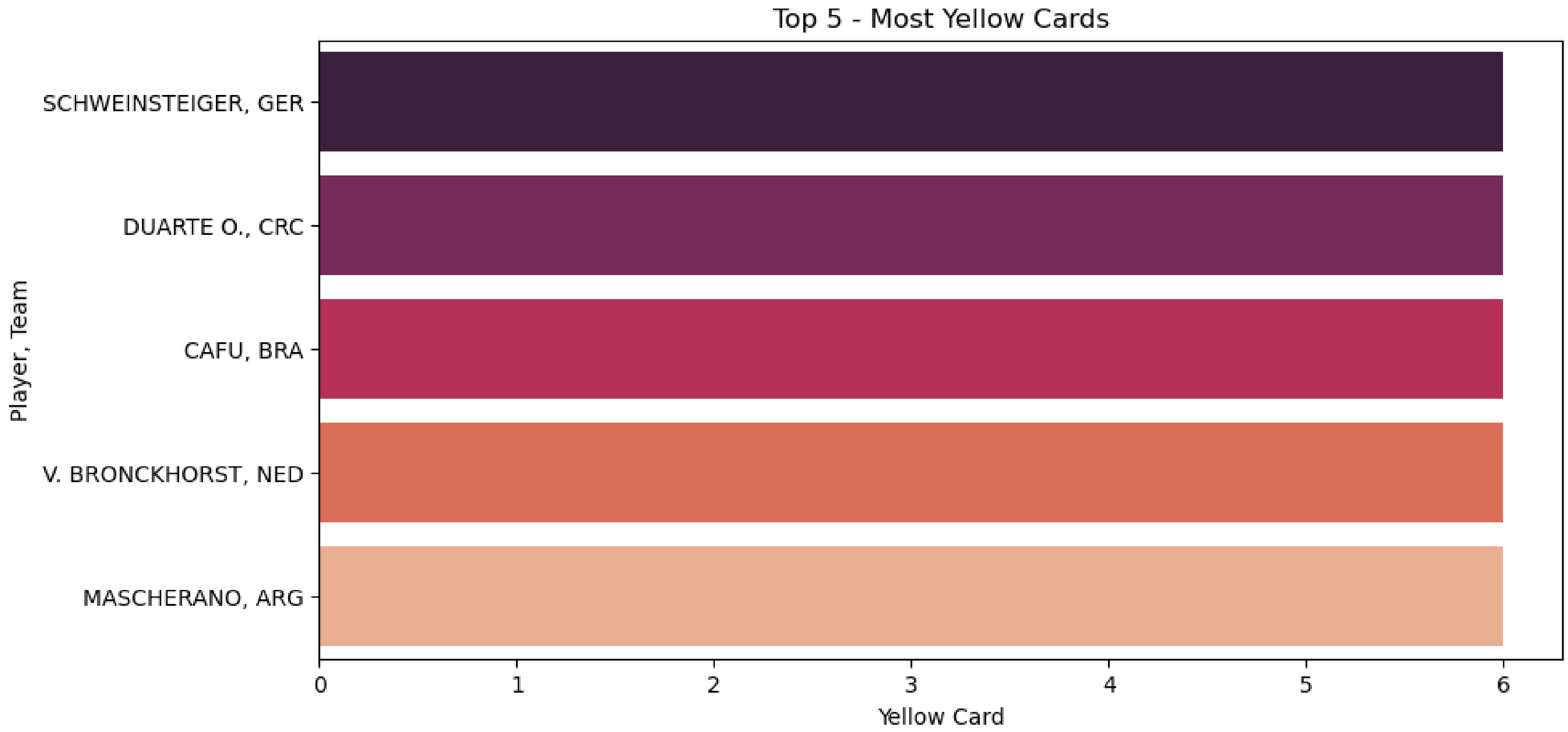
In [ ]:

```
# Top 10 Highest Goal Scorers in World Cups
p_total_goals = players.groupby(['Player Name','Team Initials'])[['Goal']].sum().reset_index()
p_total_goals['Player, Team'] = p_total_goals['Player Name']+', '+p_total_goals['Team Initials']
p_total_goals = p_total_goals.sort_values(by='Goal', ascending=False).head(10)

plottitle = 'Top 10 - Goal Scorers'
barplot(p_total_goals,'Goal','Player, Team',plottitle,'rocket')
```

