

Monza Circuit: F1 Stats and Record



Monza Circuit also known as Temple of Speed is a race track near the city of Monza, north of Milan, in Italy. Constructed in just 110 days in 1922, the Autodromo Nazionale Monza was the world's third purpose-built race track, coming after Brooklands in the UK and Indianapolis in the US. Like those two tracks, the original circuit featured a daunting series of banked curves, as well as much of the 'outfield' section that's still in use today.

Stats:

- First Grand Prix : 1950
- Circuit length : 5.793 km
- Number of laps : 53
- Race distance : 306.720 km

In [2]:

```
%%html
<style>
@font-face {
    font-family: F1;
    src: url(<a href="https://www.formula1.com/etc/designs/fom-website/fonts/F1Regular/Formula1-Regular.woff2">https://www.formula1.com/etc/designs/fom-website/fonts/F1Regular/Formula1-Regular.woff2</a>);
}
span{
    font-family: F1;
}
```

```

a{
  font-family: F1;
}

.nav-pills>li.active>a:focus {
  color: #ffffff;
  background-color: lightgray;
}

.container-fluid, .container-fluid h1 {
  font-family: F1;
  line-height: 1.7;
}

.container-fluid p {
  font-family: F1;
  color: black;
}

h1,h2,h3,h4,h5,h6,p,table {
  font-family: F1;
  color: black
}

```

In [3]:

```

import numpy as np
import seaborn as sns
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
import warnings
warnings.simplefilter("ignore")
pd.set_option('display.max_columns', None)

```

In [4]:

```

import time
import datetime
import scipy.stats as sp

import plotly.express as px
import plotly.graph_objects as go
from plotly.subplots import make_subplots

```

In [5]:

```

result_df = pd.read_csv("C:\\\\Users\\\\bassa\\\\Downloads\\\\archive (1)\\\\results.csv")
stats_df = pd.read_csv("C:\\\\Users\\\\bassa\\\\Downloads\\\\archive (1)\\\\status.csv")
drivers_df = pd.read_csv("C:\\\\Users\\\\bassa\\\\Downloads\\\\archive (1)\\\\drivers.csv")
races_df = pd.read_csv("C:\\\\Users\\\\bassa\\\\Downloads\\\\archive (1)\\\\races.csv")
constructor_df = pd.read_csv("C:\\\\Users\\\\bassa\\\\Downloads\\\\archive (1)\\\\constructors.csv")
driver_standings_df = pd.read_csv("C:\\\\Users\\\\bassa\\\\Downloads\\\\archive (1)\\\\driver_standings.csv")
circuits_df = pd.read_csv("C:\\\\Users\\\\bassa\\\\Downloads\\\\archive (1)\\\\circuits.csv")
pd.get_option("display.max_columns",None)

```

In [6]:

Out[6]:

	resultId	raceId	driverId	constructorId	number	grid	position	positionText	positionOrder
0	1	18	1		1	22	1	1	1
1	2	18	2		2	3	5	2	2

2	3	18	3	3	7	7	3	3	3
3	4	18	4	4	5	11	4	4	4
4	5	18	5	1	23	3	5	5	5

In [7]: `stats_df.head()`

	statusId	status
0	1	Finished
1	2	Disqualified
2	3	Accident
3	4	Collision
4	5	Engine

In [8]: `drivers_df.head()`

	driverId	driverRef	number	code	forename	surname	dob	nationality	wikiPage
0	1	hamilton	44	HAM	Lewis	Hamilton	1985-01-07	British	http://en.wikipedia.org/wiki/Lewis_Hamilton
1	2	heidfeld	11	HEI	Nick	Heidfeld	1977-05-10	German	http://en.wikipedia.org/wiki/Nick_Heidfeld
2	3	rosberg	6	ROS	Nico	Rosberg	1985-06-27	German	http://en.wikipedia.org/wiki/Nico_Rosberg
3	4	alonso	14	ALO	Fernando	Alonso	1981-07-29	Spanish	http://en.wikipedia.org/wiki/Fernando_Alonso
4	5	kovvalainen	11	KOV	Heikki	Kovalainen	1981-10-19	Finnish	http://en.wikipedia.org/wiki/Heikki_Kovalainen

In [9]: `races_df.head()`

	raceId	year	round	circuitId	name	date	time	wikiPage
0	1	2009	1	1	Australian Grand Prix	2009-03-29	06:00:00	http://en.wikipedia.org/wiki/2009_Australian_Grand_Prix
1	2	2009	2	2	Malaysian Grand Prix	2009-04-05	09:00:00	http://en.wikipedia.org/wiki/2009_Malaysian_Grand_Prix
2	3	2009	3	17	Chinese Grand Prix	2009-04-19	07:00:00	http://en.wikipedia.org/wiki/2009_Chinese_Grand_Prix
3	4	2009	4	3	Bahrain Grand Prix	2009-04-26	12:00:00	http://en.wikipedia.org/wiki/2009_Bahrain_Grand_Prix
4	5	2009	5	4	Spanish Grand Prix	2009-05-10	12:00:00	http://en.wikipedia.org/wiki/2009_Spanish_Grand_Prix

In [10]: `constructor_df.head()`

	constructorId	constructorRef	name	nationality
--	---------------	----------------	------	-------------

0	1	mclaren	McLaren	British		http://en.wikipedia.org/wiki/Mc
1	2	bmw_sauber	BMW Sauber	German		http://en.wikipedia.org/wiki/BMW_S
2	3	williams	Williams	British		http://en.wikipedia.org/wiki/Williams_Gra
3	4	renault	Renault	French		http://en.wikipedia.org/wiki/Renault_in_Fo
4	5	toro_rosso	Toro Rosso	Italian		http://en.wikipedia.org/wiki/Scuderia_Toro_R

```
In [11]: driver_standings_df.head()
```

	driverStandingsId	raceId	driverId	points	position	positionText	wins
0		1	18	1	10.0	1	1
1		2	18	2	8.0	2	0
2		3	18	3	6.0	3	0
3		4	18	4	5.0	4	0
4		5	18	5	4.0	5	0

```
In [12]: ind = circuits_df[circuits_df['country'] == 'Italy']
ind
```

	circuitId	circuitRef	name	location	country	lat	long	alt
13	14	monza	Autodromo Nazionale di Monza	Monza	Italy	45.6156	9.28111	162
20	21	imola	Autodromo Enzo e Dino Ferrari	Imola	Italy	44.3439	11.71670	37
64	65	pescara	Pescara Circuit	Pescara	Italy	42.4750	14.15080	129
73	76	mugello	Autodromo Internazionale del Mugello	Mugello	Italy	43.9975	11.37190	255

```
In [13]: track = circuits_df[circuits_df['circuitRef'] == 'monza']
track_lat = track['lat'].values[0]
track_long = track['long'].values[0]
```

```
In [14]: fig = px.scatter_mapbox(track, lat='lat', lon='long',
                           color_discrete_sequence=["fuchsia"], zoom=12, height=300)
fig.update_layout(mapbox_style="open-street-map")
fig.update_layout(margin={"r":0,"t":0,"l":0,"b":0})
fig.show()
```

```
In [15]: concat_driver_name = lambda x: f'{x.forename} {x.surname}'
```

```
drivers_df['driver'] = drivers_df.apply(concat_driver_name, axis=1)
```

```
In [16]: drivers_df.head()
```

	driverId	driverRef	number	code	forename	surname	dob	nationality	url
0	1	hamilton	44	HAM	Lewis	Hamilton	1985-01-07	British	http://en.wikipedia.org/wiki/Lewis_Hamilton
1	2	heidfeld	11	HEI	Nick	Heidfeld	1977-05-10	German	http://en.wikipedia.org/wiki/Nick_Heidfeld
2	3	rosberg	6	ROS	Nico	Rosberg	1985-06-27	German	http://en.wikipedia.org/wiki/Nico_Rosberg
3	4	alonso	14	ALO	Fernando	Alonso	1981-07-29	Spanish	http://en.wikipedia.org/wiki/Fernando_Alonso
4	5	kovalainen	11	KOV	Heikki	Kovalainen	1981-10-19	Finnish	http://en.wikipedia.org/wiki/Heikki_Kovalainen

```
In [17]: result = pd.merge(result_df,drivers_df,on = 'driverId')
result.head()
```

	resultId	raceId	driverId	constructorId	number_x	grid	position	positionText	positionOrder
0	1	18	1	1	1	22	1	1	1
1	27	19	1	1	1	22	9	5	5
2	57	20	1	1	1	22	3	13	13
3	69	21	1	1	1	22	5	3	3
4	90	22	1	1	1	22	3	2	2

```
In [18]: races_df[['circuitId','raceId']]
```

```
Out[18]: circuitId raceId
```

0	1	1
1	2	2
2	17	3
3	3	4
4	4	5
...

```
1097    69    1116  
1098    32    1117  
1099    18    1118  
1100    80    1119  
1101    24    1120
```