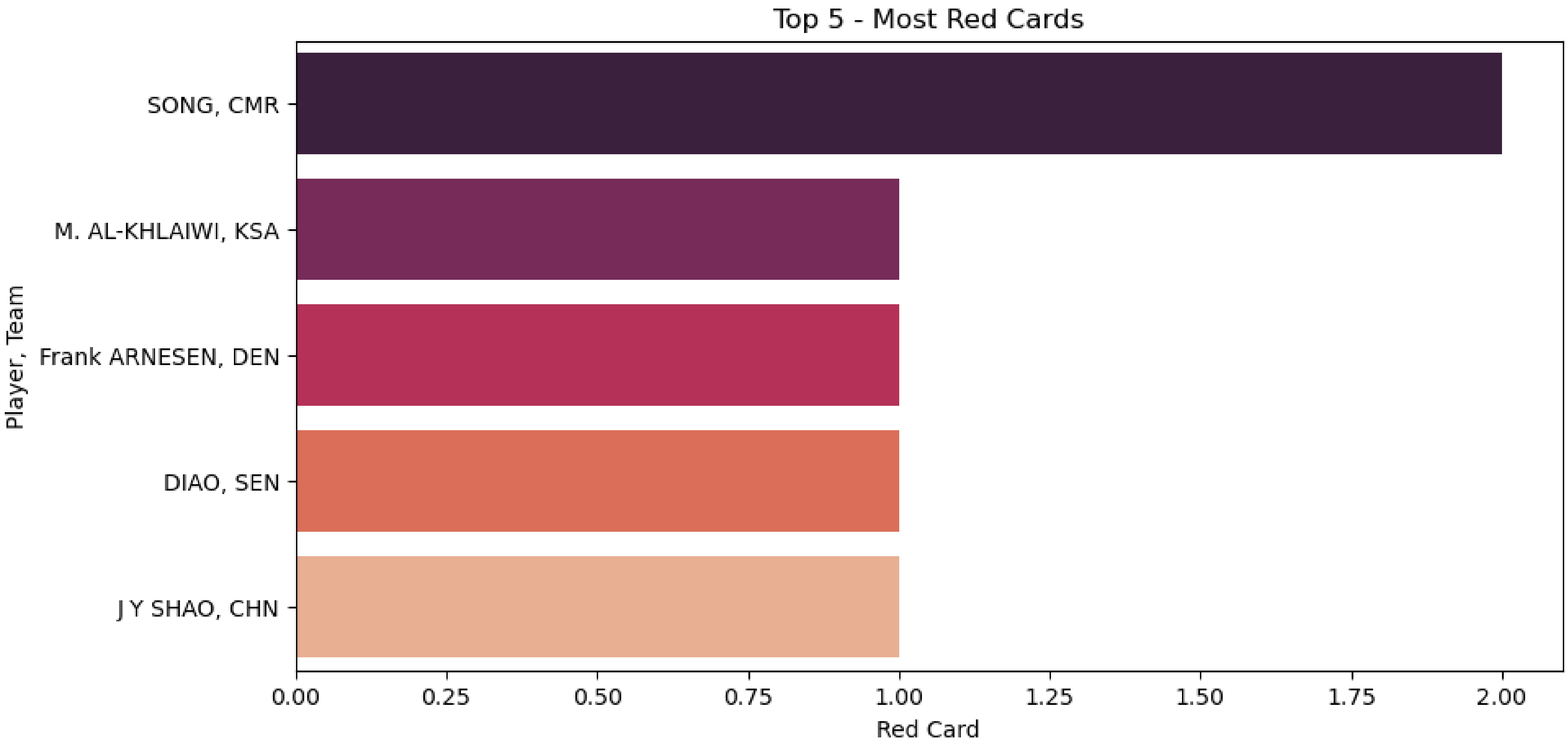


In [ ]:

```
# Top 5 - Yellow Cards
p_yellowcards = players.groupby(['Player Name','Team Initials'])[['Yellow Card']].sum().reset_index()
p_yellowcards['Player, Team'] = p_yellowcards['Player Name']+', '+p_yellowcards['Team Initials']
p_yellowcards = p_yellowcards.sort_values(by='Yellow Card', ascending=False).head()

plottitle = 'Top 5 - Most Yellow Cards'
barplot(p_yellowcards,'Yellow Card','Player, Team',plottitle,'rocket')
```



```
In [ ]: # Top 5 - Red Cards
        p_redcards = players.groupby(['Player Name','Team Initials'])[['Red Card']].sum().reset_index()
        p_redcards['Player, Team'] = p_redcards['Player Name']+', '+p_redcards['Team Initials']
        p_redcards = p_redcards.sort_values(by='Red Card', ascending=False).head()

        plottitle = 'Top 5 - Most Red Cards'
        barplot(p_redcards,'Red Card','Player, Team',plottitle,'rocket')
```


Top 5 - Most Red Cards
SONG, CMR
M. AL-KHLAIWI, KSA
Frank ARNESEN, DEN
DIAO, SEN
J Y SHAO, CHN
Player, Team
0.00
0.25
0.50
0.75
1.00
1.25
1.50
1.75
2.00
Red Card