1102 rows × 2 columns

```
In [19]: result = pd.merge(result,races_df[['circuitId','raceId']],on = 'raceId')  
result.head()
```

```
Out[19]:   resultId raceId driverId constructorId number_x grid position positionText positionOrder  
0          1     18        1            1       1      22      1        1             1  
1          2     18        2            2       2      3       5        2             2  
2          3     18        3            3       3      7       7        3             3  
3          4     18        4            4       4      5      11        4             4  
4          5     18        5            5       1      23      3        5             5
```

```
In [20]: result = result[result['position'] != '\N'].copy()  
race_monza_df = result[result['circuitId'] == 14]  
race_monza_df['position'] = race_monza_df['position'].astype(int)  
race_monza_df = pd.merge(race_monza_df,constructor_df,on = 'constructorId')  
race_monza_df.head()
```

```
Out[20]:   resultId raceId driverId constructorId number_x grid position positionText positionOrder  
0      275     31        1            1       1      22     15        7             7  
1      270     31        5            1       1      23      2        2             2  
2      634     48        1            1       1      2       2        2             2  
3      633     48        4            1       1      1       1        1             1  
4     7805     13        1            1       1      1       1      12        12            12
```

```
In [21]: race_monza_df.sort_values(by=['resultId']).head()
```

```
Out[21]:   resultId raceId driverId constructorId number_x grid position positionText positionOrder  
181      269     31       20            5      15      1        1             1  
1      270     31        5            1      23      2        2             2  
73      271     31        9            2       4      11        3             3
```

151	272	31	4	4	5	8	4	4
72	273	31	2	2	3	10	5	5

In [22]:

`race_monza_df.info()`

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 980 entries, 0 to 979
Data columns (total 32 columns):
 #   Column           Non-Null Count  Dtype  
--- 
 0   resultId        980 non-null    int64  
 1   raceId          980 non-null    int64  
 2   driverId        980 non-null    int64  
 3   constructorId   980 non-null    int64  
 4   number_x         980 non-null    object  
 5   grid             980 non-null    int64  
 6   position         980 non-null    int32  
 7   positionText    980 non-null    object  
 8   positionOrder   980 non-null    int64  
 9   points           980 non-null    float64 
 10  laps              980 non-null    int64  
 11  time              980 non-null    object  
 12  milliseconds     980 non-null    object  
 13  fastestLap       980 non-null    object  
 14  rank              980 non-null    object  
 15  fastestLapTime   980 non-null    object  
 16  fastestLapSpeed  980 non-null    object  
 17  statusId         980 non-null    int64  
 18  driverRef        980 non-null    object  
 19  number_y          980 non-null    object  
 20  code              980 non-null    object  
 21  forename          980 non-null    object  
 22  surname           980 non-null    object  
 23  dob                980 non-null    object  
 24  nationality_x    980 non-null    object  
 25  url_x             980 non-null    object  
 26  driver             980 non-null    object  
 27  circuitId        980 non-null    int64  
 28  constructorRef   980 non-null    object  
 29  name              980 non-null    object  
 30  nationality_y    980 non-null    object  
 31  url_y             980 non-null    object  
dtypes: float64(1), int32(1), int64(9), object(21)
memory usage: 248.8+ KB
```

In [23]:

```
color_map = {
    'Michael Schumacher': '#EF1A2D',
    'Lewis Hamilton': '#00A19B',
    'Sebastian Vettel': '#000B8D',
    'Fernando Alonso': '#006F62',
    'Rubens Barrichello': '#EF1A2D',
    'Alain Prost': '#c60000',
    'Ronnie Peterson': '#000002',
    'Nelson Piquet': '#000080',
    'Daniel Ricciardo': '#FF8000',
    'Juan Fangio': '#A42134',
    'Stirling Moss': '#COCOCO',
    'Jackie Stewart': '#005CAA'
}
```

```

constructor_color_map = {
    'Williams': '#00A0DE',
    'Alfa Romeo': '#A42134',
    'AlphaTauri': '#20394C',
    'Red Bull': '#000B8D',
    'Mercedes': '#00A19B',
    'Haas F1 Team': '#E6002B',
    'Aston Martin': '#002420',
    'Ferrari': '#EF1A2D',
    'Alpine F1 Team': '#2173B8',
    'McLaren': '#FF8000' ,
    'Renault': '#ffd343' ,
    'Brabham': '#000080' ,
    'BRM': '#808080',
    'Team Lotus': '#000002',
    'Vanwall': '#004225',
    'Minardi': '#ffd343',
    'Osella': '#87CEEB',
    'Connaught': '#006F62',
    'March': '#0000FF',
    'Lotus-Climax': '#002420',
    'Spirit': '#FFFFFF',
    'Cooper-Maserati': '#8B0000',
    'ATS': '#FFDB58',
    'Larrousse': '#00OB8D'
}

```

Races Won

In [24]:

```
podiums = race_monza_df[race_monza_df['position'] == 1]
podiums.head()
```

Out[24]:

	resultId	raceId	driverId	constructorId	number_x	grid	position	positionText	positionOrder
3	633	48	4		1	1	1	1	1
9	21520	872	1		1	4	1	1	1
23	25226	1065	817		1	3	2	1	1
32	1415	85	31		1	10	1	1	1
35	4271	219	14		1	10	6	1	1

In [25]:

```
df = podiums[['driver', 'position']]
df = df.groupby(['driver']).sum()
df = df.sort_values(by=['position'], ascending=False)
df.columns = ['Races Won']
df = df.iloc[:10]
df
```

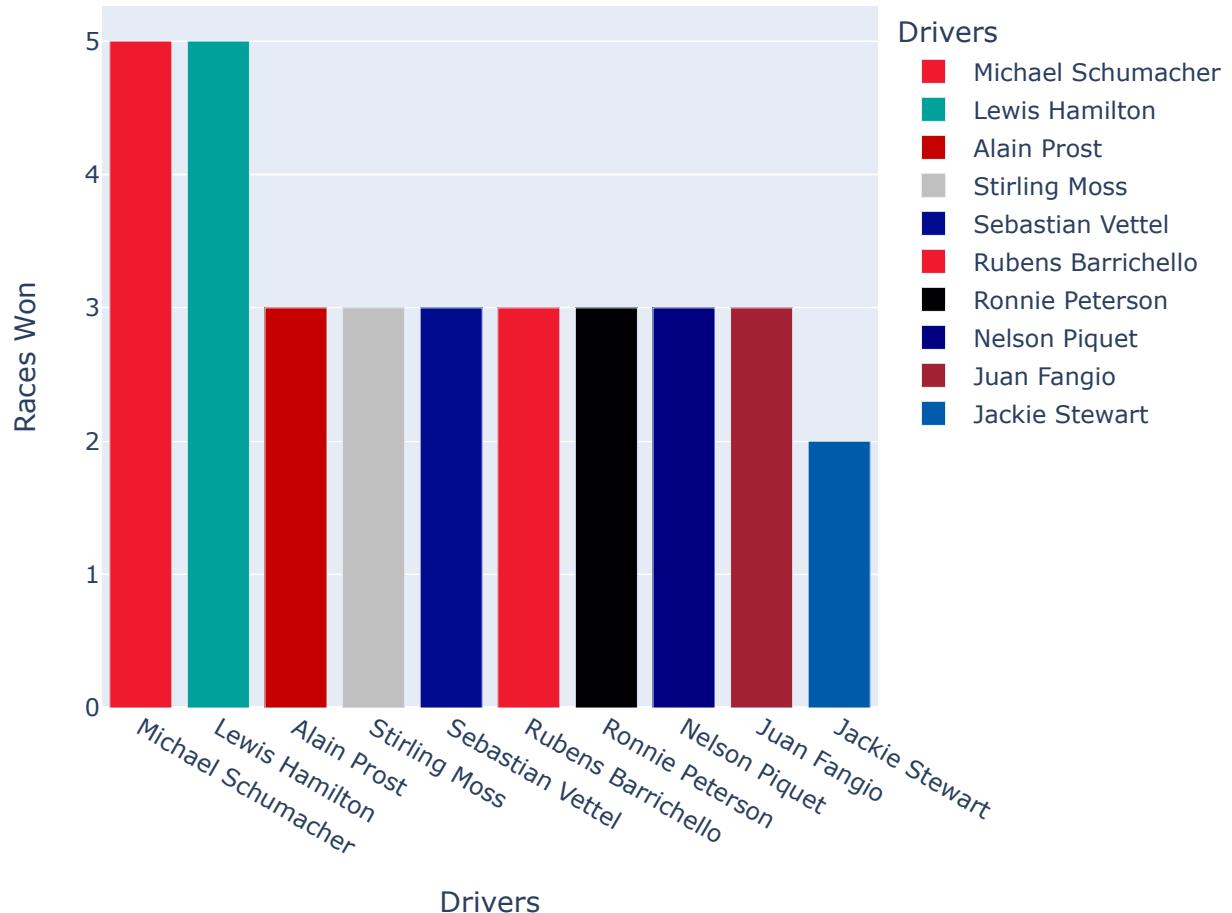
Out[25]:

driver	Races Won
Max Verstappen	10
Charles Leclerc	8
Lewis Hamilton	7
Valtteri Bottas	6
Sebastian Vettel	5
Kevin Magnussen	4
Yuki Tsunoda	3
Antonio Giovinazzi	2
George Russell	2
Callum Ilott	1

Michael Schumacher	5
Lewis Hamilton	5
Alain Prost	3
Stirling Moss	3
Sebastian Vettel	3
Rubens Barrichello	3
Ronnie Peterson	3
Nelson Piquet	3
Juan Fangio	3
Jackie Stewart	2

```
In [26]: fig = px.bar(df,x = df.index, y='Races Won',color = df.index, color_discrete_map = color_map
                  labels={
                    "driver": "Drivers"
                  })
fig.update_layout(title='Most Races Won by an F1 Driver')
fig.show()
```

Most Races Won by an F1 Driver



Most Races won by an F1 driver is Lewis Hamilton and Michael Schumacher (5 times).

Points Won

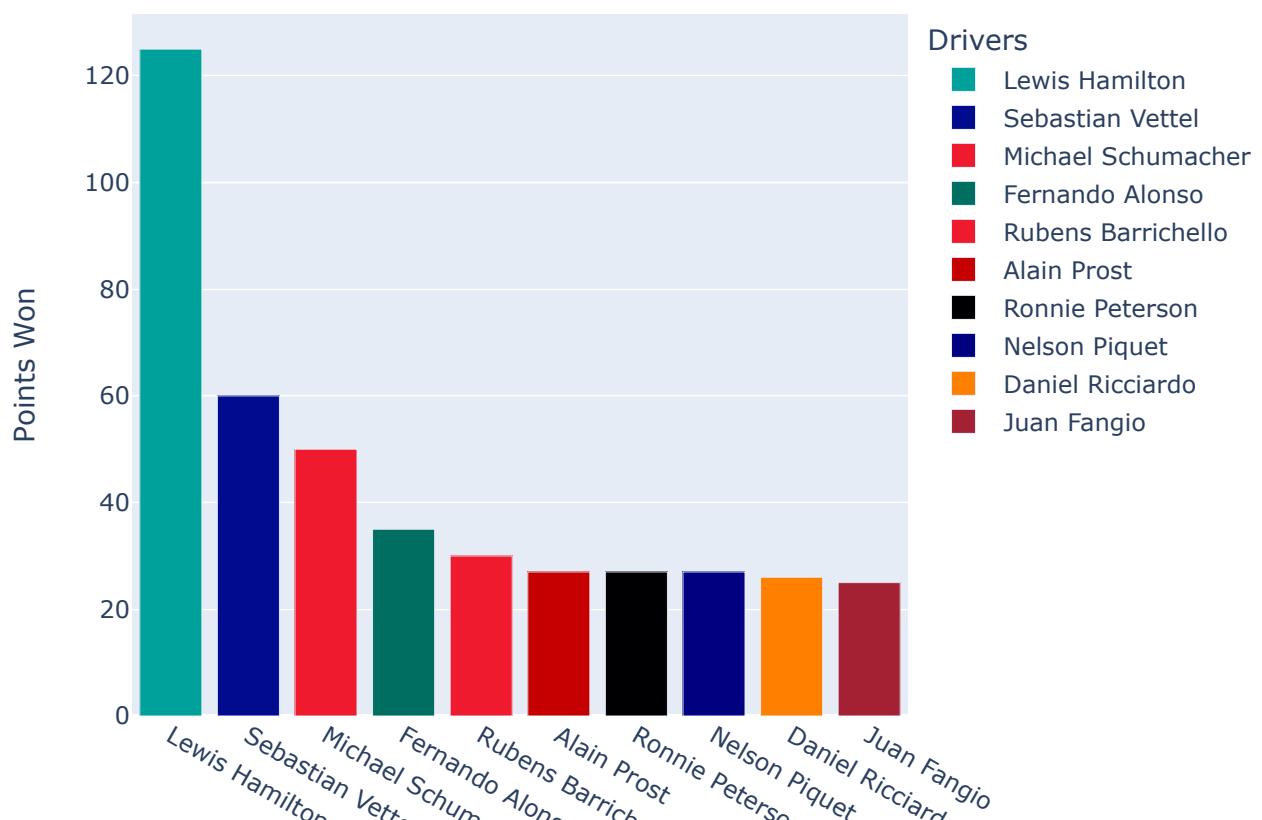
```
In [27]: df = podiums[['driver', 'points']]
df = df.groupby(['driver']).sum()
df = df.sort_values(by=['points'], ascending=False)
df.columns = ['Points Won']
df = df.iloc[:10]
df
```

```
Out[27]:
```

driver	Points Won
Lewis Hamilton	125.0
Sebastian Vettel	60.0
Michael Schumacher	50.0
Fernando Alonso	35.0
Rubens Barrichello	30.0
Alain Prost	27.0
Ronnie Peterson	27.0
Nelson Piquet	27.0
Daniel Ricciardo	26.0
Juan Fangio	25.0

```
In [28]: fig = px.bar(df,x = df.index, y='Points Won',color = df.index, color_discrete_map = color_map
                  labels={
                    "driver": "Drivers"
                  })
fig.update_layout(title='Most Points Won by an F1 Driver')
fig.show()
```

Most Points Won by an F1 Driver



Drivers

Most Points won by an F1 driver is Lewis Hamilton (125 points).

Constructors Won

```
In [29]: df2 = race_monza_df.loc[(race_monza_df['position'] < 4)]
df2.head()
```

	resultId	raceId	driverId	constructorId	number_x	grid	position	positionText	positionOrder
1	270	31	5		1	23	2	2	2
2	634	48	1		1	2	2	2	2
3	633	48	4		1	1	1	1	1
6	20636	350	18		1	1	2	2	2
8	21065	853	18		1	4	3	2	2

```
In [30]: df = podiums[['name', 'position']]
df = df.groupby(['name']).sum()
df = df.sort_values(by=['position'], ascending=False)
df.columns = ['Races Won']
df = df.iloc[:10]
df
```

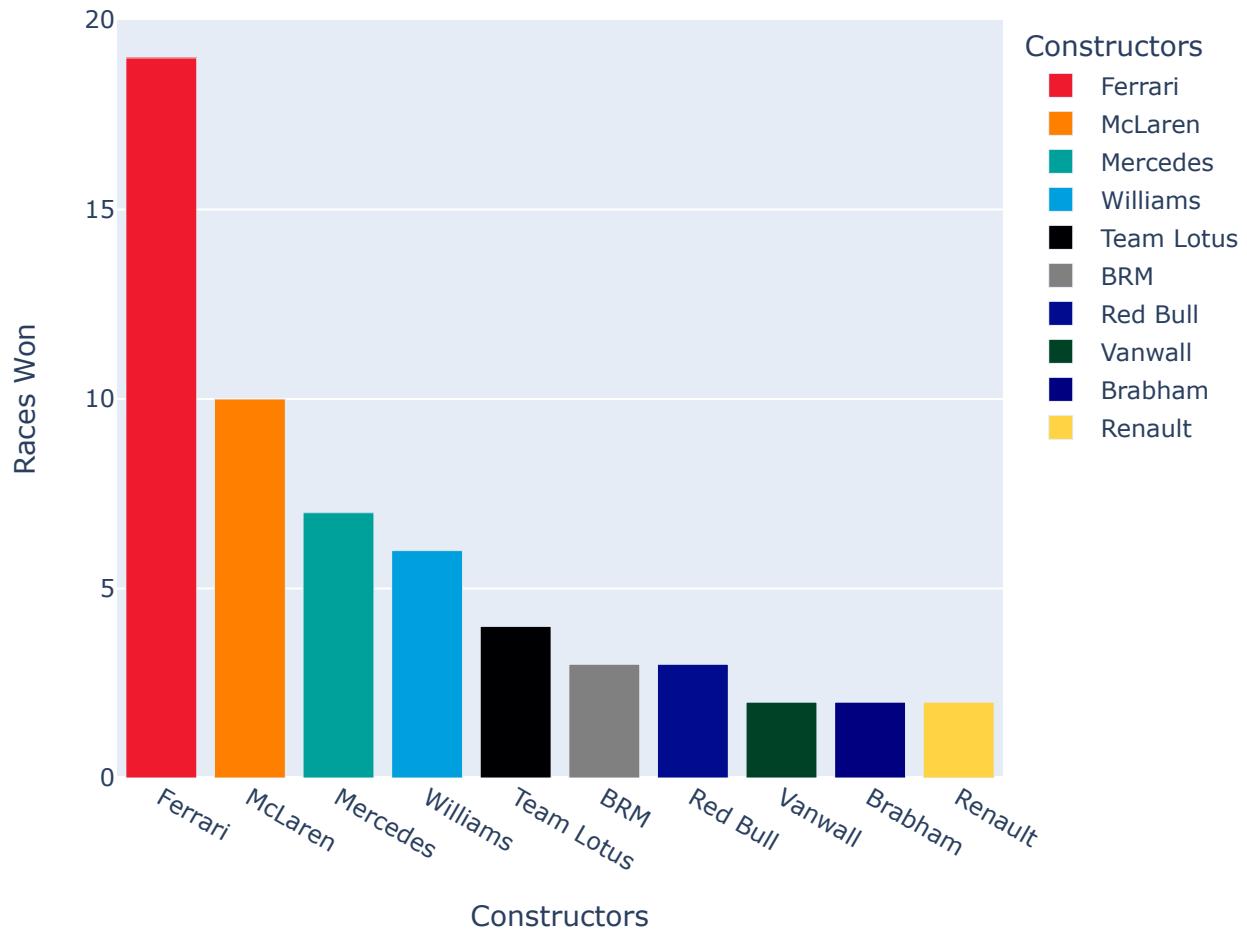
Out[30]:

Races Won

name	Races Won
Ferrari	19
McLaren	10
Mercedes	7
Williams	6
Team Lotus	4
BRM	3
Red Bull	3
Vanwall	2
Brabham	2
Renault	2

```
In [31]: fig = px.bar(df,x = df.index, y='Races Won', color = df.index, color_discrete_map = constructor_color_map,
                  labels={
                      "name": "Constructors"
                  })
fig.update_layout(title='Most Points Won by F1 Constructors')
fig.show()
```

Most Points Won by F1 Constructors



Most races won by a constructor is Ferrari (19 times).

Lap Records

```
In [32]: speed = race_monza_df[race_monza_df['fastestLapSpeed'] != '\N'].copy()
speed['fastestLapSpeed'] = speed['fastestLapSpeed'].astype(float)
speed.head()
```

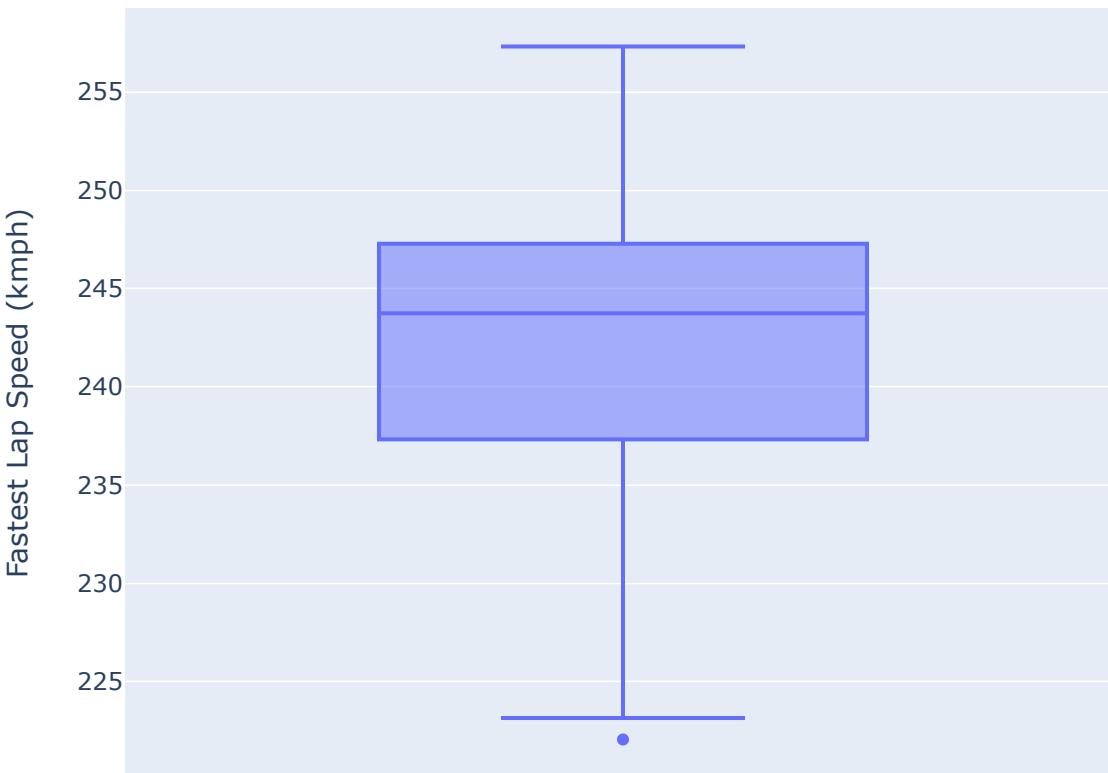
Out[32]:

	resultId	raceId	driverId	constructorId	number_x	grid	position	positionText	positionOrder	
0	275	31	1	1	1	22	15	7	7	7
1	270	31	5	1	1	23	2	2	2	2
2	634	48	1	1	1	2	2	2	2	2
3	633	48	4	1	1	1	1	1	1	1
4	7805	13	1	1	1	1	1	12	12	12

```
In [33]: fig = px.box(speed, y="fastestLapSpeed",labels={
    "fastestLapSpeed": "Fastest Lap Speed (kmph)"
})
```

```
fig.update_layout(title = 'Box Plot of Average Speed of Fastest Lap')
fig.show()
```

Box Plot of Average Speed of Fastest Lap



```
In [34]: speed = speed[speed['fastestLapSpeed'] == speed['fastestLapSpeed'].max()]
speed
```

```
Out[34]:    resultId  raceId  driverId  constructorId  number_x  grid  position  positionText  positionOrder
            232      1795      104          22             6        2       1           1                 1
```

The fastest lap is 1:21.046 with an average speed of 257.32 kmph by Rubens Barrichello

Positions Gained

```
In [35]: df = race_monza_df[['grid','position','driver','name']]
df['gained'] = df['grid'] - df['position']
df.head()
```

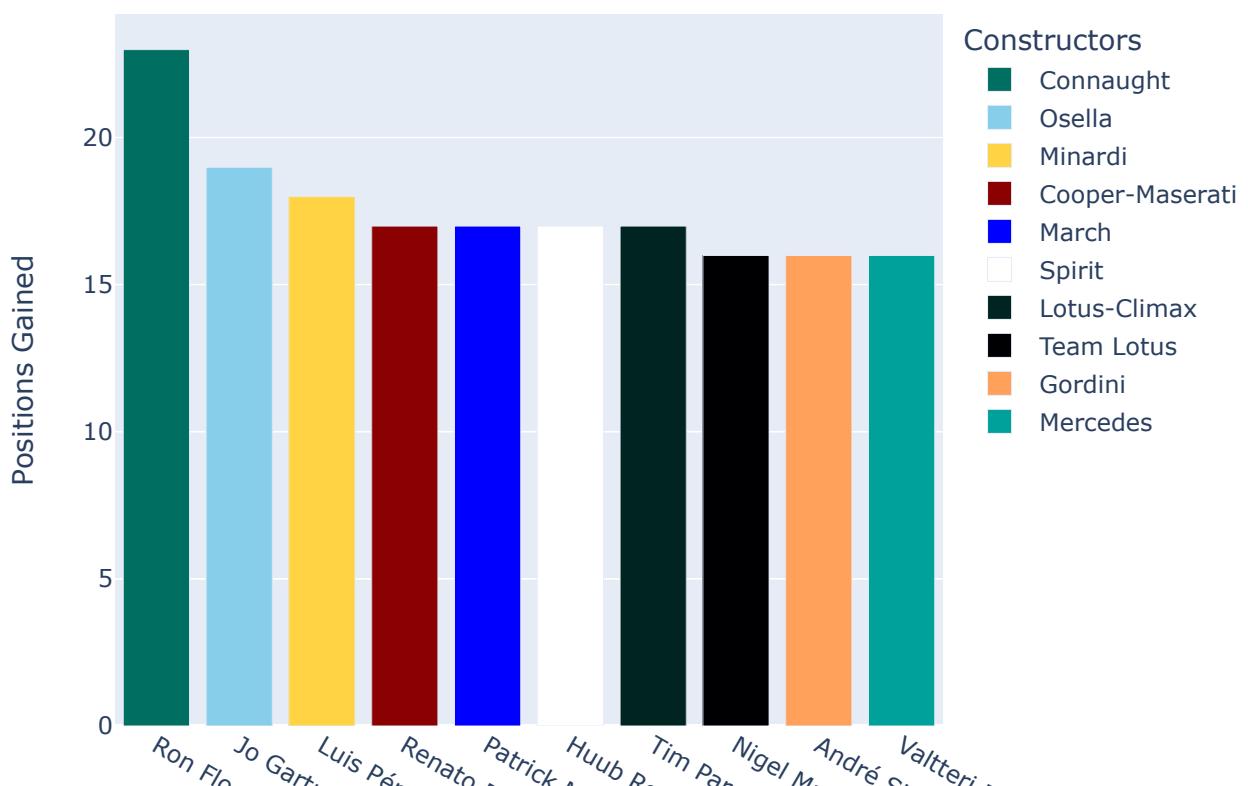
```
Out[35]:   grid  position      driver      name  gained
  0     15         7  Lewis Hamilton  McLaren      8
  1      2         2  Heikki Kovalainen  McLaren      0
  2      2         2  Lewis Hamilton  McLaren      0
```

```
3 1 1 Fernando Alonso McLaren 0  
4 1 12 Lewis Hamilton McLaren -11
```

```
In [36]: df = df.sort_values(by = 'gained', ascending = False)  
df = df.iloc[:10]  
df
```

```
Out[36]:   grid  position      driver        name  gained  
961    26       3  Ron Flockhart  Connaught    23  
773    24       5    Jo Gartner    Osella     19  
593    26       8 Luis Pérez-Sala  Minardi     18  
860    29      12 Renato Pirocchi Cooper-Maserati    17  
725    24       7  Patrick Nève      March     17  
775    25       8 Huub Rothengatter     Spirit     17  
887    27      10    Tim Parnell  Lotus-Climax    17  
707    23       7   Nigel Mansell Team Lotus     16  
963    25       9 André Simon      Gordini     16  
436    19       3 Valtteri Bottas    Mercedes     16
```

```
In [37]: fig3 = px.bar(df, x='driver', y='gained', color = 'name', color_discrete_map = constructor_color_map,  
                   labels={  
                     "gained": "Positions Gained",  
                     "driver": "Drivers",  
                     "name": "Constructors"  
                   })  
fig.update_layout(title = 'Positions Gained during an F1 Race')  
fig3.show()
```



Drivers

Most positions gained during an F1 Race in Monza is 23 by Ron Flockhart driving for Connaught.